Research Article

Application of Audio Communication Technology in Music Production and Remote Music Cooperation

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ARTICLE INFO	ABSTRACT
	Music has always been regarded as an ancient and pure art. The emergence of audio communication technology changes traditional music storage, playback, and transmission functions and facilitates music production and transmission. After a brief review of audio communication technology's development process and characteristics, this paper thoroughly explains the high portability and versatility of mobile browser HTML5 and then designs and implements a complete audio transmission system on the HTML5 platform. The proposed system provides a reliable basis for audio transmission and significantly improves transmission efficiency. Finally, this paper focuses on the influence of the development of audio communication technology on contemporary music by taking audio communication technology as the starting point for music production and communication.

Keywords: Music, Audio Communication Technology, HTML5, Audio Transmission System.

INTRODUCTION

Under the heritage of speedy financial improvement and non-stop social progress, the degree of China's tune enterprise has increased significantly. As one of the imperative applied sciences in tune engineering, digital audio technological know-how has performed a necessary position in the promotion of the improvement of the industry; hence, it is the necessary lookup path in the discipline of track [1], [2], [3]. Virtual or online concerts will gradually become the inevitable trend of the development of the music industry because they are not restricted by the venue and have convenient viewing modes. However, restricted by technical conditions and objective network quality, audio, and video information will be compressed to ensure smooth signal transmission, which will cause irrecoverable distortion and data loss to the signal quality to a certain extent. In addition, the virtual platform does not force synchronous verification of the participants' voice signals, resulting in different signal delays between several participants on the same platform. In music production, it is difficult for composers to communicate smoothly with performers in this mode, and the audio quality needs to be up to the performance standard, significantly affecting music creation. Although some mature commercial audio transmission systems are on the market, the cost is high, so many composers and engineers are trying to find a way to transfer audio data at a low cost and high quality while maintaining audio quality.

Domestic and foreign scholars have carried out extensive research on audio communication technology. Yao [4] analyzed the implementation of a digital piano audio transmission scheme and the difficulties to be solved from the professional audio transmission network perspective. Ravi [5] designed an efficient WIFI dual audio

transmission system based on modulation and analyzed its performance. Lee et al. [6] analyzed the causes of delay and noise in receiving Oracle Analytics Cloud (OAC) and proposed a method to process data packets using Anchor technology. Chu et al. [7] constructed a passive audio pickup sensor based on an exogenous Fabry-Perot interferometer and developed a one-way four-channel passive audio parallel transmission system based on a passive bidirectional optical fiber audio transmission system and wavelength division multiplexing technology. Lee et al. [8] reviewed the existing transmission technology types using Audio over IP (AoIP) and Unshielded Twisted Paired (UTP) cables and proposed an audio network protocol that is more advanced than the existing AoIP technology. Yao and Ma [9] designed an embedded remote audio transmission system based on Ethernet communication, aiming at the high hardware cost and low resource utilization of high-speed remote digital audio transmission via radio for embedded devices. Lu and Hu [10] designed an embedded audio transmission system based on H.323 protocol based on the process control of audio conferencing and the characteristics of low power consumption and high convenience of the embedded system. Although domestic and foreign scholars have extensively studied audio communication systems and proposed different types of audio systems, there are still several shortcomings as follows. Firstly, the established communication system often needs to use plug-ins to transmit audio files. Secondly, the adopted audio communication system has high compression capacity, but the audio quality is not high, and it is not compatible with HTML5. Moreover, the practicability of the audio transmission system needs to be further tested. In addition, the application and development of audio communication technology in the field of music is still rare.

This paper takes the application of audio communication technology in music production and remote music cooperation as the starting point, discusses the development history and characteristics of digital audio communication technology in detail, and gives full play to the high portability and versatility of mobile browser HTML5. This paper designs and implements a complete audio transmission system on the HTML5 platform. Finally, the effect of audio verbal exchange technological know-how on track manufacturing and improvement is explored.

