Design and Implementation of Multifunctional Music Player Based on Android Platform

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Abstract

The work of this paper is to research and realize an online music player based on Android. Firstly, this paper introduces the background of the topic, analyses the development and application status of online music client and mobile phone operating system. And then we analyse the feasibility and requirement of music player based on the Android platform. After making clear at the whole work flow of music player, we established the core function modules, including my music, recommendation music, music library, search music and download music. Then I adopt the idea of object oriented, using use case diagram and sequence diagram of UML to detailed design object, process, function and database of each module. In the process of implementation, I use Android built-in SQLite database to store data. And I introduce the design method, interact method and communication theory of the core components, at the same time, I show the effect of key interfaces. After realizing all the functions of the music player, we use black box method that without considering the internal logic, as far as possible to design detailed and complete test cases to test. And we analyses the results and make corresponding improvement. Along with the rapid development of the intelligent mobile phone, the music player implemented in this paper will get extensive application.

Keywords: Wireless Internet technology, Multifunctional music player, Android platform, Online music, UML

1. INTRODUCTION

Wireless Internet technology and intelligent mobile terminal are gradually extended to all areas of daily life. Especially the intelligent mobile phone, now, its function is no longer limited to communication service. More often it can meet our needs of entertainment and life service. For example, online videos, online music, group purchase, map, weather forecasting and so on. Among them, online music as a recreation can be used when traveling and queuing. Online music has the most extensive application in the mobile phone users, and has gradually become indispensable in daily life. Android is one of the popular mobile operating system, its typical advantage is fully open source; its source code can obtained by any manufacturer. Android has caused great changes in the field of mobile Internet application. Since its release, Android system has occupied the highest market share in global mobile operating system. Applications based on Android platform are more and more comprehensive, especially in the multimedia direction.

With the rapid development of mobile internet, mobile applications increase day by day, becoming more and more competitive in the market. Developers must accelerate the efficiency of application development, and deploy application products to market quickly in order to maintain market advantage. Meanwhile, in order to meet the increasingly stringent quality audit requirements of application shops, application developers must ensure high quality; make the time, cost and performance advantages. Because the software framework is critical for improving development efficiency and quality, so many scholars from a framework point of view, research the methods to improve software development productivity and quality, mainly focused on the android platform, cross platform and application framework in specific areas (Wang and Yang, 2011).

In the aspect of improving the efficiency and quality of software development, framework plays a decisive role. Software framework is a set of cooperating classes. It is a reusable design of a kind of special software, and gives the main functions of each part of the system, so that developers can concentrate on the details of the application.
The framework can be divided into general framework and application framework. The former can be used for different types of applications, and the latter is only applicable to specific types. Therefore, in the design of the framework, we need to determine whether the framework for the field is universal, so as to determine the type of frame. In the activities of design framework, following certain principles are conducive to improve the framework of robustness, usability, flexibility and other quality attributes.

The software design is the software engineering quality formation in place. Good design can ensure the quality of software, and in the principle of regulation, will further enhance the quality of software. In object-oriented design, has a lot of principle for the use of the software designers, such as the single responsibility principle, opened closed principle. The software design model is from the data design, architecture design, interface design and component design of the four models. In order to get a comprehensive software design model, it is need to respectively to design the four models.

In order to prove the validity of this design method, based on the music software as research object, randomly selected three cases of music software(Ryu et al., 2014). By using and not using the design method of case design and implementation, form the experimental group and the control group design scheme design. Finally, use the CK kit for the analysis of experimental results, comparing the experimental group and the control group cohesion coupling case(Xu and Niu, 2012). Use source code statistical tools to statistics achieve the amount of code of two groups of cases. By comparing the three indexes of cohesion, coupling and the amount of code, the effectiveness of the proposed design method is empirical(Wu, 2015).

The rest of the paper is organized as follows. In Section 2, Transition process analysis is summarized briefly. In Section 3, Transition code is described. In Section 4, experiments are presented and the results are discussed. Finally, a conclusion is provided in Section 5.

