Computer-Assisted Interactive Platform Design for Online Music Teaching Based on Cloud Computing

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Combining multimedia speech recognition technology and harmony technology, one can realize automatic control and optimization in the process of music creation. This improves the quality and efficiency of music creation. This paper designs a computer-assisted interactive platform for music teaching and develops an interactive creation platform for computer-aided music teaching embedded within the Linux root file system. In the cloud computing environment, music teaching resource scheduling, information compilation and data storage design are carried out, and the music speech recognition algorithm is optimized. Considering that the tones include pitch and overtone components, the signal they contain has a wide spectral characteristic, so harmonic weighting will have a large peak at the fundamental frequency of each note. The research shows that the platform designed in this paper has a strong ability to detect and recognize the voice signal during music creation, and this improve the interactive creation quality of music teaching.

Keywords: Deep Learning; Online Music Teaching;Signal Processing; Signal De-noising

1. INTRODUCTION

The development of network information technology has greatly promoted the interactive creation of music. In the network WeMedia era, many music works were created through an interactive approach. Combined with multimedia speech recognition technology and tuning technology, it realizes automatic control and optimization in the process of music creation and improves the quality and efficiency of music creation [1]. Combining it with computer-aided technology builds an interactive creation platform for music teaching. The teaching interactive creation platform is an automatic intelligent system for automatic voice input through music pronunciation signal recognition and tone analysis [2–3]. The music teaching interactive creation platform plays an

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important role in realizing music pronunciation signal analysis and speech recognition. In the interactive creation platform of music teaching, speech control and multimedia control technology are combined with expert system analysis methods for speech feature analysis [4]. Using artificial intelligence and pattern recognition technology to realize the interactive creation of music teaching, the study of the computer-assisted interactive platform for music teaching is of great significance [5–6]

Music is an art without language, and we can't hear the clear thoughts that the composer wants to show. However, some music is exciting; some music is sad. This is because the auditory stimulus causes a color effect, which is the synaptic response [7]. So, when listening to the music, it's about mobilizing the synesthesia to feel the difference that music brings to us. The biggest difference between

Table 1 Chinese Contemporary Music Creation Challenges.

Chinese Contemporary Music Creation Challenges	Reflections
The diversified development of music in China	The diversified development of Chinese pop music is not only reflected in form, but also in content and expression. At the same time, the development of popular music from single form to diversification also meets the needs of contemporary diversified society. The development of diversification has brought great improvement to peoples' spiritual field and the field of general popular music creation.
Influenced by international music	Through international music fusion, it carries on bold innovation to music form, not only can one promote our country's pop music development. One can also can enable our country's traditional culture to be disseminated and promote cultural exchange between various countries.
The popular music is too commercial	Some economic companies and singers in the pursuit of the economic interests, result in the singer and musician in the creative process looking at the commercial aspectsand do not pay attention to quality. In this case the music created out of the lack of musical power and musical connotation, leads people to listen again. It is difficult to mention the second time listening.

impressionist music and the other genres is largely due to its unique acoustic color, such as the same colorful picture [8]. Most of the Impressionist music links music to art and is the source of inspiration for art. Therefore, when dealing with impressionist piano works, it is necessary to better display the musical style of this period. There must be different touch-key methods to better handle the music works from the details as well as giving the audience different synesthesia reactions. Film and television music are a very important part of film and television art [9-10]. It allows people to imagine things that are not visible through tangible things. They can feel and experience with the heart; they can make their own reality at the same time. The reality, the imagination and the infection of the emotions are combined to show its special artistic expression and aesthetic characteristics. At the same time, this unique state of mind allows people to think about the world displayed in the film and television drama, and then let people all integrate into the world of film and television.

Inspired by this idea, this paper proposes intelligent Chinese contemporary music creation based on the acoustic signal processing model. Wavelet neural network is a new neural network model based on Wavelet analysis [11]. It combines the good time precision of the high frequency domain, the nature of frequency precision of the low frequency domain and the self-learning function of the neural network with the Wavelet Transform, so it has a strong ability of approximation and fault tolerance. Therefore, this feature is suitable for pop music.

