# The Design and Application of Porcelain Musical APP based on Android System

Na Hu[1*], Xing Xu[2], Xiaoping Yu[1]

[1]School of Foreign, Jingdezhen Ceramic Institute, Jingdezhen 333403, China
[2]School of Information, Jingdezhen Ceramic Institute, Jingdezhen 333403, China

**Abstract—** *Based on the Android system, the Porcelain Musical APP, which is a digital media format combined with video, audio, animation and text introduction, provides both music video game and appreciation of ceramic culture. The functions of this APP, first of all, refer to the introduction of Porcelain Musical Instruments; then the performance, the record and the play of this special musical instruments are also included; and some pieces of animations are designed to provide musical games via the WeChat login. This porcelain musical APP also aims at the popularizing and promoting the associated ceramic culture in the way of edutainment, meantime, this APP is also helpful in spreading the local Jingdezhen ceramic culture elements.*

**Keywords—** *Android, porcelain musical instrument, ceramic culture.*

## I. INTRODUCTION

Porcelain is one of the great inventions in Chinese history, and Jingdezhen, which ranks one of the four famous ancient Chinese towns, is also well-known for its ceramic industry. Known as the capital of ceramics, Jingdezhen has long been good at producing porcelains which are as white as jade, as bright as mirror, as thin as paper and with sound like a stone [1]. Timbre is one of the product standars, therefore, making musical instruments with porcelain pieces is regarded as an unique characteristic of Chinese culture. After years of painstaking exploration, Jingdezhen has successfully created a brand new set of musical instruments---the porcelain musical instruments---which is composed of 11 kinds of instruments ranging from the porcelain ou (a traditional Chinese instrument), porcelain bell, porcelain flute, porcelain flute to porcelain drum. This set of musical instruments, whose vocal range, sound quality and strength has achieved the level of conventional instruments, is said to be the ingenious combination of acoustics, principles of physics and ceramic technology. With the high quality clay, this musical set is produced with refined technology for professional instrument, thus, it sounds sweet and beautiful while being played, which symbolizes the "sound" characteristic of Jingdezhen porcelains. Being featured for its pure and beautiful sound quality, moderate volume and accurate pitch standards, the porcelain musical set, which is believed to be the world's first sample, is also featured for its stable pitch in different temperature [2], [3].

The exquisite craftsmanship of the porcelain musical set, first of all, is the combination of the acoustic physical data and the ceramic technology. After having collected the high-quality porcelain clay, the professional craftsmen would strain to throw the clay into the claybody merely by hand. Considering that the thickness of the claybody will eventually contribute to the tone and intonation of the musical set, a strict regulation was applied at the very first step of the making procedure [4]. Only in the temperature as high as 1800℃, could a porcelain musical set be produced even after countless trial productions. The grace and elegance embodied in

different ceramic types could also be the bonus point for the design of the musical set. Taking the Jingdezhen Blue-and-white porcelain musical set for example, the instruments are all painted with blue-and-white patterns and shaped in different blue-and-white wares, making the musical set be featured as a elegant but refined products. In the history of ceramic arts, the production of porcelain musical set has long been perceived as the increasingly developed issue, providing a broad perspective for exploration and research in the ceramic circles. In recent years, there is a trend that the national music turns so diversified that the distinctiveness of this musical set is more and more popular with the public. A case in point is that the porcelain musical set is absorbed as a special music type in the works of modern composers and musicians.

To better explore, at the same time to protect and spead the amazing legacy of traditional music, the technicians together with the craftsmen have created the "Ci Ou" in 1985. Ou is a container made of clay, in ancient China, it is also used a musical instrument by beating. Ci Ou, which is a unique set of musical instruments with a string of porcelain dishes of the same size and design, has been used for performance of Jingdezhen Chorus and rewarded with great success. This distinctive performance with the porcelain musical instruments has already reaped a series of awards, such as the silver medal of national invention, the Technology Achievement Award from the National Ministry of Culture. Later in 1991, a new set of thinner Porcelain Chime has been developed with two fixed points on the upper right-hand corner of the porcelain chime, and the string was replaced by the two points, aiming at the stability of the set and the sound quality. The creation of the Ci Ou (porcelain Ou) and the Ci Qin(porcelain chime) has laid a solid foundation for the manufacture of the following porcelain set, which includes the porcelain flute, the porcelain Xun (the Two-string fiddle), the porcelain bells and the porcelain drums. The porcelain instruments have contributed to the original system of porcelain musical set; consequently, when the set was first played in Kunming during the 1999World Expo, it became the hottest word in various news media. Commented as "the perfection combination of ancient ceramic technology and

