Design Research Based on the Human-Computer Interaction Techniques of Music Education Software for Colleges and Universities

Yang Ting Ou

Xi'an Physical Education University, Xi'an710068, China

Abstract

Human-computer interaction techniques are of great significance to construction of music education software for colleges and universities. Methods for designing music education software for colleges and universities based on human-computer interaction techniques are described in this paper through explanation of the basic connotation of human-computer interaction techniques, where design processes of music education software for colleges and universities are discussed from angles of establishment of music recognition system, intelligent music evaluation and construction of music creation pages, etc., and application methods and important functions of music education software for colleges and universities are introduced in the same time, thus promoting development of music education.

Keywords: Human-Computer Interaction Techniques, Music Education Software for Colleges And Universities, Design Research.

1. RESEARCH BACKGROUND

1.1. Literature review

The concept of human-computer interaction techniques was first proposed by American inventor Christopher Latham Sholes in nineteenth century when earliest human-computer interaction technique, namely keyboard interaction technique came into being (Yang, 2017). After that, human-computer interaction techniques, after changing and improving, have gone through 5 stages, in which great progress and breakthrough have been made to human-computer interaction techniques (Hu, 2016). Especially with the advent of the Internet era, human-computer interaction techniques have entered a period of rapid development. The application and development of human-computer interaction techniques has greatly facilitated people's production and life. It provides convenience for work and life by mastering human-computer interaction techniques, especially for multi-media human-computer interaction technique which provides convenience for people's lives. At the same time, in the development of human-computer interaction techniques, due to comprehensive control of human-computer interaction techniques by people, human-computer interaction techniques have gradually been applied to many fields (Li, 2016). In this context, application of human-computer interaction techniques in the field of education has injected new vitality into education. Education software based on human-computer interaction techniques has also been developed and applied to the actual teaching. Education software designed by using human-computer interaction techniques has changed traditional methods of software design, and also provided new ideas for design and development of educational software (Peng, 2015). With the further development of higher education, use of educational software has become more and more popular, while design of music education software promotes development of music education in colleges and universities as music education as an important part of college teaching. Currently, references about music education software, through research on which ideas for designing music education software for colleges and universities are proposed, mainly include software design, software research & development, software application methods, etc.

1.2 Purpose

With entry points as overview of human-computer interaction techniques and methods of designing music education software for colleges and universities based on human-computer interaction techniques, how to use human-computer interaction techniques to design music education software for colleges and universities is researched in this paper. Human-computer interaction techniques should be made full use of in the design process to contribute to perfect combination of music education software for colleges and universities with
human-computer interaction techniques. At the same time, application method of music education software for colleges and universities based on human-computer interaction techniques is explained in this paper. Music education software for colleges and universities is found to have positive impacts on music teaching in colleges and universities in use process. Progress of human-computer interaction techniques is promoted in the process of using human-computer interaction techniques to design music education software for colleges and universities, while music education software for colleges and universities promotes the development of music education in colleges and universities in its application in teaching (Tan and Li, 2015).

2. Overview of human-computer interaction techniques

Human computer interaction techniques refer to the information exchange channels formed between computer and human, which are the information communication channels developed by information flow (Zhang, 2014). Development of human-computer interaction techniques, which includes the period from advent of computer technique to the present, can be divided into 5 parts—keyboard, mouse, touch technology, multimedia technology and virtual reality technology, which altogether constitute 5 stages of development of human-computer interaction techniques (Chen and Zhu, 2014). It can be found through the research on human-computer interaction techniques that techniques or their carriers are constantly changing in the course of the development of human-computer interaction techniques, while these changes promote development of human-computer interaction techniques. But in the development of human-computer interaction, graphic image is still the main display form of its user interface, though great progress has been made to its mode of operation (Wan, 2014). The carrier of interactive technology is mainly computer, and the traditional interaction mode of making users adapt to the computer has not changed. But with the emergence of multimedia interaction technique, new development power has been injected into the development of human-computer interaction techniques, besides, multimedia interaction technique is a transition technique between intelligent user interface and natural interaction technique. In the process of human-computer interaction, powerful force of multimedia is mainly reflected in that it can improve the user's ability to select and control the form of information expression (Zheng, 2013). At the same time, multimedia interaction technology highly integrates its expression form with logical thinking and creativity of human. Combination of multimedia technique with human-computer interaction technique can make the information output diverse. Meanwhile, with the development of multimedia interaction technique, its application fields are also gradually increased, where application of multimedia technique in the field of music education provides a new idea for development of music education (Li and Zhang, 2013). Combination of multimedia interaction technique with music education has innovated music education model. Application of human-computer interaction technology in music education is reflected in the design of music education software, while use of human-computer interaction techniques in music teaching software fully reflects the current characteristics of the times and development trend of music education.

