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The Enhancement of Piano Improvisation Accompaniment's Musical Creativity and Aesthetic Expression by Computer Music Technology

Kaihua Li*

Philippine Christian University, Manila, Philippine
**Corresponding author: 839275712@qq.com*

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Abstract: In the training of piano improvisation accompaniment skills, it is essential to integrate computer technology to optimize and enhance the technical challenges, thereby improving the performers' artistic expression. The ultimate goal is to enhance the creativity and aesthetic capabilities of piano improvisation accompaniment through computer music technology. By selecting various forms of computer music technology, such as sampling and playback, signal recognition, signal separation, information analysis, and automatic arrangement, performers can leverage the advantages of computer music technology to provide technical support for piano improvisation accompaniment. This paper analyzes the current application status of this technology and proposes practical strategies to improve its effectiveness.

1. Introduction

Mastering piano improvisation accompaniment is a crucial component of music education and an essential musical skill for students. Therefore, in music education, piano improvisation accompaniment should be included as a foundational course. Piano improvisation accompaniment involves accompanying musical pieces and designing accompaniment textures to enhance the artistic expression of the music, providing a critical basis for optimizing musical performances. The immediacy of piano improvisation accompaniment allows for the rapid presentation of musical ideas and expressions, integrating piano improvisation art, musical creativity, and aesthetic expression. In particular, the scientific application of computer music technology in musical creativity and aesthetic expression can highlight the musical qualities of piano improvisation accompaniment, making the melodies more graceful and nuanced.

2. Core functions of computer music technology

Computer music technology involves the use of computer technology in music practice to create auditory art, aiming to meet people's sensory needs for auditory aesthetics. This technology is a method for processing sound information [1]. It plays a crucial role in music creation and performance, particularly in the generation of timbre and sound processing. The emergence of

digital sound generation and sound digitization technologies highlights the core functions of computer music technology. Key technologies include electronic analog synthesis, digital analog synthesis, sampling playback synthesis, and physical silence synthesis, which provide the foundational support for timbre creation. These technologies ensure that sounds have spatial depth, sound quality is more transparent, and multiple sounds blend harmoniously, maintaining clarity in complex and dynamic environments [2]. In the application of computer music technology, the goal is to achieve optimal human-computer coordination, ensuring that the digital processing of hardware devices reaches its best state.

3. The various forms of application of computer music technology

3.1 Sampling playback technology

In the application of sampling playback technology, the primary focus is on digitizing sound source signals. This technology records and outputs sound through computer technology, achieving a playback effect [3]. In piano improvisation accompaniment, computer music technology can convert analog signals to digital signals and digitally capture the melodies played by instruments, thereby enriching the collected data and enhancing the efficiency of computer music technology. The emergence of MIDI technology during the development of computer music technology highlights the advantages of digital signal conversion, providing digital services for MIDI protocol instruments. As illustrated in Figure 1, based on the differences in the sound signal sources of piano improvisation accompaniment, sampling playback technology can be demonstrated through two methods.

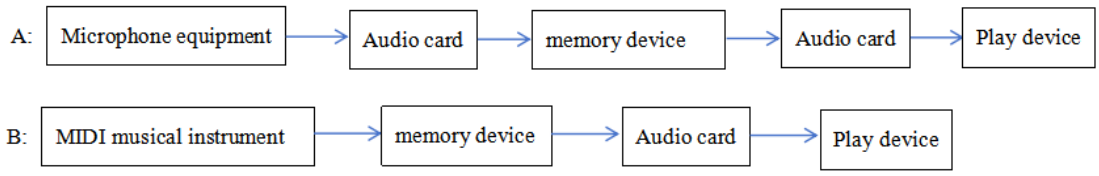

Figure 1: Two ways to display sampling playback technology

Among them, A is used for analog signal simulation; B is used for digital signal acquisition. In the application process of both, the innovation and variability of computer music technology can be reflected, the application efficiency of computer music technology symbols can be highlighted, and an important digital basis can be provided for improving the effect of piano improvisation accompaniment [4].