LITERATURE REVIEW

Development of Digital Audio Communication Technology

As a part of the spiritual and cultural field of human beings, the technology and mode of music communication develop synchronously with all the information communication of human beings. Human music communication has evolved from primitive music communication to incomplete music communication form, from the birth of audio recording technology to the leap of music transmission technology. Every major invention and progress has promoted the development of society and also promoted the spread and development of music. Driven by multiple factors such as policy, technology, and market demand, "digital music" with emerging business models such as digital audio workstations, MP3, and online concerts is accelerating into the fast lane of development, forming a global service ecology and the market scale is becoming larger and larger. Digital audio technology is the mainstream form of audio communication technology in the 21st century, which belongs to audio communication technology. Figure 1 shows the development trend of online audio user size and market size in China in recent years. It can be seen that the development and innovation of digital audio technology is the main reason for the rapid increase in the size of the "digital music" market.
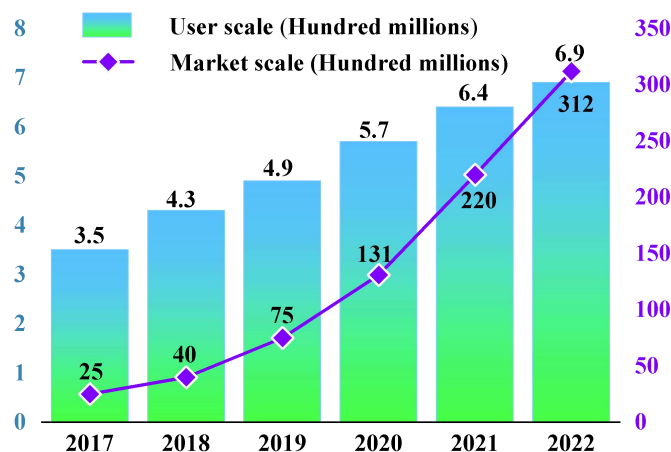

Figure 1. Development Trend of Online Audio User Scale and Market Scale in China

Digital audio technology originated from transistor technology [11], [12], [13]. The transistor used to be

invented in the Nineteen Fifties and was once a vital section of the improvement of digital audio technology. However, due to the boundaries of the science at that time, the measurement of the transistor used to be significant, resulting in the use of transistor-based digital audio science nevertheless having room for enhancement in contrast with analog audio technology, which has no obvious advantages. After entering the 1960s, mp3 compression technology also appeared, which can use digital audio amplifiers to adapt to new media tools. Although the early digital power amplifier and digital sound source cooperate very well, because of the high manufacturing cost of new media tools, large size, and many manufacturers do not strictly follow the process to control production costs, there are backward marketing methods, high production costs, product scale is too significant and other problems, affecting the promotion and application of digital audio technology. With the accelerated development of integrated circuits in China, the production cost of digital audio technology has been effectively controlled; digital audio technology is more and more mature, the application of various industries is more and more extensive and in-depth, and the efficiency of various industries. Under the background of the rapid development of information technology, the application of multimedia technology is becoming increasingly common, and digital audio technology, as an indispensable part of multimedia technology, has also become an essential help in People's Daily life. Figure 2 shows the general development of digital audio communication technology.
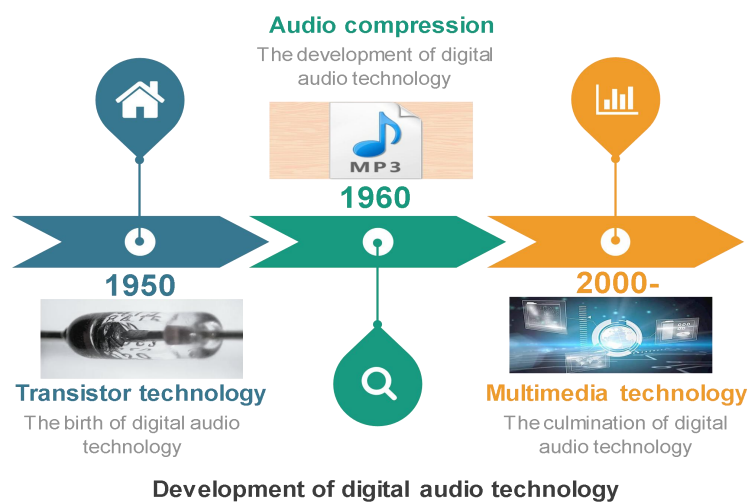

Figure 2. Development of Digital Audio Communication Technology

The development of digital audio technology has dramatically promoted our country's music industry. The industry's most common digital audio technology protocol or standard is the Audio Engineering Society/European Broadcast Union (AES/EBU) interface protocol. Many industry radios, such as CD players, DAT, and digital mixers, support this protocol. If the mode is balanced, the transmission distance is further. Because digital audio technology has the advantages of high signal quality, low transmission loss, and more flexible operation, it has been paid more and more attention to practical applications. At present, digitalization is the pillar of the development of China's music industry, and digital audio signals as an auxiliary means can ensure that audio technology can retain the input and output of the original analog audio signals.

