Abstract

This paper introduces a launcher system which can decorate a unique smart phone by linking the music and interesting sites in its wallpaper. This is similar to other applications, but is different in nature from others in the way that it can replace a user interface. This paper’s goal is to establish a service system to change the wallpaper. These studies have been conducted, many results have been announced. But the primary differences between the wallpaper of a proposed system and one of existing systems are the wallpaper changing in real time and the system automatically connecting to information (image, music, app sites etc.) associated with the wallpaper. The system uploads the wallpaper and music sources to a server and implements a real time service which can be connected to any other relevant information on the wallpaper according to a user's preference. For doing this, the implementation of a proposed system is composed of 3 parts, CDN (Contents Delivery Network) servers with DB, a mobile app for user clients, and a web page for the administrator. This paper shows the implemented results and analyzes them. The proposed system can be utilized as a new operating system on the existing androids User Interface (UI) because it can be added a distinct user environment.

Keywords: CDN Server, Launcher, Real Time Service, Wallpaper

1. Introduction

Recently the concern for launcher, an application program that can change the design of wallpapers and icons on smart phones, has increased. Portal and SNS providers, as well as mobile operators have also been showing interest in the launcher because they are able to lead smart phone users by providing launcher services. This does not mean simply decorating their phone, but can be a platform to dominate the user's environment. The companies can put their application services into the launcher system which can expose more of its services to smart phone users. The services will appear in the first screen of the wallpaper when smart phone users install the launcher.

According to the portal's search trend analysis about mobile wallpaper, we know there's a search of 40 million or more each month domestically. Although it was restricted to the mobile arena, it is the high levels to overcome a number of searches for games, as shown in Figure 1. This is interpreted as an effort to express individual personality with the smart phone.

This paper begins with a simple idea that the launcher techniques can lead today's culture to a more advanced smart phone. That is, if the wallpaper changes automatically, according to fixed rules, and provides a path that connects to the other required information. The proposed approach has a meaningful ability to integrate two processes: specifying the wallpaper with a given interval according to the user's attention and selecting one's web browser separately to find relevant information or clicking on an app such as YouTube. In order to implement it, the user's relevant data, wallpaper images, background music (or connected sites with background music), or video clips are uploaded to the CDN server. A manager with this data is responsible for the process of connecting the wallpaper image and the associated data. Users periodically decorate their smart phones with the downloaded wallpaper material in real time.

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The remainder of this paper is organized as follows. Section 2 explains the related works about music source markets. Section 3 discusses the interface design, the characteristics of the proposed wallpaper system and the proposed system structure. Section 4 presents details of the system design, implementation and the system evaluation results. Finally, Section 5 concludes with planned future work.

2. Background

According to the data of Korea Creative Content Agency⁹, online and mobile services are responsible for 80 percent of the current music market. Sales in 2012 reached 700 billion, four times the amount of the offline music market. Such large agencies are those who masterminded the development of online markets and control more than 80 percent of online music source market.

Thus, the mobile distribution space of a small general composer and singer is required, and a composer and a direct connection of the mobile system is required. A complication in this system that must be solved is that the profitability depends on the general composer due to complex source distribution. To achieve this, the system has to allow the streaming service with a mobile direct link of the wallpaper image and sound source by clicking a button for the wallpaper. Mobile content distribution is still in the early stages due to the lack of clear business models¹⁰. To satisfy the consumer’s needs and to maintain the competitive advantages, the media companies should consider developing new business models.

In this sense, the wallpaper can be used as digital music promotion channels. Then, all the people become available to the direct mobile distribution services as a result of helping early indie music and K-pop in advance. Thus, K-pop’s ongoing content is provided with a knock-on effect that can be a fundamental motivation to help a diverse and luxurious assortment of musical activities.