musical style" and "the fusion of traditional culture elements and modern popular factors, the porcelain musical set has caught the eyesight of the world with its glow of unique charm.

## II. THE RELATED WORK OF THE MUSICAL AND ART APP

Science, has always been connected with arts, let us say, the development of acoustics theory has always inspired the creation of musical instruments. With the increasing understanding of the ceramic culture, the electronic music elements have also been added to the combination of music and arts. It is believed that the electronic music combines music with latest technology, leaving a promising industry[5]. With the prevailing mobile terminal equipment like smart phones and iPads, people get used to the log-in online via various APPs, and the domestic E-commerce platforms are encouraged to set up their own client APPs, which symbolize the omnipresence of commercialized client APPs. In the meantime, together with the increasing use of the 4G network, the application of APPs in the Internet Age becomes more and more popular. The number of mobile application software booms in the past years, and the variety of cellphone APPs has provided enough resources for the different needs, including education and assisted learning [6-8],meteorological and seismic disaster reduction [9], [10], daily life [11] and medical care [12], [13]. Under this background, the research institutes both home and abroad work with the modern enterprises on the development and application of Internet platform and technology, aiming at promoting the creative design of tradition culture and arts and transmitting the cultural heritage [14-16].

The porcelain musical instrument is featured with its distinctive performance and timbre, which make the audience feel novel and amazed; therefore, there is a great potential for its popularity. However, the whole set of the porcelain musical instruments is too clumsy to be settled on the stage for performance, in addition, every piece is very fragile. Taking all the limiting factors into consideration, this paper tries to develop an APP associated with the porcelain musical instruments and build a "new technique+arts" system [17-19]. The set of musical porcelain instruments, which is connected to the intelligent terminals like the mobile client, not only helps in dealing with its impossibility of carry-over of the giant porcelain plates, but also extends the artistic function of the porcelains for daily-use. The production of this set makes it possible that people could play the porcelain musical instruments with perception, which is a creative way to fulfill the "combination of technology and arts" and achieve effect of "using with hands and brain". Meanwhile, by presenting the features of ceramics and the process of porcelain, this paper also strives to introduce the ceramic cultures of local Jingdezhen. Based on the Android system, this APP deliberately selected several typical porcelain musical instruments which are available to be downloaded by the lovers of Chinese ceramics and porcelain music. The musical APP is also a great way to improve the publicity of porcelain music as a brand and to raise the profile of Jingdezhen Ancient Kiln as a 5A grade scenic spot; and the porcelain musical

performance is a creative way to promote the ceramic culture and the porcelain musical culture.

## III. THE DESIGN AND DEVELOPMENT OF THE APP

1) The design of the interface and its style: the porcelain musical APP is supposed to use the blue-and-white element, aiming to strengthen the cultural traits of Jingdezhen ceramic culture;the unified style gives the user an overall visual experience and helps in expressing the overall brand image, which is beneficial for the research team to define its design specification; the APP also concentrates on the collection of source material, the post production and editing of the porcelain musical set.
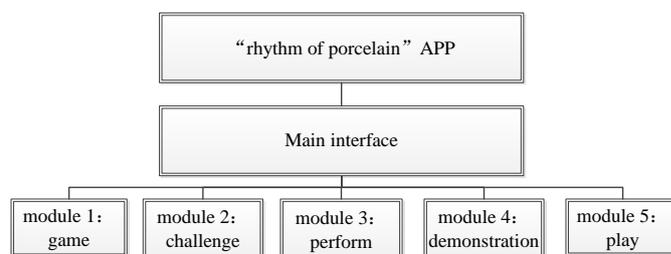