At present, China's popular music is in the golden period of development. More and more music resources and music forms have laid a solid foundation for the development of popular music. Music aesthetic psychology plays an important role in solfeggio training. Music's aesthetic psychological characteristics are closely related to students' own cognitive ability, that is, general students' perception ability, professional knowledge, aesthetic imagination and some other factors directly construct their aesthetic psychological characteristics. In solfeggio training, music aesthetic psychology is also the basis of students' inner hearing. Inner

hearing is the basis for students to distinguish the rhythm, which requires students to have a good music memory, and at the same time, students need to pay attention. To sum up, in order to stimulate and develop students' inner hearing in solfeggio teaching, music works that students are familiar with should be selected to stimulate students' perception system and resonance of the music temperament. Therefore, by actively selecting popular music elements familiar to students and integrating them into solfeggio and ear training courses, students can improve their inner hearing to a certain extent and help them understand and master music elements. However, we are still facing some challenges that need to be solved. Table 1 gives the details of the challenges

To address this, intelligent signal processing will be used to assist the creation.

Intelligent signal information processing utilizes many nodes distributed in the monitoring area. Each node collects quantitative information the physical attributes of the surrounding environment and then processes and transmits it. The collected information finally reaches the middle-end observer and the data collection as well as the monitoring of the area of interest is implemented. The detectable physical quantities are attributes such as temperature, humidity, light intensity, pressure, speed, direction, and volume of the moving object. In the figure 1, the acoustic signal processing model is outlined.

2.   THE PROPOSED METHODOLOGY

2.1   The Overview of the Chinese Contemporary Pop Music

At present, in the teaching of the harmony, the more traditional Chinese language teaching mode is used, which has existed for a long time. With the evolution of time, popular music is also constantly developing. Although it is said that the roots of modern pop music and harmony are in traditional harmony, the
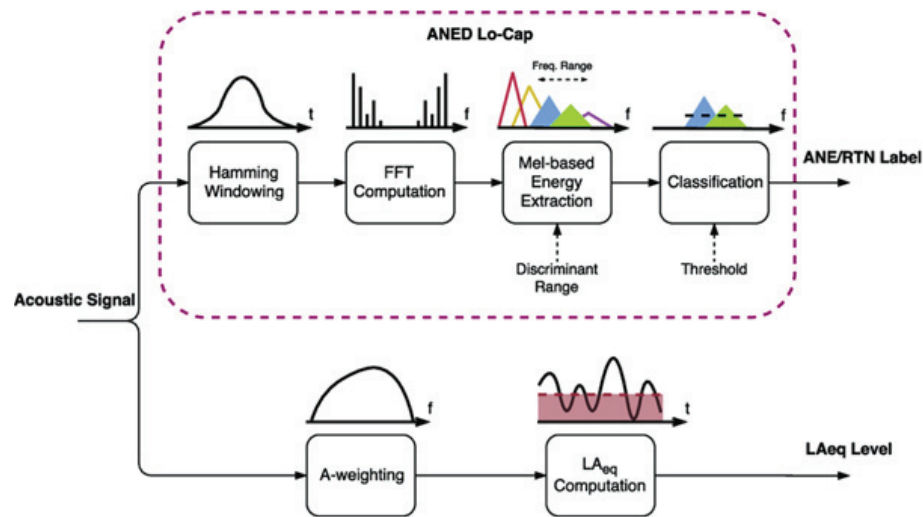
Figure 1 The Acoustic Signal Processing Model.

popularity of pop music has also undergone certain changes. In the field of popular music, the speed of updating is very fast. In the actual teaching process, most colleges use traditional teaching methods, which are divided into two stages: In the first stage, the school will provide students with traditional harmony teaching; During the second stage, at this time the school will provide the students pop music and sound teaching as well as jazz harmony teaching. Therefore, for the training, we should consider the following aspects:

i. Teachers should train singers to be good at using their own body language, but also to be able to combine their own singing style, their own characteristics or specialties to carry out diversity of stage performance innovation, such as singing and dancing, self-singing and so on, to enhance the singer's singing. This enriches its stage performance form, which in turn promotes the singing and the popularization of its popular music.

ii. In the process of singing, pop music singers should organically convey their understanding of songs and lyrics and make use of the singing voice and body language to enable the audience to better understand the theme and connotation of pop music and songs by using "hearing" and "vision".

iii. The rhythm of pop music can be divided into basic, accent shift, legato, and rest. The rhythm is very simple and easy to grasp. And in R&B and hip-hop music, it also has a dynamic rhythm, which is the rhythm form that students prefer.

