Construction of Network Teaching Information Interactive Platform of Traditional Music in New Media Era

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Abstract. In order to optimize the online teaching effect of traditional music, the interactive information platform of online teaching of traditional ethnic music is constructed. In view of the existing network information interaction platform in the actual operation, the logic of teaching information interaction is chaotic, which leads to too many times of delay generated by the platform. Aiming at this problem, this paper constructs a kind of national traditional music network teaching information interaction platform in the new media era. After constructing the interactive logical relationship of network teaching information, the collected interactive data of teaching information is taken as the processing object, and the platform architecture is built. The data involved in the teaching of national traditional music is outlined by using digital communication technology to realize the real-time interaction of teaching information. After building the platform test environment, we use a traditional interactive platform, the interactive platform in literature [5] and the interactive platform designed in this paper to carry out experiments. The results show that the interactive platform designed in this paper has the least time delay and is suitable for practical use.

Keywords: New media era · National traditional music · Network teaching information · Interactive platform

1 Introduction

"Traditional music" is a concept that has emerged only recently and in the modern age. Before the Opium War, it was collectively referred to as "Chinese music". After the Opium War, works created or adapted from the acceptance of Western musical theories are referred to as "new music". And the definition of "traditional music" refers to "music created by the Chinese people in the intrinsic forms of their own nationalities by using the intrinsic methods of their own nationalities and with the characteristics of their own nationalities, including not only ancient works produced in history and handed down from generation to generation, but also musical works created by the contemporary Chinese people in the intrinsic forms of their own nationalities and with the characteristics of their own nationalities." It is obvious that traditional music does not include new music, while "Chinese music" includes both "traditional music" and "new music".

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Traditional music categories are related to their social and cultural attributes, each with its own unique characteristics and content [1]. Understanding the classification of Chinese traditional music is helpful to the selection of teaching contents and the effective implementation of traditional music teaching. Traditional Chinese music contains five thousand years of Chinese history and culture, and precipitates the unique etiquette, custom, spirit and temperament of the Chinese nation. The implementation of traditional music teaching in colleges and universities is conducive to the healthy development of college students' body and mind, and is of great significance to maintaining national culture, inheriting and carrying forward the spirit of the Chinese nation, and enhancing national pride and patriotism.

The Chinese traditional music has a long history, is extensive and profound, and is a huge treasure in our country's cultural treasure-house. This inexhaustible and long-standing source of culture and art should be protected and spread from depth to width. But the fact is not ideal, in more than 100 years of social unrest and change, the traditional culture has been turbulent, experienced too many subversive shocks, spread has not been so deep in people's imagination, so bright. The change of social form, the social adaptability of politics and economy and the emergence of their contradictions lead to the change of social culture as superstructure [2]. In the past one hundred years of the 20th century, the following social factors have exerted a great influence on the traditional music education and inheritance in China.

Therefore, more and more experts begin to pay attention to the problem of information interaction in online teaching of ethnic traditional music. Literature [4] proposed a scheme of "smart phone+Moodle platform" to construct interactive feedback system for teaching. Taking university Chinese classroom teaching as an example, this paper discusses the implementation method, application mode and practical effect of IRS system based on smart phone applied to classroom teaching. The results show that using students' personal smart phones to build interactive teaching feedback system has the advantages of simple and effective, powerful function, low cost and so on. Literature [5] explored three application strategies for Mousemischief to support interactive classroom teaching through teaching experiments, namely class mode, group mode and individualized mode, and pointed out that the process of applying Mousemischief to classroom teaching design can be divided into three stages: front-end analysis, teaching process implementation and teaching evaluation. Finally, the application effect is analyzed through on-site observation, classroom record analysis, interview, questionnaire survey and other methods. However, the above traditional methods have a large number of attacked nodes, a high CPU utilization rate and a serious delay problem when the platform runs.

In order to solve the above problems, build a new media era ethnic traditional music network teaching information interactive platform.

