Music Sharing Platform based on Sina App Engine

Zhe-Yi Zhao*, Chang-Dong Wang*,†, Ping-Jun Zheng*, Qian Gong*, Kai-Wei Huang* and Jian-Huang Lai†‡
*School of Mobile Information Engineering, Sun Yat-sen University, Zhuhai, P. R. China, 519082
†School of Information Science and Technology, Sun Yat-sen University, Guangzhou, P. R. China, 510006
‡SYSU-CMU Shunde International Joint Research Institute (JRI), Shunde, P.R. China, 528300
Email: zhaozhy6@mail2.sysu.edu.cn, changdongwang@hotmail.com, sitazpj@gmail.com, ggphia@gmail.com, hkalw@mail2.sysu.edu.cn, stsljh@mail.sysu.edu.cn

Abstract—Music sharing is one of the most important components in interactive entertainment. In recent years, mobile music market has experienced a rapid growth. Current mainstream music sharing platforms provide users with a large number of online music, which however suffer some limitations of functionality since they neglect the interactions in the physical world. This paper presents the entertainment-oriented Location-Based Mobile Services (LBMSs), which is a music sharing platform based on Sina App Engine, where a novel music recommendation algorithm is proposed based on the geographical location. We utilize a map-based interface for visualizing the possible points of interest and the related information. The combination of online music sharing and offline music sharing creates a new music sharing mode. The proposed music sharing platform is developed with cloud computing techniques, which relies on sharing of resources and focuses on maximizing the effectiveness of the shared resources. Music sharing on cloud is more convenient and efficient in this case. Experimental results show that this platform can function properly and achieve satisfactory user experience.

Keywords—Cloud computing; music sharing platform; geographical location; recommendation system; offline sharing

I. INTRODUCTION

The music industry is continuing its transformation into a global digital business, expanding into new markets and extending new access models to more territories across all continents [1]. The developments are based on the global shift of music device to smart phones. At the end of 2012, 12.9 percent of worldwide mobile devices are smartphones. This figure reaches 36.2 percent by the end of 2016 (Portio Mobile Factbook).

In the past three years, mobile music application has experienced rapid growth, the driving force of which is the rapid growth of users. In recent years, basic functions such as search, download, and play songs have been improved. Mobile music applications have been extended to social applications, e-commerce of performing arts and other peripheral industries.

Users of traditional music sharing platform find songs in the vastness of cyberspace and then download them into mobile terminal. However, mobile phones and other mobile devices may be subject to the overall capacity of the storage. Even if one can copy all the songs to his mobile terminals, it would not be convenient to share music with friends. With cloud computing services, which blooms in recent years, users can obtain music from the cloud to achieve convenient listening and sharing [2].

Unlike other kinds of applications, music is a good way of emotional catharsis, so music applications cannot be simply positioned as a tool, but as an emotional, personalized design. Faced with intense competition in mobile music application market, getting rid of the product features homogenization phenomenon has become a key point. Innovative personalized applications and the combination of online products and offline market will be the next focus of competition [3].

The work in [4] proposes a new algorithm Dynamic Round-Robin (DRR) to deploy the virtual machines for power saving purpose. The work in [5] proposes a lightweight framework for hosting and consuming Web services on mobile devices. During the research, RESTful Web services was found to have high performance. The work in [6] proposes an Android based application in which users can share or edit Google maps while using social networks. This project also exploits some updated technologies such as the publish/subscribe design pattern in efficient way, the XMPP service offered by Google App Engine and the deployment on a cloud computing infrastructure. Kliem et al. [7] describe an approach allowing out-of-the-box functionality of medical device integration and authentication, using the way of moving medical devices between different networks and authorities. Suleiman [8] introduces the elasticity economics platform which means the dynamic increase and decrease in computing resources through automated mechanisms. As has been introduced in the paper [9], the rise of high-capacity mobile devices, fast wireless interfaces and positioning techniques has enabled the development of a large variety of location-based mobile services (LBMSs). The examples range from emergency services to city guides that provide information about the local tourist attractions and entertainment premises such as restaurants and bars. The work in [10] proposes a novel approach for proactively recommending services in a workflow composition process, based on service usage history. As web service technologies is becoming the de facto standard to expose the functions of business applications [11], service-oriented architecture
(SOA) is now one hot research topic in many areas such as academia and industry. After encapsulating the functionality of an application and providing accessible interfaces, a web service could be advertised, requested and invoked through messages encoded according to XML-based standards.

Overall, music discovery is mostly based on computer algorithms. This is a fast and reasonable way to recommend music to users, but may not be user friendly. There is a lack of communication between algorithm designers and music fans, which means that recommendation algorithms may not understand humans’ music taste very well. For example, recommendation systems which take users’ historical playlists as training examples may fail to take the users’ current state into consideration. In addition, current mobile music sharing applications provide mostly with online sharing. This limits music sharing on the Internet, where the physical world cannot be reached.