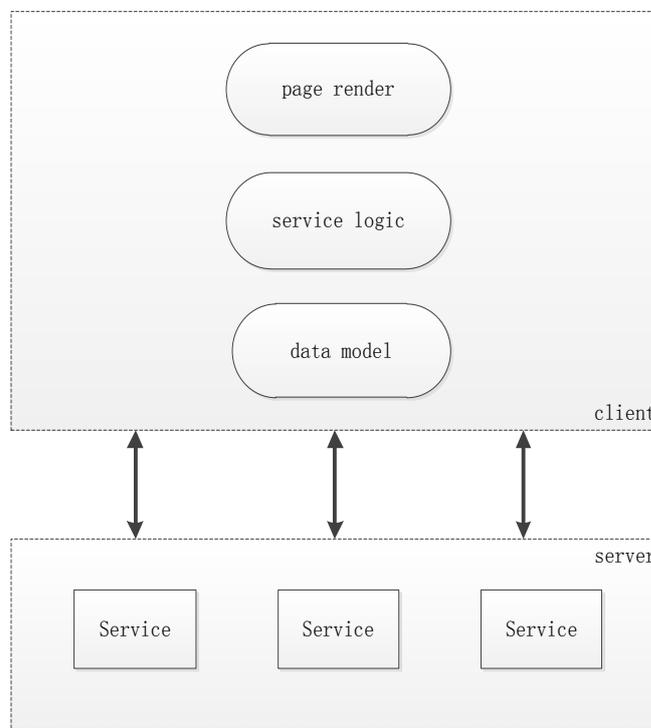Fig. 1. Modules of the "rhythm of porcelain" APP.



Fig. 2. The framework of the "rhythm of porcelains" APP.

2) Analysis of system-requirement and modeling: the client requirements have been carefully analyzed after the questionnaire survey, the collection of data and the sorting of data. As is shown in Figure 1, the static and dynamic model diagrams are plotted with the UML model;the design of the "rhythm of porcelains"APP framework refers to the analysis of both the hardware and software environment, analysis and deployment of the framework, analysis of the database

structure and the design of Module interface, as is shown in Figure 2; the system is designed to realize the functions of various models by using Agile Methodology, as is shown in Figure 3; system-testing: the system works on the testing method of the main function models and tries to test the whole system by using the Major Function Testing method.
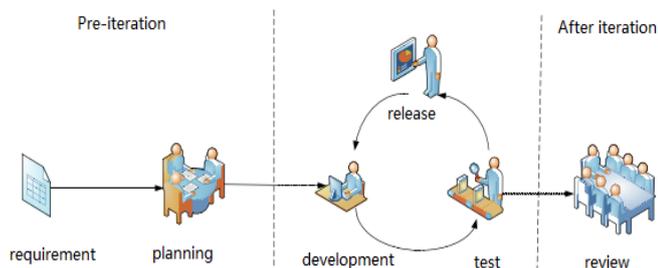

Fig. 3. Development principle of Agile methodology.

## IV. THE REALIZATION OF FUNCTION IN THE PROJECT

1) Functional module: game for users

The game module: with their fingertips, the users could tap on the porcelain plates which would turn into corresponding musical notes, and they could make a series of notes into a tune by continuous tapping, see Figure 4. The users could make a pause by clicking on the red triangle button which could turn into a red rectangle during the pause. If the users want to continue their playing, they could re-click the red button. The game is over when the music stops, taking the *Twinkle, Twinkle, Little Star* for example, the tune lasts for only 20 seconds, and the game will stop after 20 seconds with the reminder of the time panel. Surely, the users can also choose a song to play by clicking the small headset icon (see Figure 5), and return to the main page by clicking the small arrow button.