2 Construction of Network Teaching Information Interactive Platform of Traditional Music in New Media Era

2.1 Constructing Interactive Logical Relationship of Network Teaching Information

According to the composition structure of network teaching information, traditional ethnic music is divided into different nodes and contained equipment according to the teaching lines. According to the topological relationship between the wires where the nodes are located, the data of network teaching information interaction is collected. For traditional ethnic music in the new media era, the information interaction index of current network teaching is calculated. The calculation formula is as follows:

$$C_p = \sum_{i=1}^{n} R_i \cdot I_i \tag{1}$$

R_i represents the number of people participating in information teaching, I_i represents traditional music parameters, i represents the interactive point of network teaching, and n represents the number of nodes obtained by division. Assuming that the external teaching environment is not considered and the information nodes are not affected [3], according to the principle of new med I_a dissemination, the loss of teaching information is reduced as much as possible, and the control of information loss ia can be expressed as:

$$I_a = \frac{(C_p - C_\Delta)}{\sum_{i=1}^{m} R_m} \tag{2}$$

C_Δ represents the reduced network data information, and m represents the actual network teaching information. In the case of the above control information, according to the reality of national traditional music, the omission of knowledge points generated in the process of interaction can be expressed as:

$$I_b = \frac{\min(\mathrm{I}_a t)}{k} \tag{3}$$

Among them, t represents the time of online teaching, and k represents the number of people participating in online teaching. Take the time data obtained from the above processing as an independent variable, and delimit the change of information loss in the process of interaction, as shown in the following figure (Fig. 1):

In the process of information loss shown in the above figure, the data of network teaching information is continuously collected, and the interaction process between teaching information forms the following influence relationship, and the numerical value can be expressed as follows:

$$C_x = \frac{dlr}{\lambda} \tag{4}$$

Among them, d represents the actual interactive teaching data, l represents the interactive time, r represents the data loss caused by network teaching, and λ represents the

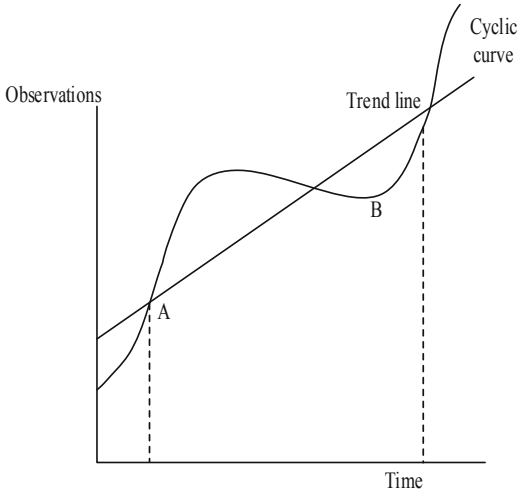

Fig. 1. Information loss process

parameter of line failure. According to the interaction frequency ρ generated in network teaching, an information suppression process is constructed, which can be expressed as:

$$C_d = \frac{r_d \rho}{\gamma} \tag{5}$$

In which, r_d represents the information effectiveness generated in unit time, and γ represents the failure rate. Synthesize the data obtained from the above control as the processing object of the interactive platform, and build a preliminary interactive platform architecture [4].

3 Construction of Platform Architecture

The interactive big data collected above is taken as the processing object, B/S architecture is adopted as the basic structure of the architecture, server is taken as the core processing part of the architecture, and Web server, database server and software application server are integrated into an overall architecture structure, which is shown in the following figure (Fig. 2):

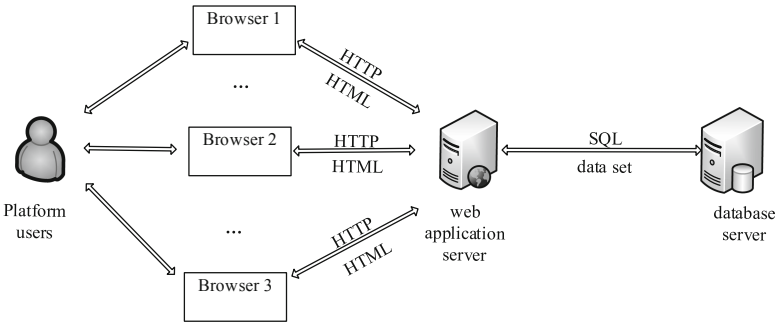

Fig. 2. B/S architecture used

Under the architecture shown in the above figure, the collected big data of teaching information is integrated into a SQL data set, and two browsers of different management types are connected by using HTTP and HTML protocols. Combined with the program structure in J2EE framework, the interactive data processing is supported [5]. In order to enhance the running speed of the information interactive platform, Flex technology is used to create the processing function of the information interactive platform, and the program generated by the function is run in the browser containing Flash Player to ensure the data interaction of the interactive platform in different browsers, and the inherent technical framework of Flex technology is adopted, as shown in the following table (Table 1):