Our design aims to create a connection between the virtual world and the physical world. By doing this, we are able to build a recommendation system based on users’ current state. We design entertainment-oriented location-based mobile services, where both online music sharing and offline music sharing are realized. In this music sharing platform, location service in smart phones is used to build location-oriented playlists. Users are able to search for desired music online by locations. A map with playlists associated with geographical location is provided for users to find out what songs other users are listening to. This is a novel way of recommending music. Based on the assumptions that locations can be a good reflection of the users’ current state, location-based recommendation system can provide users with music fitting the current atmosphere and mood. Users are encouraged to contribute songs to the playlists, sharing them with others via cloud platform. Through online music application, users can store music in the cloud where local storage can be saved. Offline sharing is what connects the virtual world and the physical world. Public sites such as restaurants, caf and supermarkets can gather information on the music taste of customers via our cloud platform. We believe this is a good way of advertisement to attract potential customers. Combining with music software and cloud platform can not only give intelligent recommendation, provide user data security, but also create new online and offline sharing mode.

II. RELATED WORK

Many mobile music applications based on music sharing have been released in recent years. Rithm [13] is a music messaging app which introduces a new way of music sharing and real-time chatting. Music is designed as a new kind of message which can be shared to friends online, along with texts, photos and dancing emojis. Shared music can also be added into a playlist. Sounds App [14] is an application dedicated to music sharing on Instragram and Snapchat, which provides a connection between music and major social applications. BOOMiO [15] focuses on original, full length licensed tracks online sharing. It offers access to artists’ accounts to hear new music from the source. Free MP3Box [16] uses title, artist, genre and tags to search songs from a large online music library. In addition, users can create their own Favorites playlist. Listen [17] is a gesture music player which a gesture-based interface is designed. A set of operations such as changing tracks, playing-pause and adding songs to Favorites Playlist can be done with simple gestures. In 8tracks playlist radio [18], users can discover and share playlists based on theme or genre. The music sharing application listed above focus on online sharing, based on information of the tracks such as title, artists, themes and so on. SoundTracking [19] is a music sharing application where songs can be added with photos, hash tags, friend tags, and writing captions, and shared to major social applications.

For Facebook users, music moments can be added to Facebook Timeline. For twitter users, jams can be shared into Twitter. For Foursquare users, shared songs can be tag with a venue check-in. Friends can view and play them inside the check-in. This application also provides users with their own social music profile. From our points of view, the innovation point of this application lies in the interaction with major social application. Sharing songs with location tags is an interesting mode, and can be developed further more. In Android application market, users have a great demand on music application according to statistical data. The use of music software occupies a large part of the time in the use of application among mobile phone users. Recently, CNIT released a market report on mobile music application in 2014 Q2. Kugou music, TTPod, KwMusic and others are the mainstream music application. These applications have friendly user interface. What’s more, the large music library can meet the needs of most people as shown in Figure 1(a). From Figure 1(b), we can see that, in Android application market, Kugou music with over 1.1 billion downloads is way ahead of other software, topping the list [12]. The followings are TTPod, KwMusic and QQ music, while the gap of downloaders among them is relatively small. Other products have relatively few downloads. It is not difficult to conclude from Figure 1(a), Figure 1(b) and Figure 1(c), that market share were positively correlated with the user scores, and the user experience is often the determination of the fate of the applications. These top-ranking music applications have good user interface and large music library, so the user experience they are usually better than others.

III. THE PROPOSED PLATFORM

A. Overview of the Proposed Platform

This application provides user with a location-based music-sharing platform, including music map, neighbor playlists and other functions. The platform is based on a
map location, allowing users to freely share music with their
current location, and listening to playlists other people have
shared. Due to the specific locations, music recommended
can fit in the current atmosphere well, which simple classifi-
cation cannot compared to. There are two innovation points
on this project.

- First, this application has intelligent music recommen-
dation. It provides a music map, which is tagged
with location-oriented playlists. By touching different
locations on the map, users can get one special playlist.
- The second innovation point is offline music sharing.
This feature is motivated by the music played in
physical stores. Usually, restaurants and shops play
background music through internal decisions. Our
application can provide users with more fun. Specifi-
cally, stores can share their playlists online to attract
potential customers. For customers, they can have the
background music as a reference to choose their desired
restaurants.

This is a combination of virtual world and real world,
which redefines the mode of music sharing by breaking
the gap between online and offline. It can be not only
a marketing tactics for physical stores, but also a great
improvement on the user experience, making music sharing
more interesting than ever. Users can get nearby playlists by
searching point of interest (POI) on the map. Nearby playlists
categorized with types of locations, such as restaurants and
supermarkets. This function provides a novel way of offline
sharing with easy access to nearby physical locations.