2.MATERIALS AND METHODS

2.1 Transition Process Analysis

The music player based on Android platform can satisfy the user demand of whenever and wherever possible to appreciate music of various audio formats. The music commended function in this paper provides convenient and flexible, user-friendly music service for mobile users, the songs are categorized according to the music style, artist information and user mood. In recent years, the development of the mobile phone presents a trend of intelligent; all kinds of intelligence collection operation system emerge in endlessly. According to related survey, mobile phone users in2015 for the first time more than a computer user, mobile phones become the most common mobile electronic products. In recent years due to the openness of the Android platform is good and convenience etc., make the Android platform of smart phones is more and more get the favour of people, occupied most of the market, the Android platform in the field of smart phone’s role is becoming more and more important. Considering the Android broad market prospect, based on the Android platform application development, can greatly enrich the mobile phone application software, therefore, the Android platform as the research object in this paper. In the Android system, at the same time there is only one component of Activity in active state. Therefore, when the ActivityManagerService service activated a new Activity component, it will need to notify the WindowManagerService service to display the window of the Activity components. This will involve the former focus and screen resources such as an active component of Activity switching to an activation of the Activity assembly process. This paper analyses this process in detail(Nie and Huang, 2013).

The switching operation of the Activity window is in the starting process of the new Activity component of activation. Specifically, is that access to the Paused state in the activation of an activity component before and after Activity(Wang et al., 2014; Ma et al., 2016), the activation of the new component to the Resumed state, the Activity component activation before a window settings is not visible, and the new Activity component activation window is set for visible. The switching process is needed under the cooperation of the ActivityManagerService service and WindowManagerService service, as shown in figure 1.
When the Window Manager Service service is in the switching operation execution of the Activity window, Activity components will participate in the operation of the switch set up an animation, so that you can show an Activity component switching effect to the user, so as to improve the user experience (Jun, 2015). In fact, a Activity window in the invisible state switch to visible state, but may be set as a component of Activity animation switching, there is provided a window into the animation. In addition, if the Activity window is added in a separate window above, and the additional window is an animation display, then the animation also will be set to display the Activity window in the process. This paper is mainly concerned about switching operation of the Activity window. In the next analysis frame of the animation window, we detailed analysis of the above three kinds of animation how to display the window function in the process.

The ActivityManagerService service in the process of starting an Activity component, will call to the startActivityLocked member function of class ActivityStack. The startActivityLocked of the member function of the ActivityStack class first prepare a switching operation to the Activity module is started, and then the member function is called the other, a notice before the activation of the Activity components into the Paused state. When entering the Activity component activation before a Paused state, the service will be used to check whether the process of ActivityManagerService Activity component is starting to start up yet. If the process has not yet started, so the ActivityManagerService service will start the process. Then call the realStartActivityLocked member function of class ActivityStack, Activity component loading is starting, and its status is set to Resumed. At last notice WindowManagerService service to perform Switching operation in front (Johnson, 2014).

This research topic is "mobile platform embedded software development, software developing embedded platform based on the Android mobile phone music player. Before the software design, first of all, a lot of work on android infrastructure information, and all kinds of music software on the market at present are analysed, based on detailed analysis of the needs of users, and then according to the result of analysis was carried out for the whole software architecture and function module design, in terms of the UI done personalized design, improve user and player interaction, software function also added more humanized functions, e.g. electricity automatically suspended function, and using the freedom of the progress bar control music playback progress, etc. To implement the software based on Android framework, mainly implements the personalized Settings, playback controls, and other functional modules. Software implementation process, the author first use Eclipse to build the Android software development environment, using the Java language to write, code complete, has carried on the module to the functionality and performance of the software test, and the bugs found in the testing process was modified and optimized. Eventually determined by real machine test, the software has a small volume, strong portability, scalability is strong, and low requirements for terminal equipment configuration, suitable for a wide range of high school low-grade Android mobile phone users, but also can maintain the stability of long time running. In this research topic is based on the Android platform developed by music player software can provide convenient for the majority of Android mobile phone users local music playback function, its high convenience, fast. But many deficiencies still exist in the software, first of all, in the current network conditions, the rapid development of Internet music resources are very abundant, but not to join the network broadcasting functions in this software, the user can play only local music, also makes the music content richness were larger limitations; Second, the software support for music resources format Is
too single, currently only support common compressed audio formats such as MP3, WAV, cannot satisfy the user’s
demand for quality pursue higher; In addition, the software does not provide function of EQ Settings, can meet the
personalized requirements, users to play music in view of the above functional defects, also need to constantly
improve and optimize of the software, in order to satisfy the demands of the use of more users. Through this study
for Android development related research of the theory of underlying architecture, and the realization of the specific
software, hope to be able to not related personnel development work on the idea and development method provide
certain guidance function, promote the better and faster development of the Android platform application.