Practice teaching can effectively improve the psychological quality of the singer in the singing process, avoiding the singer's various feedback either from himself or the audience during the singing process, which affects the performance of singing skills and even affects the self-confidence of his singing. Therefore, music teachers should encourage singers to actively participate in various practical performances, such as regularly holding popular music performance competitions, or working with relevant performance agencies to create more singing practice opportunities for singers, which can enrich singers.

The practice singing experience can also stimulate the singer's desire and passion to sing, and then lay the foundation for the overall improvement of singer's singing skills. With the rapid development of the information age, people's demand for information is getting bigger and bigger, but the time for reading information is less and less, so single pieces of information content cannot depict the changes of people's knowledge structure. This suggests the need to get more information to meet the desire for information. For example, in the case of a news event, more and more readers are not satisfied with just knowing the time, place, people and process of this single event. They hope to know more about the information behind the event and hope to understand the cause of the incident asimpact and other aspects.

Accordingly, in the figure 2, we demonstrate the overview of the Chinese contemporary pop music cluster.

2.2 Intelligent Signal Processing Model

Intelligent signal information processing technology began in the 1990s. It is an emerging information processing technology and its development momentum is very rapid, which has attracted extensive attention from researchers at home and abroad who have done a lot of work. Data fusion is a hot topic of research at home and abroad. It is a highly intersected subject, which intersects with many new research directions nowadays and integrates the latest research results in these fields. Data fusion is the integration of the data from several sources or of different types for signal processing, control and the decision-making to get more efficient and more satisfying data. Signal information processing fusion, also known as multi-sensor fusion, provides decision information by detecting, tracking, associating and integrating the information of spatial distribution nodes and various samples to acquire original data and complete and timely state evaluation with higher probability, precision and confidence.

For the signal processing system, we should consider the following major aspects. (1) Two-way input ac power zero conversion. Due to problems such as phase, the two input ac power sources cannot be used in parallel directly, so they must
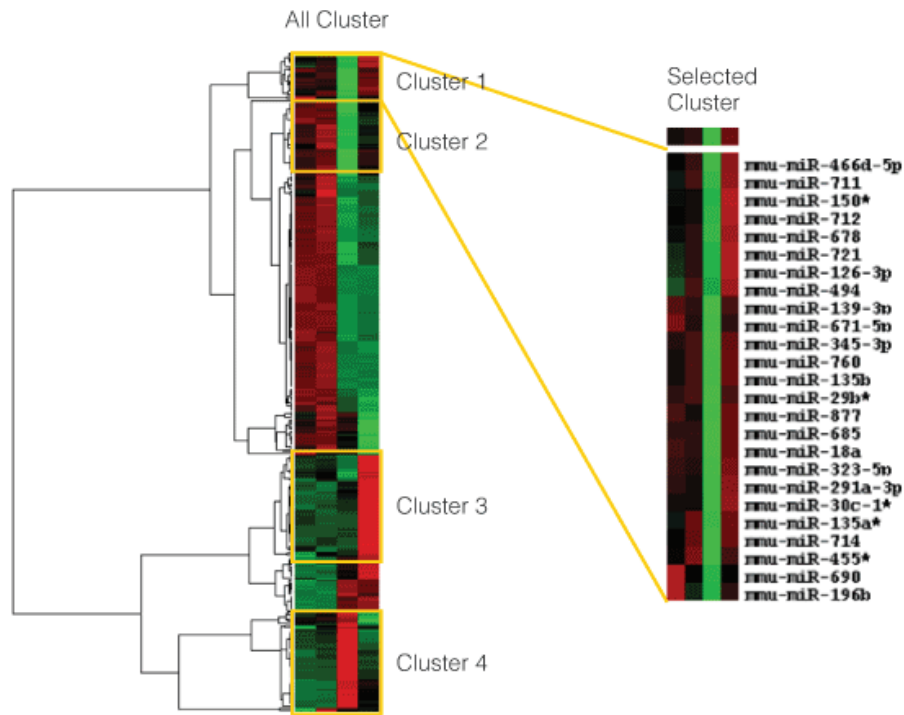
Figure 2 The Chinese Contemporary Pop Music Cluster Overview.