Steps: (the following shows the steps after the successful login, and users need to register first); Click on the the desktop icons -->display page of the APP logo --> APP user login page (successful login)-->main interface--> Select the game module-->play the game.
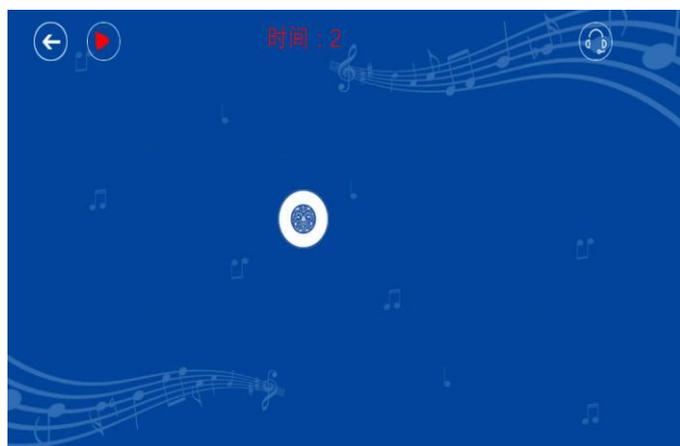

Fig. 4. The module of game-playing.


Fig. 5. Selecting songs to play.

2) Challenge module for users

Challenge module: some blue-and-white plates will be displayed randomly after the users log in the page of challenge function, and the number of the plates is placed randomly too, there could be at least one or at most five at the same time; the responding musical notes will appear when users click any of those plates, and musical notes will be made into a tune. The target score, a crucial factor whether the users can get through to the next level or not is up to the target score, which should be completed within the required time. If the users have successfully advanced to the next level, the level will automatically turn into Level 2, and the time limit changes back to 20 second. The score shows the authentic score made by users, and only when the score exceeds or equals the target score could the users move to the next level. The users could also choose to make a pause if they have leave for a while, similarly, they could restart their challenge by clicking the button; they could get back to the main interface by clicking the return button, therefore, they could operate the other functional buttons.Interface is shown in Figure 6.

Steps: (the following shows the steps after the successful login,and users need to register first) Click on the the desktop icons -->display page of the APP logo -->APP user login page (successful login)-->main interface--> Select the challenge module-->challenge.


Fig. 6. Users'challenge module.

3) Perform module for users

Perform module for users: respectively standing for the eight musical notes "do"、"re"、"mi"、"fa"、"so"、"la"、"si"、"do", eight plates will be displayed on the page after the log-in. With rhythm, users could click the eight plates below according to the musical notes of a certain tune, and all the musical notes could be connected into a complete tune. To record their own musical performance and store it in the local document, users could also click the red triangle button in advance. By clicking the symbol of a small headphone, users could check the musical document and choose to play or delete it. These modules are shown in Figure 7 and Figure 8.

Steps: (the following shows the steps after the successful login,and users need to register first) Click on the the desktop icons -->display page of the APP logo -->APP user login page (successful login)-->main interface--> Select the perform module-->performance
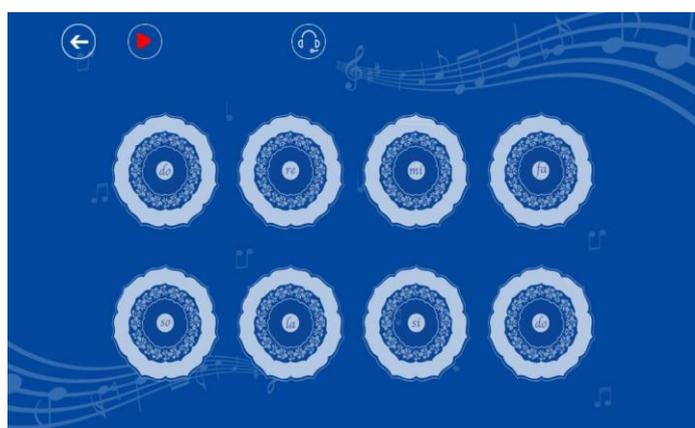


Fig. 7. Perform module for users.



Fig. 8/ File list for playing and recording.