Digital Audio Communication Technology Features

There are a variety of digital audio editing software, the most commonly used is GoldWave, which can edit the audio file through the digital audio editing function, the main process is to clearly display the audio file in the form of a waveform in the software interface, to achieve the conversion of audio signals and graphic signals. The waveform display mode can clearly express the characteristics and details of the digital audio file, so that accurate audio editing can achieve the desired audio effect. When using digital audio software to edit digital audio files, we must first analyze the audio files according to the purpose of editing, and formulate the editing strategy and direction, that is, determine the intensity of editing; Secondly, the waveform diagram in the audio editing software is used to control and display the audio. Finally, through editing operation, set detailed editing points in the waveform interface, carry out targeted effect processing, achieve a high degree of audio synchronization, and improve the quality of audio files with high quality and efficiency. Thanks to efficient and precise audio editing, digital audio technology can guarantee the fidelity of audio software while enabling personalized audio editing.

In the process of digital audio processing, different audio files can be added to different audio tracks and then combined for processing, which can greatly expand the audio effect. Through the mutual cooperation of digital audio software and computer hardware, batch audio processing, storage, and transmission can be carried out,

even if the problems encountered in the audio recording and processing process can be repaired in time through the software function. Therefore, the application of digital audio technology in the music industry can effectively ensure the sound quality and sound effects to meet the needs of the audience. In addition, due to the flexibility of digital audio technology, during the recording process of the client music software, digital devices can be flexibly combined according to actual needs, and selectively shield some weaker interference signals according to needs, fully ensuring the final recording quality, so that the recording effect is clearer, and at the same time, mobile audio tracks can be expanded according to user needs, to a certain extent, ensure the audio recording quality. In today's high-demand stage of the media industry, the ease of use of digital audio technology has reduced the production cost of the music industry while greatly improving production efficiency.

The main storage method of digital audio is digitalization, and the storage media is mainly data storage devices such as hard disks so that the digital audio software can be used for unified and efficient digital management of audio data. For example, different audio can be classified and stored with labels, and it can also be modified and processed according to different needs during use, providing a convenient digital environment for media workers to process and synthesize various audio. At the same time, the emergence of digital audio technology is accompanied by the development of information technology, which has the inherent advantage of sharing through the Internet and can realize the remote use of audio processing software to process and optimize various audio, so that audio processing is more convenient and practical. In addition, digital audio technology also includes watermarking technology and audio comparison technology, giving digital audio unique characteristics, preventing malicious distribution and forgery, and greatly improving security. Therefore, digital audio technology can realize the efficient storage and sharing of audio. The development of digital audio technological know-how can no longer solely supply humans with a higher journey however additionally promotes the healthful improvement of the track enterprise greater effectively.

Traditional music creators can only collect audio materials from real sound sources such as natural environments and artificial Musical Instruments. With the continuous development of audio communication technology, the acquisition of audio material has been a "quality" and "effect" leap. The producer can not only find the target material in a short time through the network, but also realize the creation and re-creation with the help of the virtual instrument plug-in and effect maker of the digital audio workstation. At present, some expert song recording studios nevertheless use tube components, such as tube microphones, tube preamplifiers and compressors, and strength amplifiers, to acquire notable analog sound quality. Digital audio science can convert audio archives from analog alerts to digital signals, and the nearer the conversion impact is to analog signals, the higher the sound satisfactory performance. Therefore, in order to better convert analog signals, many new professional audio products have designed digital interfaces inside the tube products to achieve high-quality audio signal conversion. The development of digital audio technology does not mean the exclusion of analog audio but the effective combination of the two and promotes each other.