3. METHODS FOR DESIGNING MUSIC EDUCATION SOFTWARE FOR COLLEGES AND UNIVERSITIES BASED ON HUMAN-COMPUTER INTERACTION TECHNIQUES

3.1 Building a music resource library and a music information communication platform

Unique human-computer interaction technique characteristics which have a very important role in designing music education software for colleges and universities have been gradually formed in its development (Liu, 2013). Firstly, correct cognition on human-computer interaction techniques should be formed, correct connotation of human-computer interaction techniques mastered and specific technique contents included in human-computer interaction techniques understood in design process of music education software for colleges and universities (Jiang, 2012). Emergence of human-computer interaction technique is based on rise of computer technology, for which information characteristic of computer technology will be integrated in forming process of human-computer interaction techniques. Secondly, in the design process of music education software for colleges and universities, not only should human-computer interaction techniques be mastered, but also should investigation and research on music education conditions in colleges and universities be carried out. Development process of music education in colleges and universities and education condition should be analyzed to provide real data support for the design of music education software in colleges and universities (Ceng, 2010). Moreover, in this process, not only should the situation of music education in colleges and universities be understood, but also should scientific research be carried out on students to learn about music learning status of students and their sense of recognition towards music education software, thus helping to design music education software for colleges and universities. Thirdly, a library of music resources should be established in the process of designing music education software for colleges and universities to provide resource support for use of music software. By adopting multimedia human-computer interaction technique, one
of human-computer interaction techniques (Zhang, 2011), a resource library of music education software should be built to input various music education resources into the resource library, providing information resources support for music education software. Finally, human-computer interaction techniques are used to build a music information exchange platform. It is found by mastering the connotation of human-computer interaction techniques that human-computer interaction techniques refer to a information communication channel between man and computer, under which circumstance, human-computer interaction techniques can be used as a information exchange platform to achieve the purpose of exchanging music information. Full use of human-computer interaction techniques in design process of music education software for colleges and universities enhances the use effect of human-computer interaction techniques.

3.2 Recognizing music systems and creating music creation pages

Music education software for colleges and universities can-not be completed at one time in the process of design. In the design process, certain design rules should be complied with, and then, the music software design work should be carried out. In the process of designing music education software for colleges and universities, implementation of student information privacy should be strengthened by establishing a sound privacy mechanism to protect the personal information of users (Zhang, 2010). Human computer interaction techniques not only refer to establishment of information communication channels between man and computers, but also include using multimedia interactive technology to deal with the corresponding information, which includes sound information, picture information and other information, providing a new design idea for the design of music education software for colleges and universities. Therefore, in the design process of music education software for colleges and universities, technical characteristics of human-computer interaction techniques can be used to design and identify the music system, in design process of which multimedia interaction technique out of human-computer interaction techniques can be used to establish a system recognizing music. With the help of computer and other intelligent media tools, music information is collected and fed back to the music recognition system, which selects music information with the help from the music resource library and chooses correct music information later on (Figure for music recognition is shown in Figure 1). Students input music collected into the software which outputs music structures through process and contrast.