Next, we analyze the switching process of Activity window from the startActivityLocked member function of class
ActivityStack, as shown in figure 2.

![Figure 2. The Switching Process of the Activity Window](image)

### 2.2 Transition Code Analysis

Android Transition framework allows all we configure the application user interface appearance changes. We can
achieve animation transition in the application screen; each stage is defined as a scene, and controls the application
how to switch from one scene to another display (Reimer et al., 2014; Rosa and Elizondo, 2014).

The algorithm can be expressed as following equation (1-8):

\[
f^{(\alpha)} (x0) = \left. \frac{df(x)}{dx^\alpha} \right|_{x = x0} = \lim_{\delta x \to 0} \frac{\Delta^\alpha (f(x) - f(x_0))}{(x - x_0)^\alpha} (1)
\]

for \(0 \leq \alpha \leq 1\) where

\[
\Delta^\alpha (f(x) - f(x_0)) \equiv \Gamma(1 + \alpha) \lim_{\delta x \to 0} \Delta(f(x) - f(x_0)) (2)
\]

And local integral of \(f(x)\) defined by Eq.3.

\[
aI_{b}^{(\alpha)} f(t) = \frac{1}{\Gamma(1 + \alpha)} \int_{a}^{b} f(t)(dt)^\alpha = \frac{1}{\Gamma(1 + \alpha)} \lim_{\Delta t \to 0} \sum_{j=0}^{N-1} f(t_j)(\Delta t_j)^\alpha (3)
\]
The we get:

\[ H_\alpha \{ f(t) \} = \hat{f}_\alpha^a (x) = \frac{1}{\Gamma(1+\alpha)} \int_x^{\infty} f(t) (t-x)^{\alpha}(dt)^{\alpha} \quad (4) \]

Where \( x \) is real and the integral is treated as a Cauchy principal value, that is,

\[
= \lim_{\epsilon \to 0} \frac{1}{\Gamma(1+\alpha)} \int_{-\epsilon}^{\infty} f(t) (t-x)^{\alpha}(dt)^{\alpha} + \frac{1}{\Gamma(1+\alpha)} \int_{\infty}^{x+\epsilon} f(t) (t-x)^{\alpha}(dt)^{\alpha} \]

Rewrite again Eq. (4) as

\[
\hat{f}_\alpha^a (x) = \frac{1}{\Gamma(1+\alpha)} \int_{-\infty}^{\infty} f(t) g(x-t)(dt)^{\alpha} = f(x) \ast g(x),
\]

\[ \partial_j \left( C_{ijkl} \hat{\partial}_k u_i + e_{ijkl} \hat{\partial}_k \varphi \right) - \rho \hat{u}_j = 0 \quad (7) \]

\[ \partial_j \left( e_{ijkl} \hat{\partial}_k u_i - \eta_{ijkl} \hat{\partial}_k \varphi \right) = 0 \quad (8) \]

The linear equation can be expressed into the following simplified forms:

\[ L(\nabla, \omega) f(x, \omega) = 0 \]

\[ L(\nabla, \omega) = T(\nabla) + \omega^2 \rho J \quad (9) \]