3. The Proposed System

This paper’s goal is to establish a service system to change the wallpaper in real time. The primary differences between the wallpaper of this proposed system and that of existing SK Planet etc. are the wallpaper changing in real time and the system ability to automatically connect to information (images, music, etc.) associated with wallpaper. Figure 2(a) shows that the icons of SK Planet’s wallpaper have differences with the primary ones in Android. When a theme has downloaded, icon shapes of wallpaper etc. are variously determined by this theme. Most of the launcher system uses this approach. On the other hand, there are two significant differences in this proposed system. First, the wallpaper has changed with the various images at a predefined time interval by the user, as shown in Figure 2(b). The wallpaper makes changing at time intervals with which a user selects the preferred ones of a number of images stored in the DB server. Second, because a user can insert a button on the wallpaper, as shown in Figure 2(c), when you click this button, you can move to the sites, such as music, interesting information and so on.

Therefore the proposed approach has a meaningful ability to integrate two processes, a process, specifying the wallpaper with a given interval according to the user's attention, and the other one, selecting your web browser separately to find the relevant information or clicking on the app such as YouTube.

For implementation of the proposed system, the system structure composed of 3 parts, CDN servers with DB, a mobile app for user clients, and a web page for the administrator, as shown in Figure 3. Here the server has a load balancing ability by deploying to streaming through CDN based on the cloud. The DB manages the image and its relevant information. The web page for the administrator has a role which it supplies images and contents by forwarding the content to be used for the automatic
The client or user gets a real time service after downloading the app from an app store server. Key features of this system are as follows:

- The wallpaper is set to automatically change in real time.
- Set up the wallpaper change cycle/communication method.
- When the wallpaper is touched twice, play sound source/YouTube/connects to web pages.
- Automatically supplied every day with a new image and a separate high-quality sound without the update, through a system for GCM (Google Cloud Messaging).
- Image bookmark and SNS sharing feature.

Figure 2. The characteristics of the proposed wallpaper system.

Figure 3. The proposed system structure.
When this feature is performed, it works for the server as well as the client. It is summarized in Table 1.

### 4. Implementation

#### 4.1 App Implementation for users

Users should download an app for service on each mobile device. After downloading the system's implemented result in, google play store, you can test this app. You can download this app onto your mobile device. When a user downloads the app, the user should set the environment according to the preferences of the users. It is divided into the device's environment, the list of images to change, refresh time, and setting of wallpaper. Figure 4(a) shows the wallpaper menu and setting page, including the environment of mobile device, update time, selecting images for wallpaper, etc. And the right side of Figure 4(b) shows applied results, favorites and share menu with Kakaotalk, e-mail and MMS. That is, the image of wallpaper can be sent to MMS. When the SBGM▶ button on the left side of Figure 4(b) double touch, it is toggled with the run/stop of music.

#### 4.2 Web Page for Manager

The main roles of this web site push and administrate the image and the sound source to provide for a mobile app. The administrator is responsible for the role of mediator between CDN servers and user clients. That is, the administrator can add a new image and music source data, and responsible for determining the affinity between these materials. You can test the implemented results in. The administrator is available after login.

| Table 1. Development contents |
|--------------------------------|
| **Client**                     |
| - Screen layout design / implementation |
| - Development of real time displacement system of the wallpaper |
| - Server communication algorithm implementation |
| - Implementing real time music streaming source |
| - Sound source in the service of the wallpaper streaming capabilities are collected |
| **Server**                     |
| - DB system design / implementation |
| - FTP server setting |
| - Development of load distribution system |
| - Algorithm development of mutual client communications |
| - Design/Implementation of manager page layout |
| - Load test and revision |

![Figure 4](image-url)
In Figure 5(a), we can see a list that is registered to the server after image/sound sources have been pushed by the administrator. And in Figure 5(b), we can see the linked contents of image and its other information on the past history. Figure 6(a) shows the statistical information about the change of the user number, in accordance with the time. And Figure 6(b) shows the changes in the number of each image streaming in real time.

4.3 Load Balancing Test for Simultaneous Real-Time Streaming

(1) Test Condition
After the 10 users request for each 10 times the stream in the encoded 100Kbps source, input to the J-meter simulation tools.