![Figure 1. Music Recognition](image)

The music creation pages should also be built by music education software for colleges and universities in the design process. Students develop their own musical ability by learning music, while the best way to test musical ability is to guide students to practice music. Therefore, design of music creation pages is of great significance to the music education software for colleges and universities. Touch technique out of the human-computer interaction techniques should be used to build creation pages of music education in design of the software so that users can use touch pages to create music and upload music works completed to the music information platform. In the process of designing music education software for colleges and universities based on human-computer interaction techniques, not only use functions of teachers should be cleared, but also learning functions of students can be added so that students can use the software to help their learning. Therefore, teacher page and student page, which can be built separately in page design, enable teachers and students to learn music information they want to know through different pages, in process of which the music information exchange platform can be used to communicate information and break the sense of distance between each other. Music
education software for colleges and universities based on human-computer interaction techniques is also capable of arranging specific curriculum. (Map for music curriculum setting is shown in Figure 2) in which teachers can input their teaching contents and obtain education standard with the help of intelligent analysis from education software.

Figure 2. Music Curriculum Setting

3.3 Building information convergence and intelligentizing music evaluation

It is also necessary to construct information interchange channels by using human-computer interaction techniques in the process of designing music education software for colleges and universities. Multimedia technique out of human-computer interaction technique can collect music information with other software, so as to update and design corresponding information in music education software for colleges and universities. Course arrangement of students, class structure and other relevant contents can be added in the process of building the information convergence channels by using human-computer interaction techniques so that students can master specific course arrangement of music education through the music education software for colleges and universities and adjust their course time accordingly. Meanwhile, the human-computer interaction techniques are fully used in design process of the music education software for colleges and universities to build the evaluation system for music courses. The multimedia interaction technique in human-computer interaction is used to collect and arrange the information, and the music is evaluated through the evaluation system. The human-computer interaction techniques should be applied in design process of the music education software for colleges and universities to build the evaluation system, thus ensuring normal operation of the evaluation system. The interval formula can be used to input the students’ music learning situation and the selected music curriculum content. Firstly, interval number of a student should be set as \( o \). It is understood that the greater the value is, the better the music learning effect is. Comprehensive evaluation value of music learning \( e = \sum_{o=1}^{m} a \cdot b_{e}^{c} \) and application interval \( \{ \text{max} \cdot e = 2,3,c \} \) are substituted into formula \( a_{c} = \frac{\sum_{e=1}^{c} \sum_{o=1}^{m} f_{o} \cdot e}{\sqrt{\sum_{e=1}^{c} \sum_{o=1}^{m} f_{o} \cdot e}^{2}} \) with \( e = 1,2,3,4...t \), and induction and transformation are carried out with \( e = \frac{\sum_{o=1}^{c} \sum_{o=1}^{m} \sum_{o=1}^{m} f_{o} \cdot e}{\sqrt{\sum_{o=1}^{c} \sum_{o=1}^{m} f_{o} \cdot e}^{2}} \). If the figure obtained is more than 2, it represents the best music learning effect of
the student and indicates that comprehensive music quality of the student is improved by carrying out music learning activities with the help of music education software for colleges and universities. Music course loved by students can also be learnt by formula as for arrangement of the music education curriculum system. At first, assuming $\lambda$ and $\theta$ as music course and setting time of music course, values obtained through formulas 

$$\frac{\Delta w}{\Delta t} = \sum_{u=1}^{\nu} \lambda_u \Delta y_u$$

and 

$$\frac{\Delta w}{\Delta t} = \sum_{u=1}^{\nu} \lambda_u - 1 = 0$$

can be substituted into the formula 

$$h_{wt} = \frac{h_{wt} - h_{wmin}}{h_{wmax} - h_{wmin}}$$

where $h_{wmin} = \min(h_{wt})$ and $h_{wmax} = \max(h_{wt})$ is assumed, from which $h = (h_{wt}) + 5$ can be obtained, from which it is learnt that values of $\lambda$ is bigger than values of $\theta$ and it is further concluded that which parts of music course is loved by students, thereby these courses being increased by using the music education software for colleges and universities. The music evaluation system contains not only the students’ self-evaluation. The music evaluation (Figure for music evaluation is shown in Figure 3) designed for teachers based on human-computer interaction techniques in design process of the music education software for colleges and universities helps to collect basic information about music learning of students and give evaluations results based on feedbacks from teachers, thus promoting better use of the software by teachers.