B. Baidu Map

We design a novel intelligent music recommendation
system for our music sharing platform. The system is
implemented via Baidu Map API for Android platform.
Next we will present the introduction of Android Map
Software Development Kit (SDK). Android SDK for Baidu
Map is an application interface based on Android version
2.1 and higher. It can help developers to design mobile map
applications on Android devices. By calling the map SDK
interface, the program can access services and data provided
by Baidu Map. It is a powerful tool for developing interactive
map applications with rich function.

By calling Baidu Map API, we can access the following
services in order to build our recommendation system. The
first service is the map, including map exhibition and map
operations. In particular, map exhibition contains normal
map of two-dimensional and three dimensional, satellite map
and real-time traffic map. Map operations offer interactions
such as simple clicking, double clicking, long clicking,
zooming in, zooming out, spanning and the changing of
angle of view. The second service we used is POI search,
which supports neighbor search, region search and city
search. Specifically, neighbor search is POI search with
center at a specific point and specific radius, by key words
users input. Region search is POI search within specific
rectangle region. City search is POI search within a certain
city. The third one is geographical encoding, which pro-
vides the interpretation between geographical coordinates
and addresses. Positive geographical encoding can realize
the function of interpreting Chinese address or location name
descriptions into corresponding locations on the surface of
the Earth. On the contrast, negative geographical encoding
covet coordinates to standard address. The fourth function
is map overlap. Baidu Map SDK support many kinds of map
overlap to enrich the map. The fifth service is orientation.
Baidu Map uses hybrid orientation mode of GPS, WIFI,
station and IP. By making use of this service, our application
can recommend playlists to users according to their current
location, which is fast and convenient, yet efficient.

C. Intelligent Music Recommendation System based on
Baidu Map

As mentioned above, our music sharing platform aims
at providing the outstanding user experience by designing
a novel music recommendation system, which is based on
geographical location correlated with specific atmosphere.
By calling Baidu SDK interface, we can get the service
introduced in . First, the major layout of our music sharing
application is a map, centered at the current location of the
device which the app is running on. For the locations where
playlists are created, markers are added onto them. Through
this layout and overlay on the map, users can easily find the
locations where playlists are created. A simple click on the
menu will lead the user to the corresponding playlist, which

Figure 1. Statistics on music marketing in 2014 [12]: (a) Market shares distribution on mobile music application; (b) Total number of downloads of mobile music application on Android; (c) Ranking on positive ratings of mobile music application.
lies in the locations chosen by the user. We accomplished this via cloud computing, say, SAE platform and MySQL, which will be discussed later. After achieving the playlists, users can choose the song they want to play, and it will be downloaded from cloud.

D. Baidu Music API

On our music sharing platform, the users can get the playlist correlated with geographical location, which means that service of automatic download from the cloud should be provided. We need to start a service that downloads music. As a result, we download songs from Baidu Music homepage by the specific URL we set in the program. In fact, Baidu Music doesn’t have APIs for developers. So we need to access the Baidu Music page to download music. By specify URL, our program can access the page and download music automatically.

E. Jsoup and Gson

Jsoup is a Java HTML Parser which is a convenient Java library for extracting data [20]. In our project, we use Jsoup to parse the music category XML file. As mentioned above, by clicking on certain location on the map, the user will be able to get the playlist associated with that location. After getting the playlist, for the actual songs other than just the list, automatic download from the cloud is needed. As a result, we need to start a service that download music in the background. We download songs from Baidu Music homepage by the specific URL we set in the program. After retrieving the XML file, we parse it via Jsoup to get a Document instance. Next, we can process the Document and get music URL.

Gson is an Java library which is open-source and is used to serialize and deserialize Java Objects from JSONs [21]. In particular, Gson can be used to convert Java Objects into their JSON representation. It can also be used to convert a JSON string to an equivalent Java object. Gson can work with arbitrary Java objects including pre-existing objects that you do not have source-code [21]. It provides simple toJson() and fromJson() methods to convert Java objects to JSON and vice-versa. Also, Gson allows pre-existing unmodifiable objects to be converted to and from JSON. To use Gson, first we need to define a serialized Bean, here in our project we define it in the form of inner class, which may look clearer. We can just take out the data directly from JSONBean. Notice that as the Json to be parsed has nested layers, the Bean we define also needs to be implemented with nested layers of inner class. These classes should be defined according to the corresponding Json fields. As mentioned above, JSONBean is used to fetch the data from the website. After getting the data, we need to define a class to parse these data. Then we could get the source code of the music list website. The code is for downloading music later.