In which,

\[ T(\nabla) = \begin{bmatrix} T_{ik}(\nabla) & t_i(\nabla) \\ T_k^T(\nabla) & -\tau(\nabla) \end{bmatrix}, \quad J = \begin{bmatrix} \delta_{ik} & 0 \\ 0 & 0 \end{bmatrix}, \quad f(x, \omega) = \begin{bmatrix} u_k(x, \omega) \\ \varphi(x, \omega) \end{bmatrix} \quad (10) \]

Consider delay, the \( L \) can be expressed as:

\[ L^0 = \begin{bmatrix} C_{ijkl}^0 & e_{ijkl}^0 \\ e_{ijkl}^0 & -\eta_{ik}^0 \end{bmatrix} \quad (11) \]

These functions can be expressed:

\[ C(x) = C^0 + C^1(x), \quad e(x) = e^0 + e^1(x), \quad \eta(x) = \eta^0 + \eta^1(x), \quad \rho(x) = \rho_0 + \rho_1(x) \quad (12) \]

The value with superscript of 1 represents the difference below:
In addition, we can introduce the abbreviated formula:

\[
\mathcal{G}(x, \omega) = \begin{bmatrix}
G_{ik}(x, \omega) & \gamma_i(x, \omega) \\
\gamma_k(x, \omega) & g(x, \omega)
\end{bmatrix},
\mathcal{S}(x, \omega) = \begin{bmatrix}
G_{ik,i}(x, \omega) & \gamma_{i,k}(x, \omega) \\
\gamma_{k,i}(x, \omega) & g_{,k}(x, \omega)
\end{bmatrix},
\mathcal{E}'(x, \omega) = \begin{bmatrix}
C_{ijkl}' & e_{ij}' \eta_{ik}' \\
e_{ij}' - \eta_{ik}' & -\eta_{ik}'
\end{bmatrix}, \mathcal{F}(x, \omega) = \begin{bmatrix}
\varphi_{i,j}(x, \omega)
\end{bmatrix}.
\]

(15)

In these expression, \(G_{ik}(x, \omega), \gamma_i(x, \omega), g(x, \omega)\) can be represented as:

\[
\mathcal{G}(x, \omega) = \frac{1}{(2\pi)^3} \int \mathcal{G}(k, \omega) \exp(-ik \cdot x) dk, \quad \mathcal{G}(k, \omega) = \begin{bmatrix}
G_{ik}(k, \omega) & \gamma_i(k, \omega) \\
\gamma^T_{k}(k, \omega) & g(k, \omega)
\end{bmatrix},
\quad G_{ik} = \left( \Lambda_{ik} + \frac{1}{\lambda} \right)^{-1} h_i \Lambda_{ik} h_j^T, \quad g = \left( \lambda + \Lambda_{ij}^{-1} h_i \Lambda_{ij}^{-1} h_j \right)^{-1} \gamma_i = \frac{1}{\lambda} h^T_i G_k, \quad \Lambda_{ik}(k, \omega) = k f_{ijkh} C_{ijkh} - \rho \omega^2 \delta_{ik},
\]

\[
h_i(k) = e_{ik}^0 k_i k_j, \quad h_i^T = e_{ik}^0 k_i k_j, \quad \lambda(k) = \eta_{ik}^0 k_i k_j, \quad \frac{1}{2\pi} \int_{-\infty}^{\infty} e^{-ik \cdot x} dx = \delta(k),
\]

(16)

Transition can simply switch between the two frames, used to switch between choose and be chosen, or progressive new scene today.

The XML file contains a picture frame switching. The transition tag as a container, item is as for the switch frame, android:drawable is pictures ID. The XML code is shown as follow:

```xml
<?xml version="1.0" encoding="utf-8"?>
<transition
xmlns:android="http://schemas.android.com/apk/res/android">
    <item android:drawable="@drawable/left" /></item>
    <item android:drawable="@drawable/right" /></item>
</transition>
```

TransitionDrawable access to transition resources, then calls the startTransition switch. This function will switch to the second frame first frame.