4) Demonstration function of the porcelain manual

Demonstration function of the porcelain manual: this module is mainly designed to demonstrate some types of porcelains, with the purpose that the transmission and promotion of the ceramic culture should be based on the culture elements embodied in the porcelain musical set. In this manual, there are four modules on the purpose of informing users of the knowledge of porcelain culture and the story about porcelain musical instruments; users can log in and browse by clicking any of the four modules. The catalog is designed for the users' better understanding of this module, additionally, for the Administration overview. Then interface can be seen in Figure 9. The development of porcelain musical instruments together with the related knowledge of Porcelain Ou, which can be found in the Source Start Module,are also available for users.  Then interface can be seen in Figure 10. The Cultural Relics Module consists of a series of precious porcelains and ceramic utensils which are beyond the users'horizon in normal times.Then interface can be seen in Figure 11. Joyfully, in the Anecdote Module, the users are also accessible to some anecdotes about porcelains and informed of the ceramic culture with amusement and ease. While providing the delight in the stories, this APP deliberately spreads and transmits the local Jingdezhen ceramic culture, which is shown as Figure 12.

Steps: (the following shows the steps after the successful login,and users need to register first) Click on the the desktop icons -->display page of the APP logo -->APP user login page (successful login)-->main interface--> Select the Manual-->browse.
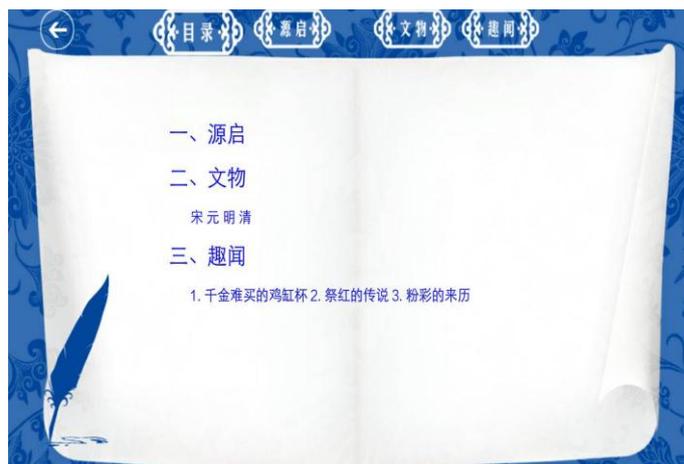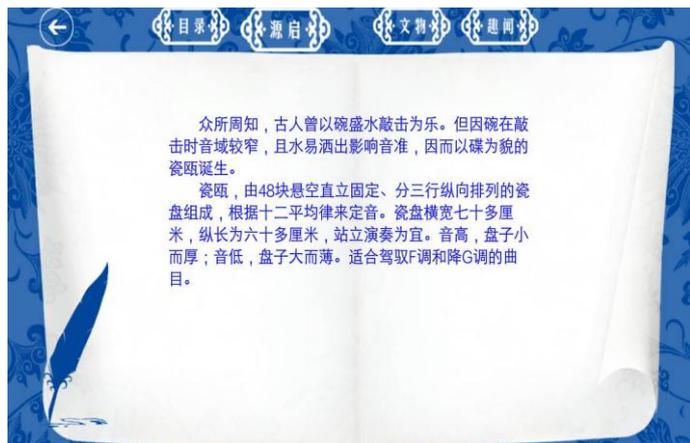


Fig. 9. Sub-module of manual.

8

Fig. 10. Sub-module of source start.
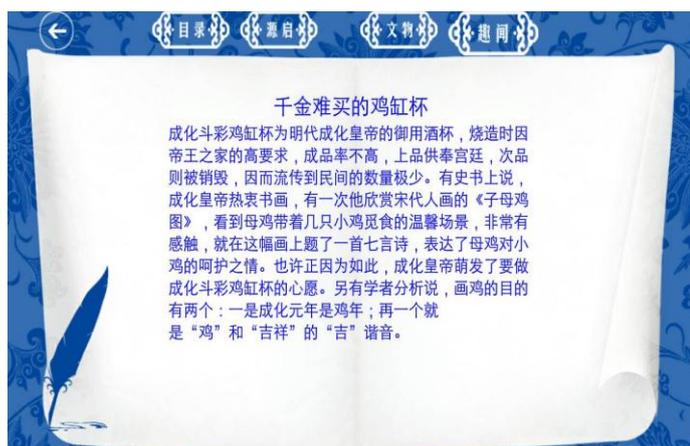


Fig. 11. Sub-module of cultural relics.