3.2 Signal recognition technology

Signal recognition technology in computer music composition primarily uses computer software to provide a complex sound environment for piano improvisation accompanists. It enhances the computational capabilities of software applications, offering creators a sophisticated environment for recognizing musical events, thereby highlighting the innovation in music [5]. In the application of computer music technology, it facilitates the retrieval and utilization of various audio files for piano improvisation accompaniment, demonstrating the speed and efficiency of technological applications. Computer music technology involves the recognition and extraction of musical attributes, which, from these two aspects, reflects sound signal processing technology, forming a musical contour with sound levels, thus enhancing the expressiveness of music [6]. Based on this, signal recognition technology can optimize the process of piano improvisation accompaniment, providing pianists with musical sounds that make their pitch values, note durations, sound

movement speeds, chord qualities, and melodic tonalities more specific, ensuring the integration and presentation of information [7].

3.3 Signal separation technology

In the field of computer music technology, signal separation technology uses computer application software to segment audio signals based on the musical structure, creating independent vocal parts. In piano improvisation accompaniment, this technology provides an ideal auditory experience for the audience, enhancing the audio's repairability. By utilizing signal separation technology, the efficiency of audio editing can be significantly improved through various channels such as film, music, and social media, providing crucial insights for music optimization. For instance, in complex sound recordings, the process of collecting, editing, and using human voice signals can effectively integrate environmental sounds, demonstrating the practical effectiveness of separation technology. Additionally, in piano improvisation accompaniment, computer music technology can separate environmental sounds from instrumental sounds, enhancing the clarity and purity of sound performance, thus achieving the goals of noise reduction and sound elimination in piano improvisation accompaniment.

3.4 Information analysis technology

Table 1: Information analysis technology function table

technical classification	operational process	major function	Specific effects
audio signal processing	pretreatment	Silent detection	Improve processing efficiency and readiness
		gain adjustment	
		muting	
	feature extraction	Extract frequency, time domain and frequency domain	Provide accurate data
Extract music features	time domain feature	Extract waveform, rhythm, pitch and other information	Understand the technical characteristics of computer music
	Frequency domain features	Extract the power spectrum	
	Temporal features	Extract the joint characteristics in time domain and frequency domain of signals	
Music style analysis	Music signal features	Vector machine, decision tree, random forest	Define music genres
Music emotion analysis	Identify musical emotions	Happy, sad, angry, lost, etc	Enhance musical expressiveness
	Analyze signal characteristics	Rhythm, pitch, timbre, etc	
Music information retrieval	MIR computer understanding and analysis	From the narrow perspective of analysis of computing means, the goal of digital processing is realized	Obtain performance information data
Deep learning applications	convolutional neural network (CNN)	Enrich your learning path	Model learning: music feature extraction, music style classification, music emotion analysis
	recurrent neural network (RNN)		
model recognition	Model feedback information	Analyze the audio signal to determine the attributes such as classification, clustering and regression	Support vector machine, neural network, etc

(Note: the chart data is from CNKI)

In the field of computer music technology, information parsing technology is a fundamental

technique. Its core function is to transform dynamic music into visual graphics and data through computer programming. In computer applications, software presentation methods provide a more intuitive and detailed analysis of the structural characteristics of music, highlighting its diverse forms of expression and serving as a reference for subsequent music editing. As shown in Table 1: Information parsing technology function table

The above technologies constitute the basis of information analysis for computers, improve the creative and aesthetic performance of piano improvisation, and provide intelligent technical services for music production, creation and performance.

3.5 Automatic arrangement technology

Automatic composition technology enables piano improvisers to set basic musical structure rules in computer software, thereby showcasing the software's algorithmic features. This technology allows for the organization of musical textures and structures, enabling the music to be played back and achieving the goal of musical sound visualization. With the support of artificial intelligence, this technology leverages hierarchical techniques, musical grammar, and knowledge bases to enhance intelligent computer music technology, thereby enhancing the advantages of AI. For instance, when piano improvisers engage in musical creativity and aesthetic expression, they can use computer software to optimize their performances, achieving intelligent composition, performance, and creation, thus improving the playback efficiency of musical sounds. The application of automatic composition technology provides a lower threshold for learning and performance, showcasing the effectiveness of computer music technology, enhancing the expressiveness and flexibility of piano improvisation, and offering a superior audio-visual experience for both performers and listeners.

