Research on Applying Digital Audio Technology to Movie Sound Production

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Abstract

With development of technology of Internet of Things, digital audio technology is widely used and has been foundation on triggering artistic thought. As a kind of expression way, movie sound needs to be more promoted in phonological representation. However, there are defects such as non-smooth current sound conversion during current movie sound conversion and loud noise during playback and need to be solved timely. For this purpose, this paper deeply explores movie sound production process and effects with digital audio technology, whose results indicate that effective conversion and production of movie sound can be realized by above technology which provides thought for sequent playback. Based on this research, we hope to systemize and summarize digital audio technology development and movie sound production so as to provide certain reference for creators in relevant fields.

Keywords: Digital Audio, Movie Sound, Production Skills, Technology Research.

1. INTRODUCTION

1.1 Literature review

Rapid development of China’s information technology makes more and more new technologies continuously infused into movie production industry. As one of the most advanced technologies, digital audio technology has made far-reaching influence on national movie industry. Wang Yiping et al. put forward that such technology should be used for animated movie so as to obtain correct sound design process and thought mode used for sound design and technology and method application through research by using the technology (Wang et al., 2013). Zhang and Ruan proposed that exploration on sound-reinforcement system of cinema should be made by digital audio technology (Zhang and Ruan, 2016). Research results indicate that many problems exist in above system, such as complicated design and installation, extremely high cost of wiring and easy influence by disturbance, which can be effectively solved under the condition of quickly meeting needs of network transmission by using digital audio technology. Then, Zhou Yun, et al. indicates influence by digital audio technology during movie sound modeling. According to research, application of digital audio technology can effectively evoke the public’s feeling and imagination on sound source image and help sound modeling and finally make the public enrich their audio-visual experience by multi-media (Zhou, 2011). Gu Yi and other scholars mainly explored music edit method for feature by using new technology (Gu et al., 2015). Research results indicate that under the condition of new technology, use of music digital technology can certainly create more space for above music edit. And then later, from perspective of movie audio production, Lu Xiaoyu analyzed application of digital audio technology to movie sound effect (Lu, 2017). In addition, according to proposal of Yang and Tong, application of motion sensing technology to multi-sound to audio production makes multichannel and acoustic image controller designed and completed and further meet natural human-computer interaction rules and also makes problems of non-consistence between input equipment and sound track spatial dimension solved from multi-sound to audio production (Yang and Tong, 2016). It can be seen from above research that in view of small number of researches on digital audio technology-based movie sound production, research has been mainly focused on digital technology and animated movie, movie sound system and movie sound modeling and featured by lack of depth, which provides a new thought and direction for the deep and comprehensive research in this paper to a certain degree.

1.2 Research purpose
Although traditional audio technology has achieved good effects in movie production industries, technologies used mainly focuses on simulated sound source. However, considering that all movie sound sources at present are digital, movie production technology suffers a lot upon the coming of digital times. Moreover, as a trend, digital technology’s higher sampling rate and precision are more beneficial to obtain better tone quality. For example, sampling frequency is increased to 48KHZ, even 96KHZ or 192KHZ from 44.1KHZ, and sampling precision is increased to 24bit from 16bit. Currently, there are all mobile devices provided in the market and necessary for movie production ranging from notebook computer, Palmtop to cell phone. Application of digital sound source equipment including CD, MP3 and DVD and EVD can reduce overall cost of movie production and save power dissipation through using the technology (Wu and Wan, 2013). Therefore, this paper will analyze current digital audio technology to expound needs and expectation for digital audio technology by future movie industries through integrating digital audio technology into movie sound production.