(2) Test Results
- As shown in Table 2, the transfer rate is up to 589.09 (KB/sec) from 71.38(KB/sec) at least. If the source is encoded with 100Kbps, there is no delay in most cases. It is determined that some delay in the case of 71.38(KB/sec) is no significant impact on services.
- The response time determined to be up to 178ms on the minimum 2789ms and the average response time is measured in 1393.5ms. Therefore the target value, 3000ms, has been sufficiently reached.
- The error rate, indicator of service failure rate showed only a 5% error in TR3, TR4. And the average is less than 1%. Therefore the assessment target value, less than 2%, has been met.

- As shown in Figure 7(a) and (b), if the source encoding value increased from 100kbps to 200kbps, the encoding speed was down generally. And there was transmission delay in some cases. But it is no significant impact on services.

5. Discussion

Through the system implementation, we have learned real time resource management skills in the vulnerable Android OS, and obtained stable music streaming technology by developing the various Open Library. We still have taken only a basic step, but we expect to help to improve services in the future. And in addition to functions that will see the wallpaper, we have checked that the wallpaper can be graphed with all the features which can be implemented in the android. This will be applied to a wide range services as well as a sound source in the future. And similar services in various fields such as games are expected to be quickly applied to the involved technology.

The application field of the proposed system is very diverse. For one example, it can be used to promote the distribution of complimentary tickets for music concerts and theater. That is, it distributes the image containing the implications and interested users make it easy to use by linking to the site on this image, as shown in Figure 8. You can see a demonstration video for the promotion of the proposed Android App in13.
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Figure 6. The Statistics of the app usage in the past.

(a) The changes in the number of users.
(b) The changes in the number of each streaming.

Figure 7. Streaming transmission rate according to the source encoding.

(a) 100Kbps encoding
(b) 200Kbps encoding

Table 2. The stress test result using J-meter

| Label | #Samples | Average | Min   | Max   | Std.Dev. | Error% | Throughput | KB/sec | Avg.Byte |
|-------|----------|---------|-------|-------|----------|--------|------------|--------|----------|
| TR1   | 10       | 105     | 89.03 | 178   | 56.09    | 0%     | 108.90/sec | 309.77 | 1564     |
| TR2   | 10       | 205     | 135   | 352   | 88.91    | 0%     | 90.1/sec  | 71.38  | 2026     |
| TR3   | 10       | 2034    | 1564  | 3890  | 91.9     | 5%     | 201.1/sec | 104.64 | 9037     |
| TR4   | 10       | 3564    | 2789  | 5402  | 102.91   | 5%     | 507.1/sec | 167.38 | 12026    |
| TR5   | 10       | 1302    | 780   | 1712  | 78.01    | 0%     | 707.1/sec | 203.24 | 5526     |
| TR6   | 10       | 1205    | 880   | 1852  | 78.91    | 0%     | 171.3/sec | 306.38 | 2826     |
| TR7   | 10       | 2205    | 1208  | 2598  | 68.71    | 0%     | 421.4/sec | 101.3  | 4026     |
| TR8   | 10       | 1205    | 908   | 1552  | 58.91    | 0%     | 151.5/sec | 401.9  | 3080     |
| TR9   | 10       | 1505    | 1109  | 2109  | 78.09    | 0%     | 111.6/sec | 589.09 | 6749     |
| TR10  | 10       | 605     | 390   | 890   | 44.9     | 0%     | 231.7/sec | 189.78 | 4320     |
| TOTAL | 100      | 1393.5  | 2789  | 178   | 74.734   | 1%     | 347.5/sec | 2444.486 | 51180   |

- #Sample: Server requesting number
- Average: Average response time (ms)
- Min: Minimum response time (ms)
- Max: Maximum response time (ms)
- Error%: Error rate
Since the proposed system has recently registered in the App Store, the downloaded users are not so much. So the current service system operates only one CDN server. The plan in the future proceeds with the marketing for B2B as well as B2C expansion. Normally the success of the app has a tendency to depend on the quality and quantity of contents. So it is necessary to secure the contents in the future. The content providers are currently reserved as shown in following.

- **SYN kissphoto**: The MOU to acquire an image of 10 million to provide by quasi photographer.
- **Kisstock**: The MOU for securing more than 50,000 high-quality photos.

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