Research and Application of Intelligent Music Interactive Teaching System

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Abstract. With the development of art education and information technology, in the current teaching of music, it is more important to use computer technology and multimedia technology to help the classroom teaching, so as to improve the level of students' independent exploration and research. On this basis, a kind of interactive music education intelligent system based on RBF is constructed. This method is not only conducive to improving the level of students' independent exploration, but also can play the effect of teacher's guidance. This paper is mainly based on artificial intelligence interactive education music intelligent system research and development and application of in-depth discussion, and combined with the current combination of artificial intelligence and music intelligent system, some of the existing problems for some targeted treatment methods, in order to promote the development and application of artificial intelligence and interactive music system intelligence.

Keywords: artificial intelligence; Music education; Music intelligent system; Interactive system; RBF algorithm; Emotional interaction

1 Development of artificial intelligence

1.1 Research on artificial intelligence in music education

With the rapid development of society, artificial intelligence has gradually developed into a new topic. With the rise of the Internet, our music education is gradually moving towards intelligence and networking. In this process [2], we can see that in our life, we will see a new, more advanced and more effective technology, which will bring great changes to our English, our education and our way of life. Thus giving new meaning to our lives and our lives. As shown in Figure 1 [3]:

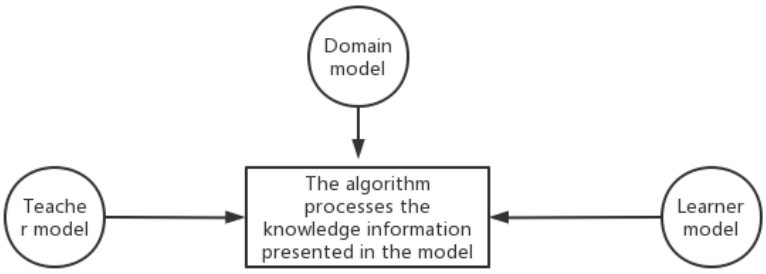

Fig. 1. Interactive learning loop diagram [self-drawing]

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1.2 Emotional machine and emotional interaction theory

Emotion is a special way of thinking composed of complex operating mechanism. Emotion is obtained through the use of machinery [3], which leads to the technical difficulties of artificial intelligence. Its functions are mainly realized from six perspectives. Marvin Minsky elaborated six aspects of human mental activity from six aspects: consciousness, mental activity, common sense, thinking, intelligence and self. Through the above six levels, we can better explain the complex mechanism of human brain and prove that it is possible to apply emotional machine to music education [4]. Emotional interaction is an emotion computing technology based on AI invented by Dr. Picard of Massachusetts Institute of Technology. This technology can enable a computer or a robot to have the functions of observing, understanding and expressing a variety of emotions similar to human beings. Affective interaction technology is one of the hot topics in artificial intelligence research. It aims to realize the interaction between human and machine and computer through affective interaction technology. For example, AI teachers like Siri provide one-to-one music guidance for children. When children encounter problems, artificial intelligence can help them answer them. When children make mistakes in the learning process, they can correct them by AI [5].

Fig. 2. Emotional interaction [self-drawing]

The so-called "node" is to present the obtained results to educators in a form of "man-machine" based on the logged-in user. Teachers constantly improve new teaching methods based on results, improve their consciousness and self-awareness through negative feedback, thus forming a complete interactive closed loop. On this basis, this paper puts forward a new evaluation method -- "development-oriented evaluation method", namely "development-oriented evaluation method". 2. In the intelligent interactive music education, the artificial intelligence method based on RBF is adopted to realize its basic operation mode. This approach is a neural network consisting of a local regulatory neuron, and generally has a five-level network model, as shown in FIG. 3 [6].

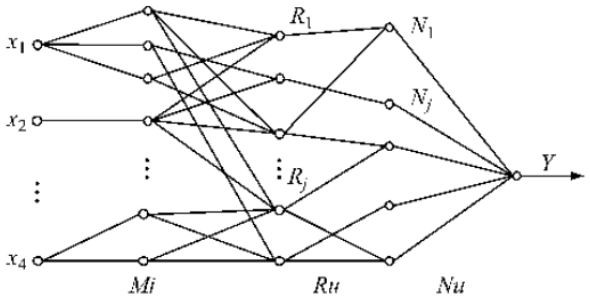

Fig. 3. Structure diagram of RBF algorithm neural network [self-drawing]

The first layer is the information factors related to the case [8] [9]. These inputs can be summarized into different music project indicators and input into the neural network structure. The second layer is membership function, its mathematical expression, such as equation (10) [7] .

$$i = 1,2... r; j = 1,2... u \quad (1)$$

The third layer describes the fuzzy rule number, through the sample learning, try to make the learning rule number is the least [10], the most important. The mathematical calculation of the output of rule JTH is shown in Equation (2) [11].

$$j = 1,2... u \quad (2)$$

Where, cj = (c1j..., crj) represents the center of the JTH RBF unit. The characteristic of RBF neural network is that the closer the neuron is to the center, the higher the degree of activation, which is very consistent with the teaching model of influencing factors of interactive music learning [12].