METHODOLOGY

Transmission Scheme and Platform Construction

Streaming media technology is a new technology that combines network technology with video and audio coding and decoding technology. However when transmitting audio resources, only the streaming media format suitable for streaming media transmission can be selected, and due to the problem of bandwidth, the transmission speed has an upper limit. At the same time, the video definition of the format is not high, and the compression capacity is much lower than that of the latest video and audio coding and decoding technology. Therefore, the main goal of this paper is to use the audio tag to realize the player on the browser side, and realize the transmission of audio in the network based on the UDP, RTCP, RTSP protocol in the streaming media technology, and realize the decoding and playing of audio by using the HTML5 audio coding and decoding technology. The transmission scheme of the audio communication system established in this paper is shown in Figure 3. The specific steps are as follows: First, the selection of audio format. Since the supported browsers only have audio codecs, the server side must select the appropriate audio format. Then select the protocol. Second is the choice of browser. Browsers need to support HTML5 and audio tags in order to implement the player. Finally, the design and implementation of an audio player, which is the key technical difficulty to achieve playback, determines the evaluation of audio transmission. The audio communication system proposed in this paper is based on the existing network protocol and hardware facilities, and its technical cost mainly depends on the cost of the hardware equipment.
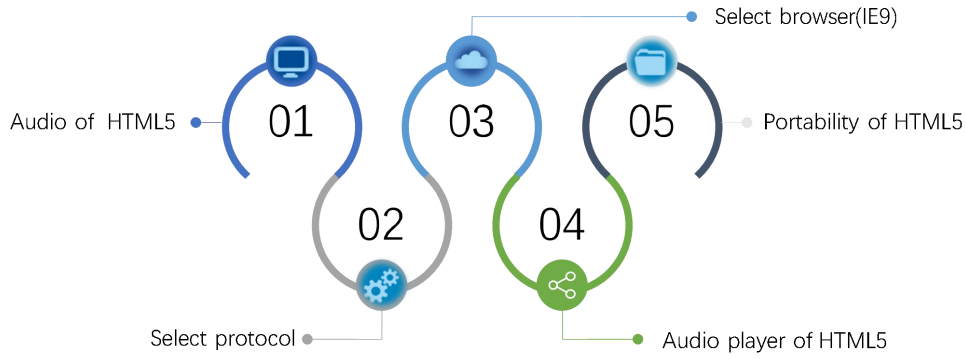
Select browser(IE9)

Audio of HTML5

Portability of HTML5

Select protocol

Audio player of HTML5

Figure 3. Audio Communication System Scheme Based on HTML5

The first issue you want to decide is the layout of the transmitted audio. At present, the audio structure used by way of the track enterprise is usually in MP3 format. Compared with the OGG decoding technology developed by HTML5 itself, H.264 decoding technology can easily achieve the compression and decoding of audio files, the encoding efficiency is high, and the technology is more mature [14], [15], [16], [17], [18]. H.264 encoding technology mainly includes video/audio. The coding layer and the network abstraction layer are shown in Figure 4. The coding layer is responsible for encoding video/audio, while the network abstraction layer is responsible for shards and encapsulates the encoded data into network abstraction layer units and then provides interfaces to the outside world. The T.S. stream consists of an audio stream and contains other information required by the protocol. The original stream is a bare stream that contains only audio data (such as MP3) output by the audio encoder, also known as the basic stream. The audio E.S. streams are packaged separately by PES to generate audio PES. Finally, the PES groups need to be packaged twice by the T.S. multiplexer, and the corresponding headers are added to generate T.S. packets, or the program stream multiplexer is used to generate P.S. packets. Figure 4 shows the generation of the transport flow.
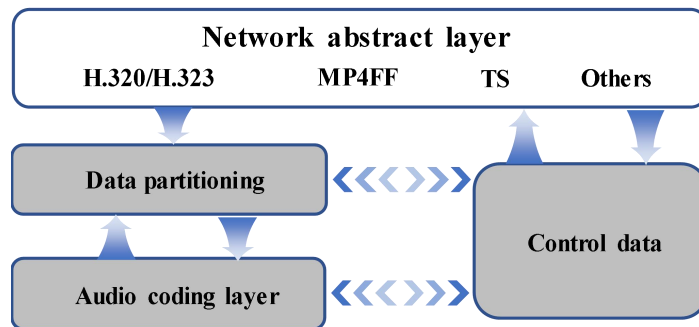
Network abstract layer