Table 1. Technical framework of Flex technology

Serial number	Name	Frame name
1	Scripting language	ECMA specification
2	Program interface	XML language
3	Service type	Instant service
4	Matching library	Powerbuilder foundation class,powerbuilder
5	Streaming media	Support
6	Application	Asynchronous call, No interface refresh, Browser compatibility
7	Ground floor	Callability
8	Programming language object	As3 programming language
9	Running framework	Flash playerbe compatible linux

With the support of the technical framework shown in the above table, the running framework is in the form of Flash player compatible with linux, combined with the basic server-side tasks of J2EE middleware in processing engineering cost, and adopts the state of high-level intermediate component management platform architecture, which reduces the amount of code written by developers under the control of as3 programming language [6]. With the participation of application programs, the logical data of interactive instructions are coded to eliminate the influence of various data in the teaching information database. Under the influence of the adjustability of the bottom layer of the architecture, the platform can integrate the management software only once.

After building the framework of interactive platform, according to the relationship between teaching information and data, Message message is taken as the thread core, and Message Queue mainly adopts FIFO principle to manage the messages sent by Handler. Each message queue needs to have a one-to-one correspondence with Handler. Handler sends messages to the message queue in sendMessage or post mode . The messages

sent by these two methods will be arranged at the end of the message queue, but the execution methods are different: what is sent by sendMessage method is the message object processed by handleMessage () function; And what is sent out through the post method is a runnable object that must be executed in person. The logical relationship formed is shown in the following figure (Fig. 3):

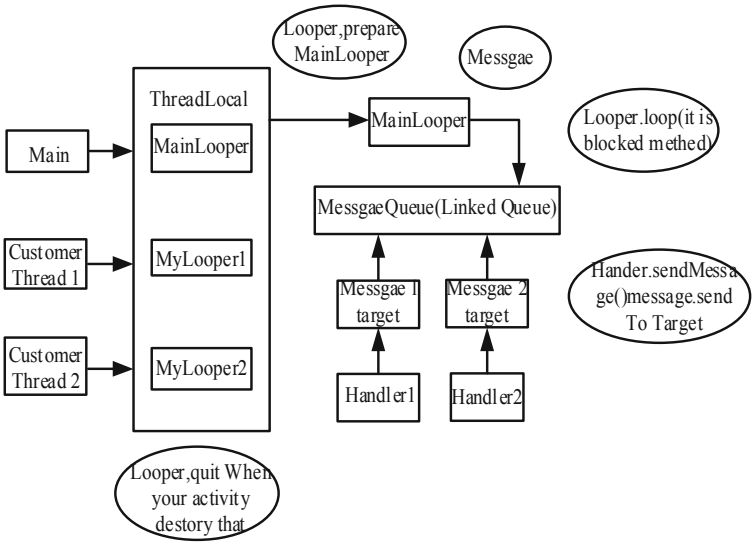

Fig. 3. Thread logical relationship

Under the logical relationship shown in the above figure, the network teaching function is realized by JAVA programming, and information exchange is carried out in real time.

4 Platform Function Realization

When building a virtual scene, the data involved in the teaching of national traditional music are used to outline the digital scene. According to the requirements of the teaching system, texture mapping and environment mapping are used to map the scene data in online teaching. Using a B/S structure, the built virtual scene is expressed as the front-end presentation layer, and a portal technology is used in the presentation layer to realize the inflow and outflow of various data of national traditional music teaching information [7], and finally form the structure of the virtual scene, as shown in the following figure (Fig. 4):