F. Music Player

A music player can guarantee the integrity of this app. But this does not mean the music player has to be a very complicated or function-completed one. Our app aims to create a pure enjoyment of music environment for the users, so the player is a simple one that only has necessary functions.

Using the service component which is a longer-running operation like a player should apply, the simple function of playing music can be realized. Service is a facility for the applications to tell the operating system that it wants some service to run in the background or to expose some of its functionality to other applications. Calls to context.startService() or context.bindService() can start some sort of service. Both method can be applied in the music player. Here we use the latter one.

G. Cloud Computing via Sina App Engine

Cloud computing is computing in which large groups of remote servers are networked to allow centralized data storage and online access to computer services or resources. It is a model for enabling the convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. With cloud computing, the providers of the cloud service maintain the hardware, infrastructure and applications. Users can get access to these services by pay-as-you-go pricing model. There are three kinds of services offered by clouds: IaaS (Infrastructure as a service), Paas (Platform as a service) and Saas (Software as a service).

Sina App Engine (SAE) is the earliest and the largest Paas platform for cloud computing in China. It is run by SAE Department, which was founded in 2009. SAE is dedicated in providing stable, effective web deployment and hosting service for those corporations, organizations and independent developers [22]. As SAE is powerful and free, it is now popular in China and has been widely used. In our project, we also choose the SAE as the cloud computing platform for developing. The MySQL database provided by SAE is used for storing address information, playlists and user information. When an APP user uploads his own playlist, the address information as well as the playlist will be stored in MySQL database and the position is marked. By touching the marker on the map, others will get this information from the cloud, thus can access playlists.

MySQL is the world’s second most widely used open-source relational database management system (RDBMS). With its proven ease-of-use, performance, reliability and scalability, MySQL has become the leading database choice for Web-based applications, used by high profile web properties including Facebook, Twitter, Google, YouTube, Yahoo, and thousands of mid-sized companies [23]. SAE also
Music Map

- User add recommended song to playlist of POI
- Like certain song
- Comment on certain song
- Download the song according to the specific playlist

Supports MySQL. The distributed MySQL database cluster service offered by SAE can support millions of database access. After applying for a SAE count, a developer will get a domain name for his application. By adding several codes on the platform, MySQL will connect to the app, and MySQL service is successfully put into use.

In this project, we make use of MySQL for storing address information, playlists and user information. When an APP user uploads his own playlist, the user information, the address information as well as the playlist will be stored in MySQL by calling SAE API. MySQL will connect to the app, and MySQL service is successfully put into use.

The main idea of our implemenation is described in flowcharts. Figure 2 shows an overview of the music sharing application.

**IV. EXPERIMENTAL RESULT**

To evaluate the performance of the proposed methods, we tested our music sharing application and the results are shown in Figure 3 and Figure 4. The home screen can be seen in Figure 3(a) which is based on Baidu Map. The current location of the user is marked on the map, which can be set as a blue arrow-default icon, or a pink dot-the custom icon with the spinner on the right. Users can click the button at the upper right corner of the map to change the mode of the map, among normal, following and compass. Zooming in and zooming out can be achieved by clicking the buttons with the positive sign and the negative sign. As mentioned above, the application is a music sharing platform which combined online sharing with offline sharing. A demo of this function is shown in Figure 3(b). Users can input the type of locations of their interests such as restaurants. The map will show the nearby restaurants with red dots overlap. By simply clicking on a dot, the application will show the playlist of the chosen restaurant, as shown in Figure 3(b). This application is a music sharing platform based on the location (the longitude and the latitude). Users can share music to the cloud, which they think is suitable for the current location. Music map will gather all the application users shared as a song list each location instantly and store in the database. Other users can get the music based on location according to the song list in the database. What Music map do is to get the list from the clouds and download the music in the list to the end device. Below the playlist is a music player where users can listen to songs on the playlist. By clicking the name of the song in the list, one can start to listen, or just click the play button and you will enjoy the first song, which is shown in Figure 4(a) When you want to stop listening, click the pause button (the play button will change to the pause button when listening). Clicking the two buttons beside the play/pause button can change the music to the last one or the next one. After listening to the songs, one can click the thumb up sign to like the song, or click the comment button to write down some comments on it, which are shown in Figure 4(c) and Figure 4(d). The information of the songs are also available, as shown in Figure 4(e).

**V. CONCLUSION**

This paper has presented the entertainment-oriented Location-Based Mobile Services, and has implemented a geographical-oriented music-sharing platform via cloud computing. Exploiting the correlation between playlists and location, we have developed a novel music recommendation system to achieve better user experience. We have applied
cloud computing technique by using Sina App Engine. Compared with current mobile music application, our application represents a novel music recommendation system.

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