be converted to dc first, and then applied to dc bus in parallel, so that the two input power sources can be converted without a gap. The output sub-module is set to the bus value, and then according to dc and ac processing, the required two input ac power zero conversion is obtained (2) Zero conversion of AC output module. The output AC power supply is converted from DC bus to AC, and then is divided into several AC output sub-modules for the equipment to use in parallel. When an AC output sub-module fails, it automatically exits, and the remaining AC output sub-modules share the work, and then analogize until the remaining AC output sub-modules are also fully loaded. (3) Disperser gathering, centralism monitor. Each module's information gathering is completed in that module. Each module's active status must be grasped, in order to determine which module has broken down promptly. This allows each live module to continue gathering information, carry out the centralized processing, and provide the related information.

Data fusion technology is also called information fusion, that is, the nodes receive information fusion that can significantly reduce the network transmission of information, in order to reduce the energy consumption of the network. Network compression technology is an effective way to then improve data processing efficiency and reduce the energy consumption by the network, employing existing data compression techniques such as the distributed transform coding. The premise that the signal can be compressed is that the signal can be sparse, so that the sampling and the compression of the signal can be performed simultaneously. The high-dimensional signal is projected to a low-dimensional signal through the measurement matrix, thereby reducing the amount of signal transmission, reducing the network energy and reducing the transmission congestion, and then reconstructing the high-dimensional source signal from the low-dimensional signal through the use of the core reconstruction algorithm,

and more accurate reconstruction than the traditional theorem. Figure 3 provides the details of the framework.

3. ACOUSTIC SIGNAL PROCESSING SIMULATION

3.1 Acoustic Signal Processing Model

The echo cancellation technique assumes that the relationship between the far-end signal and microphone signal can be expressed as a fixed-length linear system that estimates the echo component in the microphone signal by performing system identification in the time or frequency domain, thereby eliminating echo.