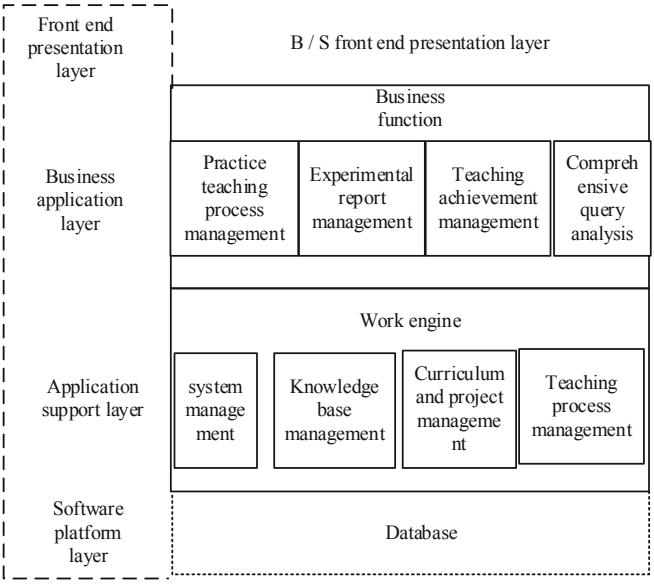

Fig. 4. Virtual scene structure

As shown by the scene structure shown in the above figure, each virtual scene is refined into the basic information of different national traditional music in the business application layer, and a work engine is set in the application support layer, which is responsible for managing the users of the simulation teaching system and the access rights of the system. The software platform layer contains the database of national traditional simulation teaching, and different databases always correspond to different simulation teaching objects [8–10].

Considering the universality of the network teaching system, the database specification is established according to the actual needs of the teaching system. Assuming that the set of teaching databases is F, the functional dependency set of F is established by BCNF decomposition method. For any sub-database $\alpha \subseteq R$ and $\beta \subseteq R$, given a functional dependency for a given R teaching relational database, the database can be decomposed into:

$$\begin{cases} \alpha \cup \beta \\ (R - (\beta - \alpha)) \end{cases} \tag{6}$$

The formula (6) is used to decompose the pattern and eliminate the dependence on the functional relationship in the database. The decomposition process can be expressed as follows:

$$U \rightarrow wR_1(U_1), R_2(U_2), \ldots, R_N(U_N) \tag{7}$$

In the above formula, U represents the database in the teaching system, w represents the decomposition coefficient, N represents the number of functional relationships corresponding to the database, and U has the following quantitative relationship with each decomposed database:

$$U = U_1 \cup U_2 \cup \ldots \cup U_N \tag{8}$$

In the decomposition process of formula (7), the quantitative relationship of formula (8) above can be ensured, the standardization of teaching simulation system in actual use can be enhanced [6, 11, 12], data errors in teaching process can be avoided, and the accuracy of teaching system in actual use can be ensured. After the virtual scene is built, the sending and receiving of teaching audio data is realized by programming, and finally the interactive platform is designed [13, 14].

5 Platform Test

5.1 Test Preparation

Prepare interactive platform development tools, and the parameters of the development tools are shown in the following table (Table 2):

Table 2. Development tool parameters

Serial number	Tool name	Parameter
1	Source code interactive tool	SVN
2	Develop application server	Windows2007Server
3	Documentation	Office2007, visio2003
4	Code development tools	Eclipse Jee3.5, Weblogic Server Plugin, SVN Plugin
5	Data model design	Power Designer 12.5
6	JAVA Environmental Science	JDK 1.5
7	Web Program container	WebLogic9. 2
8	Database	IBMDB2 9. 7

Under the control of the parameters shown in the above table, the platform test environment is built as shown in the figure below (Fig. 5):

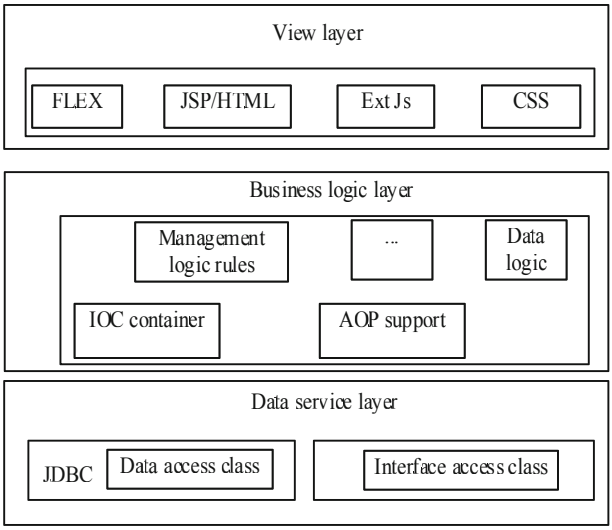

Fig. 5. Build the platform test environment

In the test environment built in the above figure, we use the Struts2.0 technology framework to communicate the data between the national traditional music teaching data and the interactive platform, and use the MVC development mode built in the platform to realize the interaction between the teaching data and the traditional music teaching information data. After debugging the software function in the platform test environment, we use the traditional interactive platform, the cost interactive platform in literature [5] and the cost interactive platform designed in this paper to carry out experiments, and compare the performance of the three interactive platforms.