H.320/H.323   **MP4FF**   **TS**   **Others**

Data partitioning

Control data

Audio coding layer

Figure 4. H.264 Encoder Architecture

Determination of the transport protocol. Transmission Control Protocol (TCP) and User Datagram Protocol (UDP) are two key protocols designed to connect computers to each other for communication [19], [20], [21], [22], [23], [24]. When transmitting multiple data streams, TCP is preferred to ensure data integrity, controllability, and reliability. However, when the transmission performance and transmission speed are emphasized, the UDP protocol is more suitable. In order to ensure the transmission speed, the audio communication system established in this paper adopts UDP as the network transport layer protocol. Figure 5 shows the specific transmission flow under the protocol.
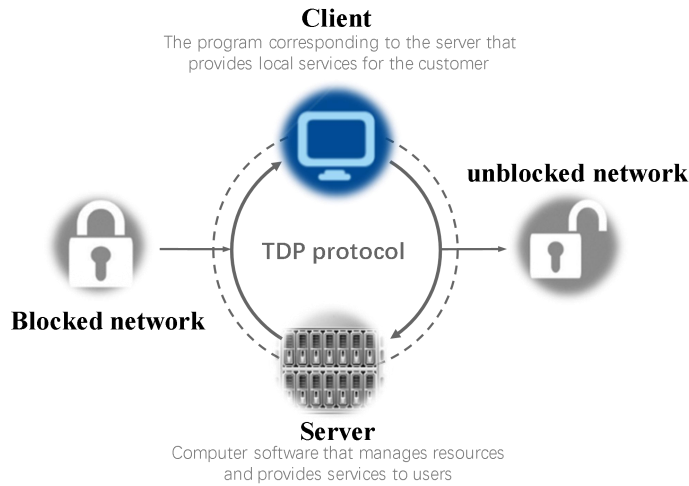
Figure 5. TDP Transport Protocol Flow Chart

Implementation of browser and audio player. You need to select a browser that supports HTML5 to implement the front-end implementation of the audio player. Since this system chooses the advantageous H.264 decoding technology, the browser needs to choose IE9 and above and use the local storage technology of Javascript to realize the local loading and storage of the player, and the appearance of the player needs Cascading Style Sheets (CSS) technology to beautify [25], [26], [27], [28]. Figure 6 shows the structure of the HTML5 player.
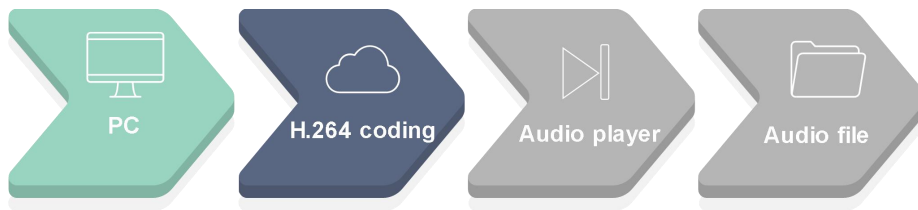

Figure 6. Structure Diagram of HTML5 Player

System Structure Design

Figure 7 is the structure diagram of the audio communication system established in this paper. The system structure consists of the following parts: Web server, network protocol, browser, operating system, platform, etc. The Web server consists of three parts: audio codec, HTML5 audio files, protocol support, and provision.
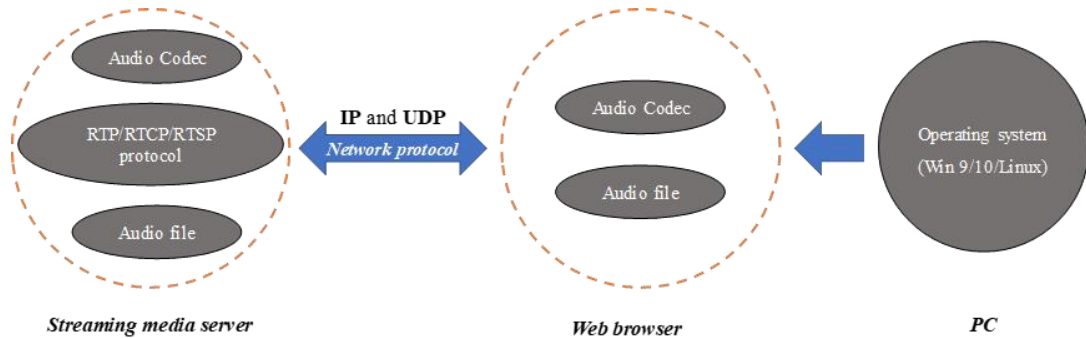

Figure 7. Structure Diagram of the Audio Communication System

The audio codec is mainly to compress and encode the audio resources collected on the external device into an audio format that can support audio transmission. At the same time, the server should provide audio resources with protocols that can support streaming media transmission and control, such as Realtime Transport Protocol (RTP) and Realtime Streaming Protocol (RTSP), to ensure stable and high-speed transmission of audio packets in the transmission process. Figure 8 and Figure 9 are the protocol frameworks of RTP, Realtime Transport Control Protocol (RTCP) [29], [30], [31], [32], [33], [34] and RTSP [35], [36], [37], [38], [39] respectively. Network protocols include TCP, which supports audio transmission, and IP. Among them, the IP. Protocol is the key protocol; the purpose of the IP. protocol is to implement the message assembled on the TCP protocol into data packets, and then in the form of packet transmission in the Internet layer when transmitted to the client, and then the packet into the original assembly of information. The Web page side is also the front-end web page design. In