4. The current situation of computer music technology to improve the creative and aesthetic expression of piano improvisation accompaniment

4.1 The harmony is well handled

Piano improvisers, based on the main melody, style, structure, and emotional tone of a song, skillfully apply harmonic techniques to create an appropriate accompaniment atmosphere. These improvisers have a solid foundation in harmony and are familiar with various harmonic features. They primarily focus on color harmony, continuous harmony, and altered harmony, comparing triads and seventh chords to create multi-layered harmonic effects, showcasing the dynamic and cohesive nature of piano improvisation. For instance, when accompanying intense sections of a song, they can use augmented seventh chords and chromatic scales to transform the harmony, returning the lyrical parts to triads, thus making the music more graceful, melodious, and touching.

4.2 Accurate sound pattern processing

By using specific note combinations and rhythmic patterns, performers can flexibly select and vary the sound patterns based on the characteristics of the main melody of a song, optimizing the accompaniment effect and demonstrating the accuracy of sound pattern handling. In this process, the performance should use the language of sound patterns and skill application to accompany different styles of music, highlighting the emotional expression advantages of piano improvisation and enhancing the ability to handle sound patterns. For instance, in jazz piano improvisation, the accompanist can add flexibility to the accompaniment by using chord progressions and repeated notes. In classical piano improvisation, the accompanist can enhance the elegance and grandeur of

the accompaniment by emphasizing the smoothness of the harmonies, thereby improving the musical creativity and aesthetic appeal of piano improvisation.

4.3 Novel melody processing

The musical melody, as a complement to the main melody, can enhance the aesthetic appeal of piano improvisation accompaniment through skillful melodic techniques, thereby improving the accompanist's ability in this area. With the application of computer music technology, performers can quickly develop unique performance styles by conducting independent analysis and systematic performances, showcasing distinctive playing styles. For instance, in piano improvisation, performers can enhance the color of the melody and create a moving artistic state by appropriately investing emotion and precisely controlling the musical melody, highlighting the interplay between its elements. Additionally, by refining the melodic processing, the issue of monotonous sound effects is addressed, offering listeners a multi-dimensional musical experience and thus enhancing their musical creativity.

4.4 Strong sound effect

The sound effect is a crucial component of piano improvisation accompaniment, providing performers with resources such as timbre, dynamics, and spatial elements. This enhances the expressiveness of the music and boosts the performer's creativity. In piano improvisation, performers use various techniques to artistically convey their ideas, emphasizing the strong characteristics of sound effects. For instance, they use accentuation and dynamic contrasts between clear and soft sounds to highlight the importance of note and range expression, thereby creating a rich emotional atmosphere. Additionally, through the use of pedal techniques, the sound can be made more varied, achieving a continuous sound effect. By adjusting the tempo, performers highlight the strong characteristics of their sound, vary the harmonic layers, and thus showcase the dynamic timbre.

5. Computer music technology to improve the piano improvisation accompaniment of music creativity and aesthetic expression countermeasures

5.1 Create emotional space and cultivate musical thinking

The piano, often referred to as the king of instruments, can convey the most authentic musical sounds. Piano improvisation, grounded in polyphonic music, showcases the diversity of musical art forms and offers a rich auditory and visual experience for the audience. In folk music performances, most pieces are primarily monophonic. With the rapid advancement of information technology, computer music technology has emerged, offering pianists a wide range of performance methods, thereby enhancing their musical creativity. Especially in the fusion of ethnic and Western music, this technology helps create new pathways for artistic performances by breaking through the boundaries of traditional works, highlighting musical expressiveness and creativity. Through computer music technology, it is possible to create emotional spaces, which in turn fosters the musical thinking of performers.

For instance, in the piano improvisation accompaniment of "Defend the Yellow River," the performer collaborates with the singer through a round singing format to provide piano accompaniment. This allows the performer to create a cohesive and united listening atmosphere for the audience, conveying the emotion of "roaring out in defense of the war" and using the piano to produce a powerful and stirring sound that echoes the spirit of resistance. Similarly, in "Roar,

Yellow River" and "The Song of the Guerrillas," the performer can use the piano's improvisation to mimic secondary key techniques, ensuring that the piano accompaniment aligns with the core of the music. This highlights the harmonious cooperation between the singer and the accompanist, reflecting the richness and sincerity of the musical emotions.