2. ANALYSIS FOR THEORIES RELATED TO DIGITAL AUDIO TECHNOLOGY AND MOVIE SOUND PRODUCTION

Since that digital era caused huge influence on human’s development, digital technology permeates into all aspects of society and life in a very fast speed. Digital audio is technology for storing, recording, editing, compressing or playing sound by digital method (Yao and Wu, 2016). It is a brand-new sound processing method formed with development of technologies related to digital audio signal processing, computer and multi-media. Digital audio technology has been comprehensively expanded to radio, film and television fields, causing material reform to movie production industry. Clearly mastering development trend of digital audio technology is extremely significant for correctly promoting digital process of movie production industry. Application of digital audio technology principles can fully increase audio technology index and adapt to computer storage and networked production system.

Firstly, digital audio technology can be used for processing system and equipment transmission. Audio signal has been at stage of technology development from simulated development stage. According to starting and development of digital broadcasting and television technology, although digital audio system equipment has continuously replaced system for television program production at early and later stages as well as audio equipment by using lots of simulated signal for processing, it maintains simulated signal input and output methods and its functions have been designed to directly replace simulated sound audio system equipment and work in simulated signal environment (Zhang, 2016). Besides, movie program production technology is developed fully towards digital studio. Application digital audio technology can define general transmission protocol and determine digital audio standard and transmit and process digital audio to all audio systems and equipment. Specific application of digital audio technology means to integrate digital audio equipment to simulated signal environment.

Secondly, digital audio technology can be used to convert simulated signal related to movie production into digital signal. During specific conversion, audio signal generated can be reduced to effective control range by using such technology so as to process digital audio format to be at state of transmission and record. At present, equipment used for collecting movie audio signal at early stage is all simulated-type equipment and should process digital signal.

Thirdly, digitalized conversion of digital audio technology involves sampling and quantification. And considering that sampling part includes many contents, main measurement accuracy relies on sampling frequency and corresponding value can, according to digitalization, storage and transmission mass, be used for correctly analyzing during movie sound production. Sampling mainly involves time-related repeated stream of pulses indicating 32 kHz and professional output standard is used during movie sound production, which means pulse and standard are highly correlated to each other so as to convert between different standards. And meanwhile, quantification is set according to each sample size and its errors can make audio waveform at initial stage of movie production be at stair stage of audio signal.

In conclusion, mastering digital audio technology development direction is necessary to have a scientific understanding of simulated audio technology for movie sound production and clearly understand such technology. Application of such technology has a great advantage of audio editing, synthesis, processing effects, transmission and networking or others. In the field of professional movie sound production, electronic valve fittings for digital audio must be used for simulated tone quality. Current digital audio will be effectively and quickly infused into movie sound production-related audio system.
3. OPTIMIZED DESIGN FOR DIGITAL AUDIO TECHNOLOGY-BASED MOVIE SOUND PRODUCTION

3.1 Basic basis for research

Driven by new scientific and technical revolution, diversified digital audio technology develops rapidly. Currently, there are lots of researches on digital audio technology and many large colleges and universities begin to analyze and explore movie sound production. For example, laboratory of Communication University of China conducted actual experiments by CDC6 sound console whose user interface impresses people, especially highlighted tone quality promoting development of movie sound production. Generally speaking, the product’s visual expression is realized by high-definition lcd touch-screen of 23.5-inch with proportion of 16:9 and by visualized graphical user interface to make touch screen and decoder combined so as to promote effective play of sound. And at the same time, diversified movie forms need digital audio technology, and infusion between them increases art form gradually, which is toward comprehensive art forms. Now, range of applying such technology is enlarged, not only includes absolute music forms such as digital audio works, but also contains lots of dram, movie and television works. Artists can contain more creation inspiration by establishing multi-new media art forms for public art and using digital audio technology as creation carrier. All this means that digital technology is creating a new art era.