**Figure 3.** Music Evaluation

4. Positive impact of music education software for colleges and universities on music education in colleges and universities

With popularization and application of music education software for colleges and universities in music education in China, it has injected new vitality into music teaching for colleges and universities. Music teachers in colleges and universities use the music education software for colleges and universities to teach, which changes the traditional teaching mode and injects new vitality into the music education curriculum. Besides, teachers in the process of applying music education software, can understand changes of music education modes in real time with help of music education software, and then change their musical ideas, promoting the development of music teaching. Teachers, in the process of music teaching, can evaluate the quality of music education by music education software for colleges and universities. $X$, in the music education software for colleges and universities, is a music teacher evaluated who using music education software for colleges and universities in its teaching. The threshold of teaching quality is $V$; evaluation standard of teacher's teaching quality is $p$; the result of teaching quality evaluation is $\beta$. $x_{vp} = 2 - p \sum_{y=2}^{5} (x_{vy} - x_{py})^2$ is used for calculation, where $\alpha$ and $\mu$ are ideal and non-ideal teaching indexes in the same class. Through comparison of the two values $\alpha = \{maxv_1, maxv_2, \Omega, maxv_5\}$ and $\mu = \{minv_1, minv_2, \Phi, minv_5\}$, the distance $\Im$ between $\alpha$ and $\mu$ is calculated by using the formula $\Im = \sqrt{\sum_{p=1}^{5} (v_{pp} - v_{p})}$. With the operation process as $\Im_{pp} = 2 - \alpha \sqrt{\sum_{p=1}^{5} (3_{pp}^2 - 3_{pp}^1)^2}$, $0 < \Im < 1$ represents good teaching quality of teachers, while $\Im < 0$ represents poor teaching quality of teachers. Teachers are able to learn their music education quality and adjust their teaching
methods accordingly by referring to values reflected in the music education software for colleges and universities. In the meantime, the human-computer interaction techniques are combined in the design process of music education software for colleges and universities, which enables the software to provide users with a wealth of music resources, which can be used by students for learning and teachers for teaching, thus enriching music contents in the classroom and promoting music education activities. Meanwhile, application of music education software for colleges and universities in their music teaching offers a development platform for individual development of students. The information platform can be used by students to give play to their own music creation ability and to further promote their comprehensive development. At the same time, application of music education software for colleges and universities in music teaching can help teachers to better grasp use methods of human-computer interaction techniques, with help of which teachers in teaching are able to build music teaching scenes, to increase students’ sense of substitution and to promote integrated development of students. Due to the fact that music education software for colleges and universities is a product of human-computer interaction techniques and music education in colleges and universities, teachers can enhance their ability and carry out teaching activities in a better way with the help of the music education software.

5. Application method for music education software for colleges and universities

Music education software for colleges and universities are not blindly applied in its application process. Teachers, using music education software for colleges and universities to help their teaching, should combine the software with own music education modes to achieve the effect that music education software for colleges and universities is consistent with the actual teaching situation, thus playing the role of music education software in a better way. Moreover, students are able to use music education software for colleges and universities in music course selection to understand the music curriculum content and class arrangement and choose music education curriculum that suits them. Students in the music learning process can also check their musical ability through music education software, understand their music learning and help them to, by using human-computer interaction techniques, develop their own music learning plans according to which steady promotion of own music ability can be promoted. Besides, in the process, teachers and students can exchange information through the information intersection channels in music education software for colleges and universities. Teachers are able to grasp music learning situation of students, according to which, teachers can adjust the contents of music education, improving the efficiency of music education.

6. CONCLUSION

Music education software for colleges and universities in the process of design should be innovated by combination with human-computer interaction techniques, which provide ideas for design for music education software. Human-computer interaction techniques are combined with music education software for colleges and universities in its construction process to build the intelligent evaluation system and other software application functions, promoting development of music education in colleges and universities.

REFERENCES

Li Y.W. (2016). analysis of the application of computer music technology in the teaching of music major in Colleges and universities. art education, 12, 74-75.
Peng H. (2015). on the application and research of computer music software in preschool education. music space time,09, 111+120.
Tan H., Li Y. (2015). research on music service and interaction design of intelligent vehicle system. packaging engineering, 36 (08), 17-21.
Zheng B.(2013). multimedia platform ENCORE software in the teaching of college music theory in the practice of art science and technology based on, 26 (05), 323-325.