Echo suppression technology is usually based on the assumption of the looser echo path model, which can work independently or as the follow-up processing of the adaptive wave to suppress the residual echo. The auto-adapted filter parameter estimation is usually done usually by the modelling the multi-dimensional linear return question. The estimate using the closed form solution, needs the inversion of far-end signal covariance matrix, which not only has a big computation load, but also the covariance matrix may in certain state conditions lead to instability. The stochastic gradient drop law may avoid the direct matrix inversion. As its he computation load is small, it results in widespread application. In speech communication and interaction systems, the linear relationship between the remote speaker signal and the proximal microphone signal is disturbed due to the presence of speech and background noise at the proximal end, which is often referred to as the "dual talk" problem. Moreover, due to the influence of indoor reverberation, more parameters are needed to model the echo path accurately.
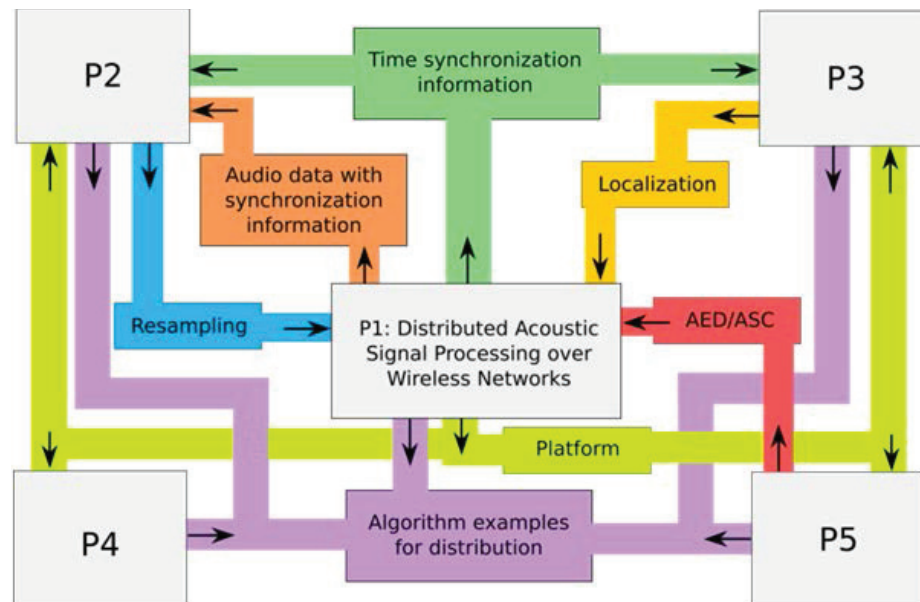
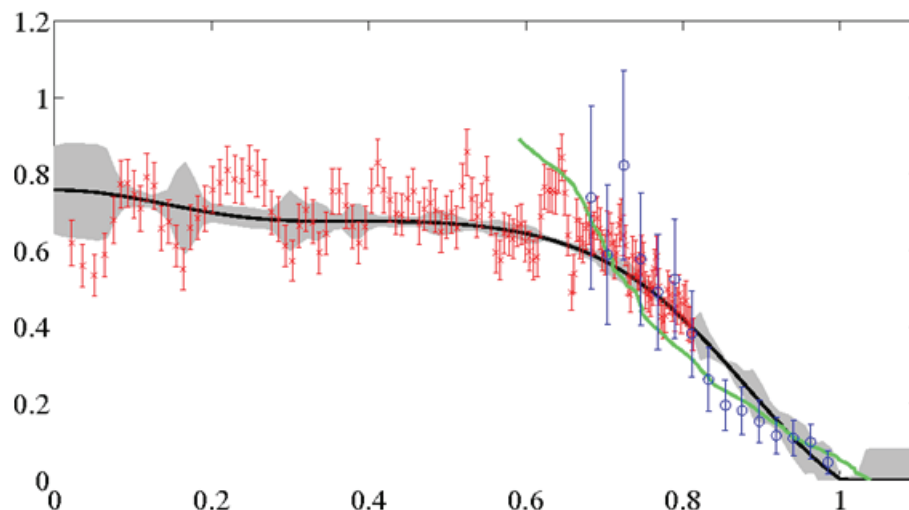**Figure 3** The Intelligent Signal Processing Framework.

Figure 4 The Acoustic Signal Processing Simulation Results.

More importantly, the echo path may be time-varying or even mutating due to environmental disturbances, so only unbiased estimates can be made based on the observed data within a limited period, which will lead to large estimation variances. Therefore, we should consider following issues.

i. To determine the echo path from two speakers to two microphones, an SAEC system consists of four adaptive filters, which are complex and difficult to implement.

ii. Preprocessing with moderate distortion of input signal reduces the correlation between input signals and avoids the problem that the solution is not unique due to correlation. The sound quality and stereo sense can be adjusted according to the expression of amplitude and phase.

iii. Through the reasonable assumption of the attenuation shape of the echo path, the order of introducing the regression variables in the stepwise regression can be reasonably determined in advance, and the estimated regression coefficients are reasonably constrained, so

that the deviation and the mean square error of the system estimation are controlled in one comparison with low range, so it is ideal for non-stationary reverberation environments where speech is the primary echo signal.

3.2   Finalized Music Information Processing Suggestions

Music can be combined with the content of the film and television drama and the plot of the film and television to make emotional interpretations and depictions of characters. It can be used to enhance the expressive power of film and television drama. One can also use expression techniques of expression and metaphor to achieve the film and the television drama. The overall presentation style is matched to enhance the expressive power of the storyline of the film and television drama, to render the atmosphere of the story, and to depict the personality of the characters. The so-called general audio signal refers to a variety of

audio signals in addition to voice signals, including music. Music is also the most important category in the general audio signals. We know that music is a complex sound phenomenon, which is the embodiment of human wisdom and perceptual thinking. Many thoughts and feelings that cannot be accurately described in words can be expressed through music. Excellent music works often make people emotionally resonate.