6 Test Results and Analysis

Based on the above experimental preparation, the interactive data generated by the teaching at the network teaching node of national traditional music is taken as SYN message, which is transmitted to three interactive platforms through the open port of TCP communication of the platform. The nodes in the whole area are divided into 10 areas containing topological nodes. The SYN ACK message is taken as the attack of the platform, and whether the data of the network teaching node is attacked is taken as the statistical index, and the attack resistance performance of the three interactive systems is compared. The results are shown in the following table (Table 3):

Table 3. Number of attacked nodes in three interactive teaching information platforms

Test topology node area	Number of attacked nodes		
	Interactive Platform in Literature [4]	Interactive Platform in Literature [5]	The interactive platform designed in this paper
Zone 1	5	3	1
Zone 2	5	3	0
Zone 3	5	4	0
Zone 4	6	3	0
Zone 5	6	4	1
Zone 6	5	4	1
Zone 7	4	3	0
Zone 8	5	4	0
Zone 9	7	3	0
Zone 10	7	3	0

When running three different information interactive platforms in the same teaching structure, there are the same data nodes in the node division area. From the results of the node data attack shown in the above table, it can be seen that when the traditional interactive platform is attacked, the number of cost data nodes in the topology structure is between 4 and 7, and the security performance of the interactive platform is poor. The number of nodes attacked in the interactive platform in literature [5] is between 3 and 4, and the security performance of the interactive platform is higher than that of the traditional interactive platform. Compared with the two existing interactive platforms, the interactive platform designed in this paper has higher security performance.

Under the above experimental environment, taking the CPU utilization rate of the host when the platform is attacked as a comparison index, calling the task interactors of the interactive hosts in different regions, and counting the CPU utilization rate generated by the three interactive platforms when attacking the topological node structures in different distribution network regions, the results are shown in the following table (Table 4):

It can be seen from the CPU utilization results shown in the above table that when dealing with the same external attack, the CPU utilization rate generated by the traditional interactive platform is the largest, and most of the CPUs of the running host are used for the operation of the interactive platform, which is not suitable for practical use. The CPU utilization rate generated by the interactive platform in reference [4] and reference [5] in the host is relatively small, which can basically provide CPU utilization space for other operations. However, the CPU utilization rate of the interactive platform designed in this paper is about 45%, and the host can provide space for other operations of the interactive platform.

Keep the above experimental environment unchanged, take the interactive data of teaching information uploaded by the interactive platform terminal as the experimental

Table 4. CPU utilization rate of three interactive platforms when running

Test topology node area	CPU Usage/%		
	Interactive Platform in Literature [4]	Interactive Platform in Literature [5]	The interactive platform designed in this paper
Zone 1	79.99	56.67	47.28
Zone 2	79.24	58.66	45.43
Zone 3	75.28	59.43	49.52
Zone 4	78.69	56.58	48.63
Zone 5	75.49	59.49	49.85
Zone 6	77.84	58.08	48.46
Zone 7	77.87	58.43	47.03
Zone 8	79.75	55.81	48.66
Zone 9	77.26	59.29	46.88
Zone 10	76.61	56.29	46.78

object, count the number of time delays generated by the three interactive platforms under the same bandwidth numerical control, and take it as the platform data transmission performance. The data transmission performance results of the three interactive platforms are shown in the following figure (Fig. 6):

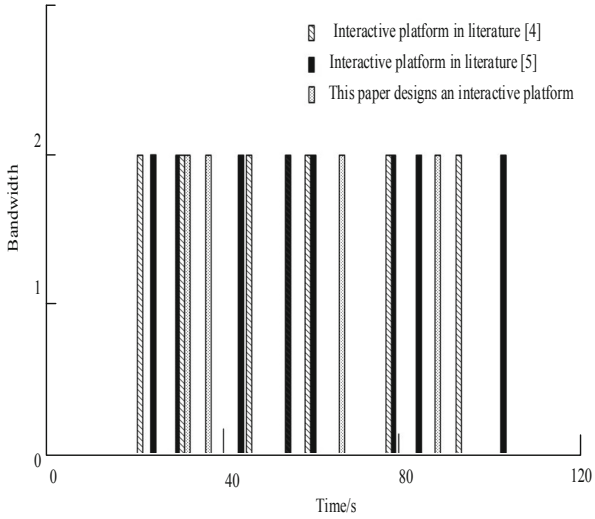

Fig. 6. The results of the number of time delays produced by three interactive stations