Fig. 12. Sub-module of anecdotes.

## V.    ACKNOWLEDGEMENT

REFERENCES

[1]    Jiequn Zou, "The porcelain musical performance in neighborhood, the call of our times--- Thoughts on the popularity of musical culture in local Jingdezhen," *Journal of Jingdezhen College*, vol. 25, issue 3, pp. 7-8, 2010.
[2]    Jian Liu, Yuanlin Zhong," My view on the international popularization of porcelain musical arts," *Journal of Jingdezhen College*, vol. 27, issue 1, pp. 18-20, 2012.
[3]    Chao Yang, Lei Liu, Wanlin Zhan, "Ceramics and the porcelain musical instruments," *Foshan Ceramics*, vol. 20, issue 5, pp. 41-44, 2010.
[4]    Yang Lu, "A probe into the composition of modern porcelain music---taking Jiangxi for example," Nangchang, Thesis of Master Degree in Jiangxi Normal University.2013
[5]    Le Yang, Liqing Yi, "New composition of ancient tunes---The practice and innovation of Jiangxi porcelain music by adding electronic elements," *Art Science and Technology*, vol. 4, pp. 238-238, 2014.
[6]    Jing Li, "Based on the design and development of mobile APP English error bag Android -- Taking Shanghai Oxford English version 6 (A) textbook as an example," Changsha: Thesis for Master Degree in Hunan Normal University, 2016.
[7]    Wenjia Wang, "Design and development of APP based on android system for provincial entrance examination information service network," Shijiazhuang: Thesis for Master Degree in Hebei Normal University.
[8]    Yuan Zhang, "Design and development of JSETITIME---Instant mutual assistance on campus APP," Jiling, Thesis for Master Degree in Jiling Normal University.
[9]    Lulu Yan, "Design and development of earthquake prevention and disaster reduction APP based on android system," Chengdu: Thesis for Master Degree in Chengdu University of Technology, 2015.
[10]   Zhiping Han, Ying Li, Shuang Ouyang, "Design and achievement of "Little Assistant"--Meteorological radar APP based on android system," *Meteorological Science and Technology*, *Meteorol Sci Technology*, vol. 44, issue 4, pp. 562-566, 2016.
[11]   Xinkai Xu, "Design and development of gas-station remote mobile monitoring system APP based on android system," Chengdu: Thesis for Master Degree in Southwest Jiaotong University, 2016.
[12]   Wei Xiao, "Design, development and research of the daily health care App for the aged,".
[13]   Yuejuan, Liu; Jing, Pang; Jian, Xu. "Design and development of the mobile terminal learning software APP for medical students," *Digital Technology*, vol. 10, pp. 198-199, 2016.
[14]   Jiejing, Liu. "The function and effects of computers in arts creation," The Young Writer Offprint: Teaching Communication, vol. 4, pp. 42-42, 2013.
[15]   Xia, Xu. "On the application of APP in ceramic creation and design," Jingdezhen: Thesis for Master Degree in Jingdezhen Ceramic Institute, 2015.
[16]   Zongjie, Shangguan, "Analysis on the development of face-up APPs in mobile terminal---Taking WMYOTee as an example," *Journal News Research*, vol. 10, pp. 41-43, 2014.
[17]   Fangzhou Cheng, "On the design and experience of virtual rendering APP of traditional Chines fans," Harbin: Thesis for Master Degree in Harbin Institute of Technology, 2016.
[18]   Wangyan, Guo, "The application of traditional Chinese arts in the game APPs," Packaging Engineering, vol. 10, pp. 123-126, 2013.
[19]   Xiaoxing, Xu. "On the design, interaction and experience of ceramic brands on iPads," China Ceramics, vol. 06, pp. 33-36, 2012.