the process of opening the browser, the audio file that supports audio decoding transmitted by the browser is decoded and played on the local machine. Although the tags and tags provided on the web page are provided and supported by the web page, they are actually implemented by the local browser. HTML5 audio tags provide audio players that support playing audio.
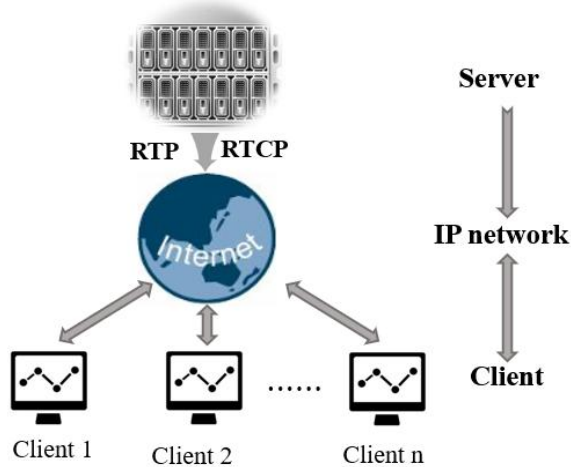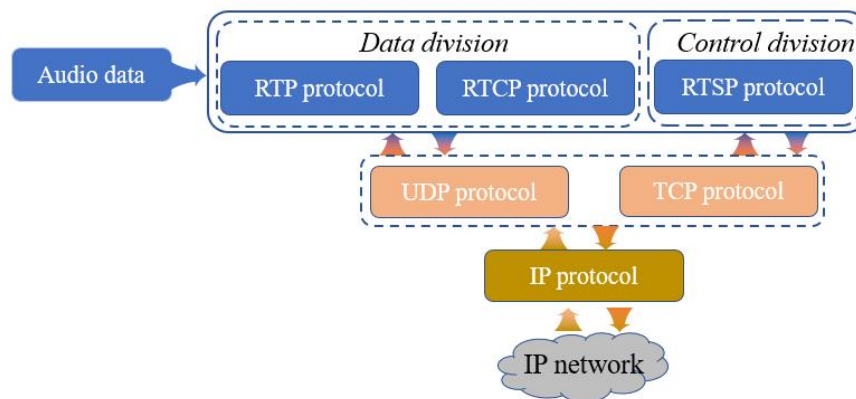

Figure 8. Framework of RTP/RTCP Protocol

Figure 9. Framework of RTSP Protocol

System Function Design

The streaming media server needs to be able to obtain audio data from the front-end device and can use H.264 technology to encode the audio data into the audio format that can be supported and package it through the RTP protocol, and then wait for network transmission through the SOCKET, the SOCKET represents the address and port and is a handle of the communication chain. This port provides a sending service, uses RTCP protocol to create an RTCP thread to process the feedback information, and dynamically calculates the sending rate required by the current network so as to control the network congestion. In the process of protocol packaging, it is necessary to retain the packet format of the RTP data transmission protocol, configure the 12-byte RTP packet header, including the version number, flag bit, serial number, time stamp, and synchronization source information, and then cut the data information into audio data smaller than the maximum network transmission unit and load it into RTP. The RTSP module on the server provides an interactive protocol to achieve session control with the browser on the P.C. When the HTML5 player on the WEB browser establishes a session with the server, the server responds in time, obtains the packet, encapsulates it into a UDP header through the transport layer, encapsulates it into an I.P. header at the Internet layer, and finally sends it to the Internet.

The main task of the media server is to RTP package the encoded media stream and then send it to the client for processing. It contains the following important functional modules: RTSP interactive module, RTP packaging and sending module, RTCP processing module, and HTML5 format local storage module. Figure 10 shows the configuration structure of the server.
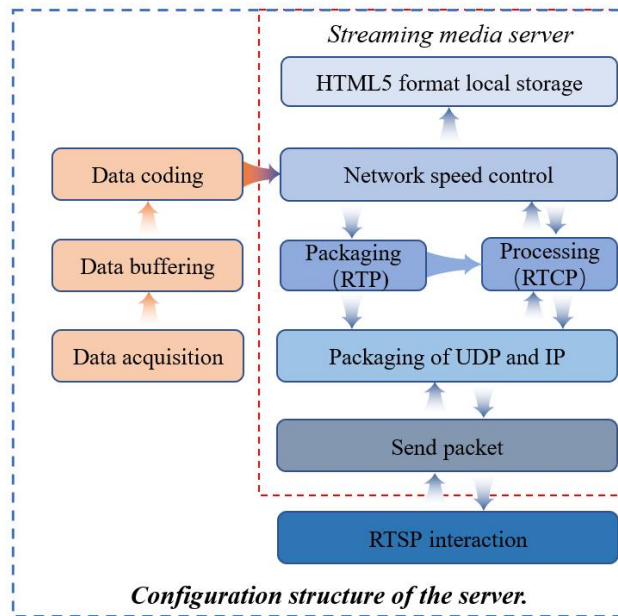
Figure 10. Configuration Structure of the Server