It can be seen from the results of the times of delay shown in the above figure that when the bandwidth of the three interactive platforms is set at 2 Kbit/s, interactive Platform in Literature [4] generates more times of delay under the same experimental time, and the platform generates six times of delay altogether. The interactive platform in the literature [5] has the most time delay, which is 8 times in the test time of 120 s. However, the interactive platform designed in this paper has the least number of time delays, with a total of four time delays. Based on the above experimental results, it can be seen that the interactive platform designed in this paper is suitable for information interaction, with the least number of nodes attacked by external, the least CPU utilization and the least number of delays. According to the above experimental results, the number of attacked nodes of the platform designed in this paper is less, and the CPU occupancy of the platform is lower when running, which is not easy to cause delay. This is mainly because the platform of this paper uses digital communication technology to form various data involved in the teaching of traditional ethnic music into digital scenes, which avoids unnecessary time consuming in the process of information interaction and makes the goal more clear.

7 Conclusion

The problems in the curriculum setting of Chinese traditional music teaching, though seemingly ordinary, do not seem to affect the normal enrollment and talent training of a professional music college, but it is related to how to build its own relatively perfect teaching system in the future development of Chinese traditional music teaching, so as to continuously promote the improvement of Chinese traditional music in teaching mode and teaching method, and make it a subject that attracts more attention from the world in the 21st century. It is true that many problems existing in the curriculum setting of Chinese traditional music teaching can not be solved immediately by any professional music college. It may be difficult to meet the expectations in the short term because it involves many aspects such as the competent leaders, teaching authorities, teaching units and teachers of each professional music college, or because the school leaders attach importance to the subject, or because the teaching authorities calculate the teaching cost of the subject, or because the teaching units weigh the subject, or because of the replacement of teachers. In view of this, the thinking put forward in this paper is only for your reference.

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References

1. Wang, Y.: The cultural logic of the construction of ethnic traditional music culture. Guizhou Ethnic Stud. **40**(02), 94–97 (2019)
2. Li, D.: The construction of national traditional music inheritance mode under the background of cultural consumption. Guizhou Ethnic Stud. **40**(02), 107–110 (2019)

3. Li, H., Zhang, X.: Visualization of National Culture by Minority Music Deduction. Guizhou Ethnic Stud. **40**(04), 78–81 (2019)
4. Shenglan, X.: Design and application of interactive response system based on intelligent mobile phone. China Educ. Technol. **7**, 45–56 (2017)
5. Zheng, L., Zhang, J., Chen, P.: Application research on multipoint-based mouse mischief: a classroom interaction teaching platform. China Educ. Technol. (10), 93–98 (2009)
6. Li, Z., Pu, X., Lin, X.: The online video platform access strategy of content provider based on two-sided markets theory. Manage. Rev. **32**(05), 180–191 (2020)
7. Liu, S., Lu, M., Li, H., et al.: Prediction of gene expression patterns with generalized linear regression model. Front. Genet. **10**, 120 (2019)
8. Liu Ziqiang, X., Haiyun, L.R.: Research on scientific and technological interaction patterns based on topic relevance analysis. J. China Soc. Sci. Tech. Inf. **38**(10), 997–1011 (2019)
9. Fu, W., Liu, S., Srivastava, G.: Optimization of big data scheduling in social networks. Entropy **21**(9), 902 (2019)
10. Luo, G., Chen, H., Liu, J., et al.: Design and implementation of mobile learning platform system based on JavaEE and Android. J. Inner Mongolia Normal University (Nat. Sci. Ed.) **48**(01), 75–81 (2019)
11. Huang, W., Pan, Z.: Load scheduling simulation of cloud platform resource multi-layer service information transmission. Comput. Simul. **36**(06), 364–367+479 (2019)
12. Liu, S., Liu, D., Srivastava, G., et al.: Overview and methods of correlation filter algorithms in object tracking. Compl. Intell. Syst. (2020). https://doi.org/10.1007/s40747-020-00161-4
13. Xing, J., Wang, H., Wu, Z.: Construction of art database for nou mask in Hunan province under the guidance of cultural creativity. Pack. Eng. **40**(24), 77–81 (2019)
14. Zhao, W., Xiao, X., Zheng, Y., et al.: Network operation platform architecture and control strategy of distributed energy storage systems high voltage. Engineering **45**(10), 3256–3262 (2019)