The main melody extraction is an important research topic in the field of the content-based music signal processing. It automatically analyzes the music audio content by a computer according to a given piece of music, and extracts the main melody of the piece of the music. Based on the above-mentioned model, we can then summarize the principles into the following aspects.

i. Polyphonic music main melody extraction is to generate a frequency sequence value corresponding to the main melody pitch of the music piece. Music retrieval system based on the main melody, first to extract the melody of music pieces given pitch contour, and then uses the sequential patterns matching algorithm to look for the song and similar songs, compared with the traditional music retrieval technology based on the text. This method does not need manual annotation, also does not require the user to know the correct information about the music, which can also realize intelligent retrieval to improve the retrieval efficiency and accuracy. In addition, the theme is used to measure the similarity of the two tracks, which can effectively identify the duet, and can be also used in copyright protection, music organization and search scenarios.

ii. Based on the significance method first estimates in a music fragment many pitches and then accompanies it according to the main melody a sound energy most remarkable characteristic. The choice has at the same time the energy significance and the time smooth pitch sequence of the melody output, namely it utilizes the multi-pitches to estimate first, then carries on to the main melody track. This kind of method has application in instrumental music main melody and in vocal music main melody extraction.

iii. Based on the machine learning method, the main idea is to extract features that can distinguish the main melody and accompaniment sounds based on the training set. These features can be artificially specified or automatically generated by the algorithm, and then the two are modeled by the algorithm. Separately one does testing after training, first extract features and then classify.

4. ONLINE MUSIC PLATFORM DESIGN

In the Internet environment, computer networks and multi-media technologies provide a variety of options for assisting music teaching. The interactive creation platform for GLUE mobile music teaching developed by the University of Washington in the United States uses a machine learning method for interactive creation of remote music teaching. LRM is used as a mobile music teaching resource by using the data core set DCMS and the Global Learning Alliance. The music teaching resource scheduling method is used to realize the music interactive teaching design. In the literature, an interactive creative resource fusion model based on linear programming model is proposed. The software design of the interactive creation platform for music teaching in the embedded Linux environment, the information fusion and scheduling algorithm realizes the interactive design of information loading and music teaching through the program loading module, and improves the intelligence of music interactive creation teaching. However, the human-computer interaction of the system is not good; In the literature, an interactive creation platform for music teaching based on three-layer middle ware structure design is proposed. Combining with the speech recognition method, the intelligent development design of the interactive teaching platform for music teaching is realized. The platform has calibration of poor tone in music interactive creation.

In view of the above problems, this paper proposes a design scheme of interactive creation platform based on computer-assisted music teaching. This paper adopts voice multimedia recognition technology to realize intelligent information management of music teaching interactive creation resource information data. The instruction loading control method is used to carry out the retrieval control of the program creation and music teaching interactive creation platform. In the cloud computing environment, music teaching resource scheduling, information compilation and data storage design are carried out, and the music speech recognition algorithm is constructed to optimize the design. The development of interactive creation platform is realized for computer-aided music teaching in Visual C++ environment. Finally, simulation experiments are carried out to demonstrate the superior performance of this method in improving the ability of computer-aided music teaching.

The test method is applied to realize the application performance of music teaching interactive creation optimization, and the simulation experiment is carried out. The experiment is based on the Matlab 7 simulation software. The music tone adjustment factor is set. The wavelet decomposition layer of the music pronunciation signal has 4 layers, and the signal sampling sample length is 4000. The test sample set is 1200. Under the computer-aided design, the output speech signal detection performance of the music teaching interactive creation platform is analyzed, and the test result is shown in Figure 5.