System Test Results and Analysis

In order to test the effectiveness of the established audio communication system, this paper takes the high-quality audio file in the local file as the test object, the size of the test file is about 24M. The specific methods used in the test are respectively using streaming media and audio communication systems proposed in this paper to compress the file and transmit it to another client through the network. The file is unzipped in a similar way. Finally, the compression size of the file, cookie and JS files are evaluated to highlight the efficiency of the audio system proposed in this paper. Compared with the current streaming media FLV format with the best technology, Figure 11 shows that for the same video resource, the size of the video resource encoded by the adopted format is 21 Mb, while that of the current streaming media FLV format is 18 Mb. In terms of compression encoding, the current streaming media FLV format has more advantages in compression encoding. However, the gap between the compressed encoding capacity of MP3 format and FLV format is relatively small.
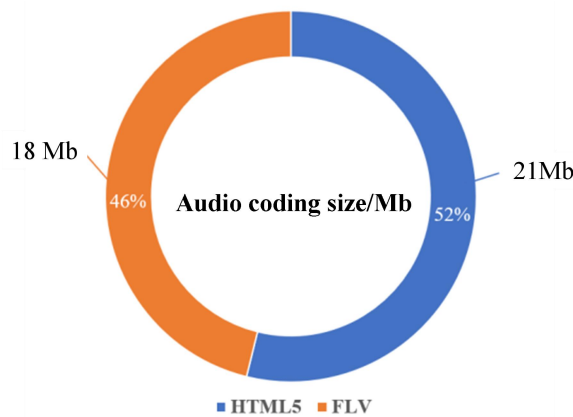
Figure 11. Video Encoding Size Comparison Results

Figure 12 compares the Cookie and J.S. file sizes of the two different players. As can be seen from the figure, the HTML5 player can store more files, while the current streaming media FLV format storage capacity is about 150K. Obviously, the HTML5 player has more advantages. In addition, comparing the J.S. file size of the two, you can find that the HTML5 player loads better resources. All in all, compared with the current widely used streaming media players, the audio communication system established in this paper has better efficiency and effect.

Figure 12. Cookie and J.S. File Size Comparison Results

RESULTS AND DISCUSSION

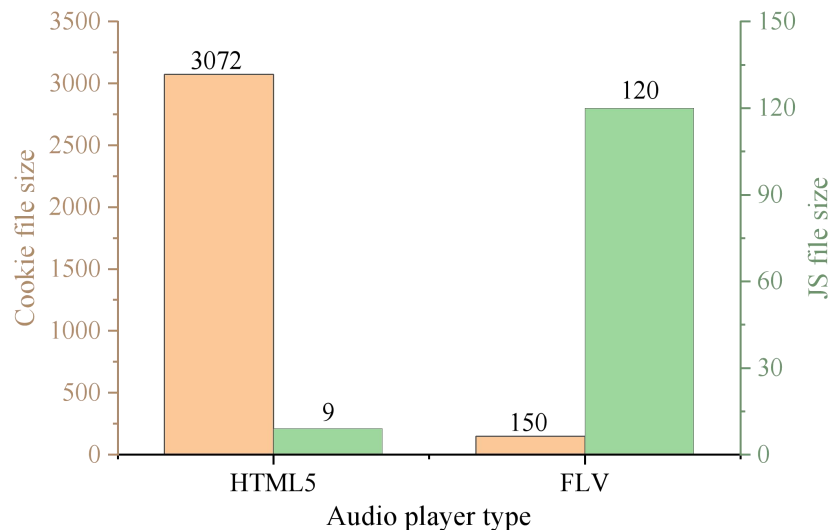The rapid development of audio communication technology provides the possibility of fine production and virtual space reconstruction for the shaping of auditory space. Through the application of audio communication technology, the number of tracks is no longer a factor limiting the quality of production; music creators can use the least time, the most concise production way to deal with tens of thousands of sound materials so that practitioners from the tedious, repetitive work free. The overall mood is also more delicate and real, increasing the precision of the production process. But despite this, the obstacles of audio communication technology to music production are also very obvious. For example, the convenience of workstations also increases people's reliance on technology, while scripted education weakens creators' inspiration. In addition, the phenomenon of vulgar music content and plagiarism in creation on the Internet is the main manifestation of the adverse impact of audio communication technology on music creation. We have to be rational about what digital audio communication technology brings us. From the perspective of music sociology, contemporary music culture, as a spiritual product, has been incorporated into the production process of industrial commodities in many aspects, while the manufacturing and dissemination of music products triggered by the digital revolution has greatly broken through the social extent of any time before, and has strongly influenced the musical lifestyle of people in contemporary society. Therefore, the impact of audio communication technology on music production and dissemination is discussed below.