5.2 Show traditional elements and carry forward traditional culture

The excellent traditional culture of China is deeply rooted in the blood and genes of every Chinese person. Over a 5,000-year history, this culture has continuously demonstrated its inheritance and development. By using piano improvisation to highlight traditional cultural elements, we can promote the preservation of these traditions. During the process of improvisation, pianists blend piano accompaniment techniques with composition techniques to create a musical feast for the audience, stimulating a strong sense of cultural identity and enhancing the audience's awareness of promoting traditional culture. Firstly, piano improvisation can fully showcase the spiritual essence of China's excellent traditional culture, thereby promoting its preservation. For instance, under the concept of 'harmonious culture,' it is essential to reflect the core values and essential characteristics of China's excellent traditional culture, allowing the piano improvisation to convey the beauty of harmony. Similarly, under the technique of' yin-yang balance, 'the unique attributes of piano accompaniment are highlighted. Through variations in song rhythm, pitch, and emotional expression, the yin-yang attributes are embodied, showcasing the integration of major and minor scales in piano improvisation. Secondly, in the context of modern pop music piano improvisation, elements of China's excellent traditional culture can be enhanced, making them more accessible and appealing to the general public. For example, in the piano improvisations of 'Olive Tree' and 'Chrysanthemum Terrace,' the method of piano improvisation can be used to achieve the goals of spreading and developing traditional culture, effectively enhancing the performance.

5.3 Relate to real life and perceive the value of music

Music is an art form, not just a collection of notes; it expresses emotions and experiences, and can be seamlessly integrated into daily life through musical works, thereby enhancing learning engagement and playing skills. With the application of computer music technology, piano improvisation can closely link music with everyday life, showcasing the artistic aspects of music through real-life scenarios. This allows listeners to intuitively understand the stories behind the music and its connection to daily life, thus appreciating the value of music. Additionally, in real life, by comparing and optimizing various elements of daily life, the creative features and aesthetic appeal of piano improvisation can be highlighted. For instance, traditional festivals, folk customs, current political events, and other aspects of daily life can inspire piano improvisation, reflecting the unique themes of society.

For instance, when performing "In the Name of Father" with piano improvisation, the emotional expression through piano accompaniment enhances the music's artistic and lifelike qualities, making the lyrics and themes closely tied to real life. In analyzing "In the Name of Father," by deeply understanding the unique aspects of music education, it highlights the emphasis on values and emotional development in piano improvisation. This allows listeners to deeply feel and understand the lyrics, such as "Father holding my hands, gently walking along the quiet stone path at dawn," which sparks their interest in exploring musical art and increases their willingness to listen to this piece.

5.4 Digital technology enables to improve the quality of music

With the application of computer music technology, it should highlight the role of technology in enhancing piano accompaniment, thereby improving the effectiveness of innovative teaching methods and contributing to the development of musical arts. In traditional piano improvisation, by optimizing performance techniques and paths, the close connection between performers and listeners can be strengthened, enhancing the performer's creative abilities and enabling them to express aesthetic qualities. Based on this, leveraging technological advancements, under the framework of computer music technology, the integration of digital music production and performance should be highlighted. Through the empowerment of digital technology, listeners can intuitively experience the uniqueness of musical works, showcasing the lifecycle of music. For instance, the conception of melodies, the arrangement of harmonies, and the interpretation of rhythms should reflect the flexibility and spontaneity of piano improvisation, helping listeners better understand the essence of musical works and develop a logical understanding and skillful application of music.

For example, in piano improvisation accompaniment, the performer uses digital audio workstation (DAW) software to play piano improvisation accompaniment for the audience, create piano accompaniment pieces, so that they can understand the characteristics of musical creativity, form aesthetic expression, and thus feel the fun of music creation and performance.

6. Conclusion

In summary, the application of computer music technology offers new artistic pathways for piano improvisation accompaniment, enhancing the accompanist's superb skills and thus improving the effectiveness of singing. Piano improvisation accompaniment can fully express the expressive power of musical conceptions, enabling the accompanist to continuously enhance their musical creativity and showcase their musical aesthetic skills, thereby improving their overall musical creation abilities. Additionally, piano improvisation accompaniment can achieve the goal of spreading traditional culture, providing innovative methods and expressive capabilities, comprehensively enhancing the artistic and innovative aspects of music performance, and promoting the comprehensive development of piano improvisation accompaniment.

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