Analysis of Figure 5 shows that the design of interactive teaching platform for music teaching using this method has better speech signal detection performance, indicating that the interactive teaching ability of music teaching under computer-aided design is better. Test the performance of different methods for music interactive creation, and the comparison results are shown in Figure 6. It is found that the interactive teaching platform of the music teaching has higher efficiency in interactive music teaching, higher level of creation and better stability of the platform.
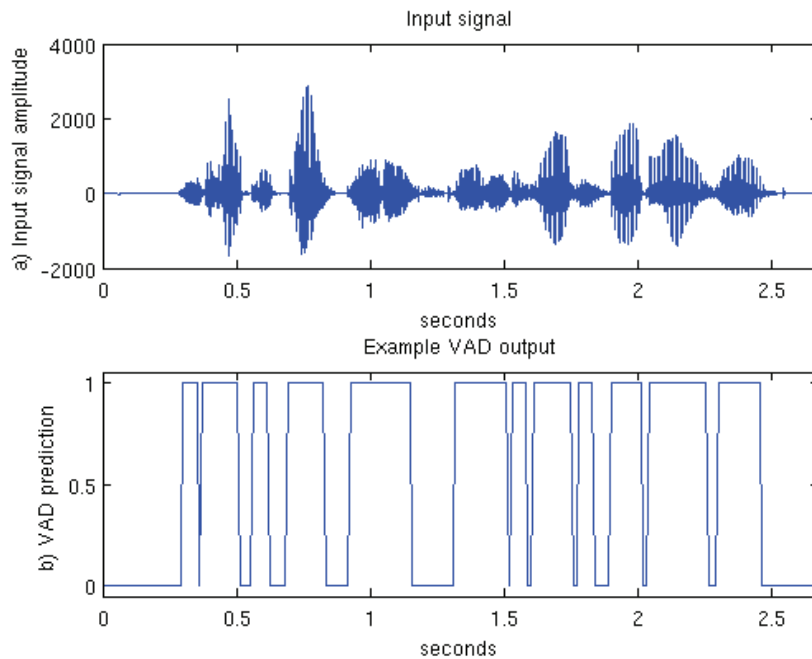
Figure 5 Detection of output speech signal of music teaching interactive creation platform.
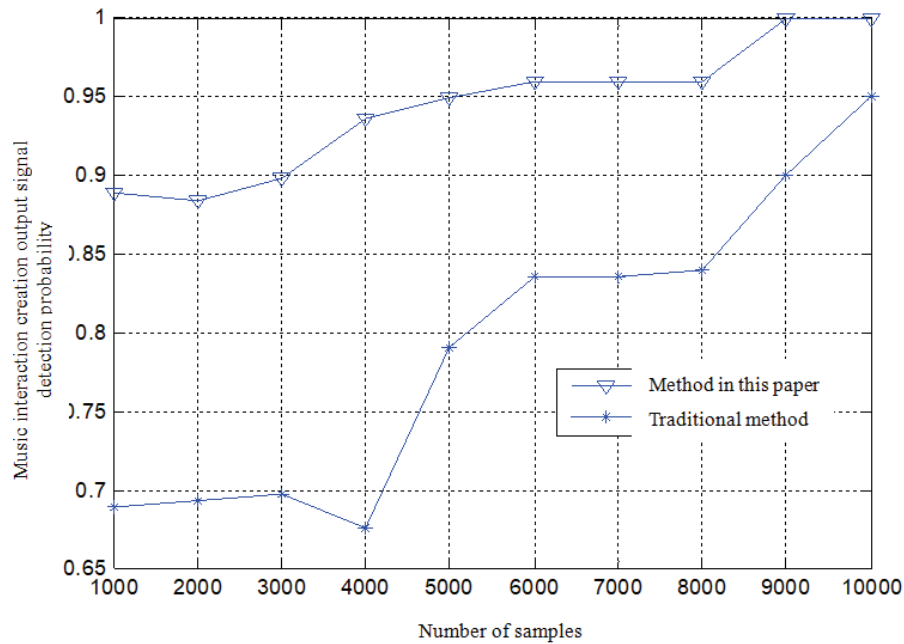

Figure 6 Comparison of Samples.

5. CONCLUSION

This paper designs a computer-assisted interactive platform for music teaching and develops an interactive creation platform for computer-aided music teaching in the embedded Linux root file system. The voice multimedia recognition technology is used to realize the intelligent information management of the music teaching interactive creation resource information data, and the instruction loading control method is used for the retrieval control of the program loading and interactive teaching platform of music teaching. In the cloud computing environment, the music teaching resource scheduling, information compilation and data storage design are carried out, and the music speech recognition algorithm is optimized. The development of interactive creation platform for computer-aided music teaching is in the Visual C++ environment. The research shows that the platform designed in this paper has a strong ability to detect and recognize the voice signal in music creation, and to improve the interactive creation quality of music teaching.

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