The fourth layer is the normalization layer, the node of this layer should be consistent with the fuzzy rule node, its JTH node Nj output, as shown in Equation (3)[13].

$$j = 1,2... u^1, u_2 \quad (3)$$

The fifth layer is the output layer, which outputs the evaluation of various skills of music performance. It is mainly based on the TS fuzzy model in the RBF algorithm, and its output is shown in Formula (4).

$$\sum ui = 1 (ai0+ai1x1+... +a1rxr) \exp\text{-}x\text{-}ci2\sigma 2 () [] i \sum ui = 1 \exp\text{-}x\text{-}ci2\sigma 2 \quad (4)$$

wk represents the connection mode of the KTH rule, that is, the sum of the weight product of output variables, as shown in Equation (5).

$$y (x) = \sum uk = 1 wk \text{ psi } k \quad (5)$$

The interactive education system based on RBF integrates the idea of algorithm with the development of the platform, fully embodies the idea of algorithm in the programming process, and applies it to various functions of the platform, so as to be closely related to the interactive education system. X refers to the proportion of the total time spent on the interactive musical intellectual activity by the students who scored well in the music exam among the 100 subjects investigated; cj∑ j refers to the implied hierarchy distribution of each music learning course of students with excellent performance in the learning process of corresponding course (X), and the implied hierarchy type is relatively parallel. Y is the optimal score for the corresponding input layer. In order to make the RBF method more simple, the second, third and fourth layers are used as hidden layers, and the first and fifth layers are used as input and output layers. The RBF method is applied to each layer. In the large-scale sample library, we will use the music samples of class m for pre-learning, and then build the RBF modeling method. Based on this method, we will build a set of music knowledge modeling method of learners based on the RBF modeling method. Finally, we will evaluate the constructed learning method through the corresponding test platform, and obtain a complete learning method. The programming diagram is shown in Figure 4.

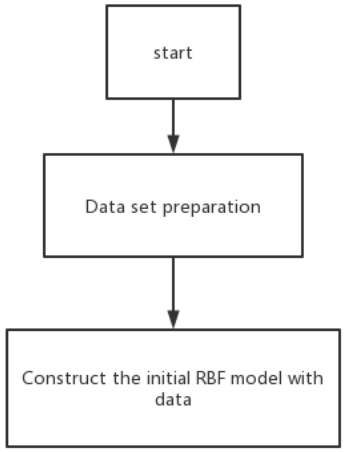

Fig. 4. Programming diagram [self-drawing]

2 System Verification

2.1 Headings, tables and figures

According to the above analysis, the network topology structure of the interactive teaching music intelligent system is shown in Figure 5.

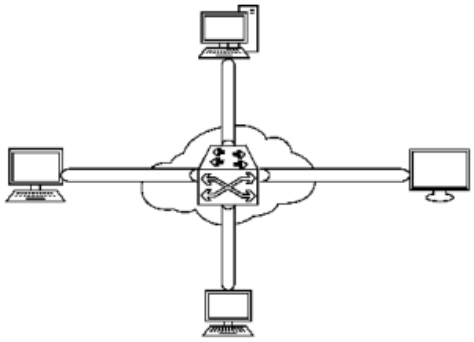

Fig. 5. Network topology [self-drawing]

Based on the user level of teacher, student, and administrator, services are provided and provided accordingly.

In teaching management, intelligent methods such as assessment of teaching methods and learning skills are used to achieve effective integration and management of different subjects (teachers, students, courseware, auxiliary), teaching methods (organization, management, evaluation, evaluation, strategy) and teaching behaviors, so that different roles can get their needs of services on the intelligent system. This system includes auxiliary training, independent learning and performance training.

On this basis, using SQLServer database as the basis, the automatic management of the system is realized, and the whole scheme of data processing is implemented. The network topology of this intelligent system is composed of hardware and software. On the basis of the server, it is configured with a database, 4 gigabytes of memory, 500 gigabytes of hard disk, 2 cpus of super CPU, and a gigabit network card. In terms of software, the system software and application program are selected. The backup software is Veritas backup. The application program uses MSWindows2007 enterprise version and WinCC system. The main function of the platform is musicology exercises, including performance problems, score problems, judgment problems, music general knowledge problems.

2.2 Test Results

This paper takes the 2018 undergraduate students of music department of a university as the research object, adopts "music intelligence" test, and investigates the application effect of this test in teaching. Enter the new game interface. Below the landing page are the names and categories of the current education sites, as well as system menus, navigation bars, system descriptions, schedules, and so on. At present, the intelligent music teaching system based on artificial intelligence technology mainly includes four aspects: special lecture, vocal singing, solfeggio ear training and basic music theory.

The wisdom system uses the form of words to show the idea, and analyzes it, from the introduction of singing, to the corresponding singing education, and to the appreciation of its typical songs; Starting from the construction of a conceptual framework, gradually increase the learned knowledge, so that the learned knowledge into a scientific and complete knowledge chain, so that the learned knowledge is easier to understand.

On this basis, using the interactive teaching method, the establishment of a knowledge point, and on this basis to learn the content of the random test. Aiming at the needs of the project, a test module for learning music theory is designed and compiled, and it is applied to online test of music theory knowledge.

3 Conclusion

On this basis, combined with some relevant international research situation, it is combined with conventional music education, and comparative analysis. In addition, we will further study the role of RBF in intelligent music education, and apply it to actual music education, study its learning methods and construction methods, and simulate students' learning rules, so as to obtain better interaction. In future experiments, more human interaction, larger scale experimental data and more accurate experimental data should be added to ensure the availability of experimental results, and a variety of different experimental methods should be used to further improve the accuracy of experimental results, the accuracy of experimental results and the correctness of experimental results.

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