ReverseTransition is a kind of switch mode, will repeatedly switch two frames, and second frames according to a switch as the first frame of the next switch. The Activity code is shown as follow:

```java
package com.translation.arrow;
import android.os.Bundle;
import android.app.Activity;
import android.graphics.drawable.TransitionDrawable;
import android.view.Menu;
import android.view.View;
import android.view.View.OnClickListener;
```


import android.widget.MusicView;
public class ArrowActivity extends Activity {
    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.main);
        View mainscreen = findViewById(R.id.mainscreen);
        mainscreen.setOnClickListener(new OnClickListener() {
            @Override
            public void onClick(View v) {
                // TODO Auto-generated method stub
                MusicView scene = (MusicView) findViewById(R.id.arrow);
                TransitionDrawable sceneDrawable = (TransitionDrawable) scene.getDrawable();
                sceneDrawable.reverseTransition(3000);
            }
        });
    }
    @Override
    public boolean onCreateOptionsMenu(Menu menu) {
        // Inflate the menu; this adds items to the action bar if it is present.
        getMenuInflater().inflate(R.menu.arrow, menu);
        return true;
    }
}

3. RESULTS AND DISCUSSION

3.1 The analysis of cohesion

Using CBO and LCOM as a measurement index, use the CK suite analysis the cohesion and adhesion of two group design cases, and use the source code statistical toolsSourceCounter to statistical line number of realization code (Barros et al., 2014). Figure 3 is cohesion coupling of design schemes between experiment group and comparison group. The results showed using design of this method the cohesion increases by an average of 32%, coupling is reduced by an average of 24%.

![Figure 3. Cohesion Coupling of Design Schemes between Experiment Group and Comparison Group](image)

3.2 The amount of code analysis
Developers must accelerate the efficiency of application development, and deploy application products to market quickly in order to maintain market advantage. Meanwhile, in order to meet the increasingly stringent quality audit requirements of application shops, application developers must ensure high quality; make the time, cost and performance advantages. Along with the network popularization and application of intelligent handset, the user and the function of the intelligent device performance is increasing. The Android platform is now the most widely used intelligence platform of intelligent system. So in the mobile platform developed perfect fully functional application interface is has abroad market prospectalso the popular desperately need. The figure 5 shows the music player.

![Music Player](image)

**Figure 5.** The music player

4.**CONCLUSION**

In this paper, the mobile application development prospects and application status and the Android application development technology, the demand for music player made careful analysis, introduces the overall architecture of the music player, including architecture design, function module division music player. And for each component are described, and introduces the Android platform storage solution, as well as the application development process need configuration files are described and illustrated. And finally, the paper points out the user needs, including the user experience and functional requirements. And then classify the functional requirements, for each type of use case diagram to explain. And according to the demand analysis, the music player software function module chart, as
for each module. Implementation is based on the Android player. In this article through the music player based on Android platform, the design and implementation of convenient user play songs, song choice. Choose the platform be fond of songs in the music library, and a download manager interface, to provide users with the operation is simple and practical interface. Because the software framework is critical for improving development efficiency and quality, so many scholars from a framework point of view, research the methods to improve software development productivity and quality, mainly focused on the android platform, cross platform and application framework in specific areas. Using software framework technology to improve developer productivity and software quality has always been supported by academics and industry. Android platform has emerged in some application development framework, which better meets the needs of building android platform fast and good mobile application. For the question that picture switches does not flow under android platform, we propose a software design methods based on transition framework. Transition can realize smoothly transform from one picture to another picture, not the kind of sudden switching. Experimental study was made for the method. Random select 3 music soft wares under android platform and their cases are as study objects. Do comparison for design scheme and realization code of the experimental cases. The results showed using design of this method the cohesion increases by an average of 32%, coupling is reduced by an average of 24%, and corresponding lines of code were reduced on average by 28%, which empirical the validity of the proposed design method.

REFERENCES