The Influence of Audio Communication Technology on Music Production

Music is the art of sound, and the sound of music is the music itself, so the complete product of music production should be musical works presented in the form of sound. In this case, the music production we are talking about here includes not only composition but also singing or performance activities that can make the music sound appear, and it should also include all kinds of music creation and production methods that can directly produce the finished music sound using digital technology (mainly relying on computers). The application of digital technology in the production of music products has not only changed the technical means of music creation in the past but also changed the way of music creation due to the improvement of technical means, and therefore changed the creative concept and music expression methods different from traditional composition. As far as the practice of music creation (production) by computer is concerned, the types of music created include commercial pop music, film and television music, and various practical music, as well as pure experimental electronic music and serious music in the professional field of music. No matter what genre or purpose of music is created, it is the result of digital audio communication technology, and it has the characteristics of digital music creation and production.

The Influence of Audio Communication Technology on Music Communication

The impact of the digital revolution on the transmission of this medium is mainly reflected in the optimization of the quality of the transmission medium and the music it carries through digital technology. In addition, with the emergence of the digital era of network music transmission, it mainly relies on the digital audio compression format of mp3 music files, which is a pure digital music information transmission. It is not limited

by time and space and capacity to spread, real-time, timely, high fidelity, large capacity, and break through the limitations of time and space to spread the network, which is the intangible digital music products are different from the tangible in the past. The material medium of music product propagation characteristics. It is precisely because digital music products can be copied and stored indefinitely and can be easily transmitted, which greatly promotes the influence of audio communication technology in music transmission.

The Influence of Audio Communication Technology on Music Development

The development of audio communication technology makes the music no longer need to disperse in the video store, TV, audio and other ways or terminals for transmission, music creation, transmission and discussion of music issues can be carried out in the computer network, making the transmission of music more convenient, fast, low price, contribute to the prosperity of the music market and the heritage and dissemination of the national culture of our country. With the rapid development of audio communication technology to make music more widely participate in Internet information dissemination, users can freely upload, download and other operations, effectively improve the musician creation environment, promote a large number of individual music creators in the network for the dissemination of music works, promote China's music market has been greatly prosperous. For example, in recent years, music talent shows such as "I Am a Singer" and "The Voice of China" have always been among the top ratings of TV programs. Although there are problems such as ratings decline and plagiarism, it is undeniable that music talent shows are appreciated by the public. This degree of music communication achievements is the impact of new technology media under the background of the digital age, to a certain extent, sharing the burden of the prosperity of China's music market and the inheritance of national music problems. In addition, with the emergence of modern digital audio technology, making music is no longer completely affected by regions and people, but more affected by different regions, countries and people, after the emergence of the localization tendency, for example: jazz, rock and other music styles in our country's localization tendency, so as to realize the integration of music theme and style. Moreover, music combined with human listening has brought comfort to people's hearts again and again, and has also provided economic income for music people in our country that can still maintain life and creation motivation.

CONCLUSION

Technology is the driving force to promote the development of art. With the rapid development of audio communication technology, it has had a significant impact on the survival and development of music. Based on this, this paper discusses the development process and characteristics of audio communication technology and, on this basis, puts forward an audio transmission system based on the HTML5 platform and deeply analyzes the far-reaching impact of audio communication technology on music production and transmission. The social existence of music and the perception of musical products are changing. Digital music products will be more dependent on the intangible identity in this information age, which is more conducive to the prosperity of our music market and the inheritance and dissemination of national culture.

ETHICAL DECLARATION

Conflict of interest: No declaration required. **Financing:** No reporting required. **Peer review:** Double anonymous peer review.

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