3.2 Speex technology-based movie sound production and design

3.2.1 Voice signal encoding

Speex project is a technology for reducing voice application input threshold by providing encoder and decoder for replacing high-performance voice. Compared with other coders, the technology is applicable to network and movie sound production and has a great advantage. And meanwhile, it is also a part of GNU project and better supported as per revised BSD agreement. There is a large advantage of using Speex method to encode voice signal of movie. Specific encode structure is as follows:

```c
// Bit acquisition structure for initialising Speex
Speex_bits_init(&bits);

// speex_encoder_ctl(enc_state, SPEEX_get_frame_size, &frame_size);
if (speex_nb_mode < 0 || speex_nb_modes)
    Speex_nb_mode = speex_modeid_NB;
else
    Speex_nb_mode = mode;

// Initializing encoder
Enc_state = speex_encoder_init(speex_lib_get_mode)

Int tmp;
Tmp = 0
```

After completing initialization, each frame during movie sound production is encoded:

inbits is a short pointer pointing at conversation frame;

outbits is place pointing at beginning of coding frame;

maxtoutsize is the maximum value that can be written into byte_ptr and not cause return to actual value of code.

After encoding, above movie audio resources are released:
In view of high-end characteristics of movie sound production supported by Speex, such as noise reduction and mute elimination, please use a model before encoding, such as Speex_preprocess, to process each frame of sound.

3.2.2 Mute processing

Mute monitoring is common technology for voice processing during movie sound production. Its basic principles lie in that based on silent characteristics of daily communication, grouping will not happen when mute is monitored by such technology and audio signal can be grouped and transmitted only in case of monitoring sudden sound. Use of mute processing program can effectively decrease broadband problems involved by transmission in network layer and finally reduce voice delay. But during actual operation, there is always interval in people’s communication in movie sound production environment, so mute elimination aims at eliminating long period for mute signal to optimize sound. And relevant processing procedures are as follows:

Pre-processing function:

```c
SpeexEncoder -> SpeexEncoder(void)
{
    // set free all resource
    speex_bits_destroy(&bits);
    speex_encoder_destroy(enc_state);
}
```

3.2.3 Combination of both-end voice processing and MDF algorithm

During movie sound production by using NLSM algorithm, noise at input end and white noise at output end need to be set, based on which the optimal step factor can be obtained:

\[
\mu_{\text{opt}}(n) = \min\left(\frac{\sigma^2(n)}{\sigma^2(\alpha)}, 1\right)
\]  

(1)

According to the formula, in case of using NLSM algorithm to eliminate echo, hypothesis not related to time of input signal and output signal fails to stand, as a result of which frequency domain processing method can be used. Considering that relevancy of signal in frequency domain is more effective than that in time domain and step factor \( \mu \) can be converted to \( \mu(k, 1) \), formula after conversion is as follows:
3.3 Testing for eliminating echo by using digital technology during movie sound production

Echo elimination is always key problems to be solved during movie sound production. In view of echo elimination model integrated in Speex method, method for synchronizing return visit and collection is put forward at this time without considering thread synchronization. Project is established in vs2008 environment and corresponding testing is conducted. Microphone is used to record a length of voice of movie sound and store in the format of abc.pcm and then play it through exposure. After that, detailed setting is made. Soon afterwards, related algorithm is used to test echo elimination. Experiment results indicate that testing effects are better, which is beneficial to movie sound production.

4. CONCLUSION

To sum up, digital audio technology has important effects on long-distance transmission, control and management of audio signal. Professional equipment makes needs intellectualized, which further reduces long-distance distortion cost and realizes resources sharing between systems. During movie audio production, traditional audio technology leads to difficulty in restoring audio playback, bringing worse experience to audience. Such problem can be better solved by digital audio technology. For the current movie industry, movie sound production process is complicated, which means that thousands of single sound in the movie needs to be classified, layered and separated and sound mixing, contemporary conversation, background music or others can be synthesized into single blends. Furthermore, digital audio technology, in various ways of creation, brings rich stuff resources to movie sound production and these resources can be processed effectively and in real time. Therefore, deep researches from different perspectives should be conducted to reveal digital audio technology and constraints by space environment so as to provide all-around services for movie sound production. In the future, movie sound production incurred by digital audio technology will be more enriched, and works produced by using different above technologies will appear at stage of sound art.

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