Logmusic : Context-Based Social Music Recommendation Service on Mobile Device

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Logmusic Prototype UI

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Abstract
Our choice of music in a daily life is greatly affected by our current mood and suggestions by others. We believe that people experience similar mood changes facing similar changes in weather, temperature, time, and location, and for this we suggest a service we named 'Logmusic', a context-based social music recommendation service. Using a prototype version, we performed a pilot test in order to determine if the hypothesis is valid. To conclude, songs recommended through this system scored significantly higher on both preference and appropriateness than randomly selected songs or popular songs. This service is expected to enhance user's music experience and promote sense of unity among users, and contribute to build unique cultures within local communities.

Author Keywords
Context based; Social music recommendation; Location based;.

ACM Classification Keywords
H.5.5 Sound and Music Computing: Methodologies and techniques; H.5.m. Information Interfaces and presentation (e.g., HCI)]

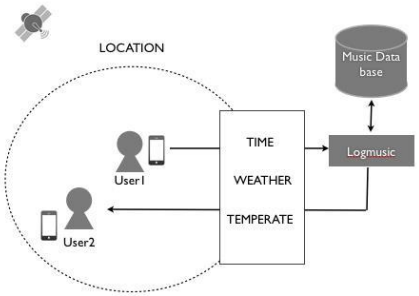

Figure1. Concept

Introduction

Along with the development of information technology and enlargement of internet, the spectrum of selection of individual users has expanded. In music field, music service users face difficulties in selecting music because the size of music information is increasing as well. We all want to listen to different songs in different situations. Our choice of music will be affected whether your surrounding is crowded/ silent, day/ night, or sunny/ rainy. Further, we would be curious as to what kind of music other people, especially someone you care, chose to listen in a similar situation. This paper suggests a music recommendation system (figure 1) under a premise that user's contextual factors such as weather, temperature, time and place plays a significant role in his/her selection of music. Through a pilot test this paper will determine the validity of this hypothesis and discuss future works required to build a sound system.

Related works

Numerous researches and services have been conducted to provide playlists based on user preference by categorizing songs by various elements. Content-based playlist generation procedure is one of them. This technology provides playlists for each user using music information retrieval engine that categorizes songs into similarity song space, which is then processed by song selection algorithm based on pre-recorded user preference [1]. Another method provides recommendation to users using cooperative filtering system [2]. Recommender-based recommendation system suggests to users list of songs based on popularity, or anticipates user's preference based on similarity with other listeners using play history.

However, human decision making processes are greatly altered by the corresponding emotional state or attitude [3], and the same goes with choosing which songs to listen to. This is why many researchers tried to utilize various sensors which detect environmental information to anticipate user's current emotional status. Terry & Greg's study shows how seasons affect people's emotion and change their choice of songs [4]. Also, Stuart & Stephen used Fuzzy Logic Model to calculate emotional status from movements, temperature and time and applied it to music recommendation [5]. Other researchers developed a system that performs context-aware recommendation task, which selects music content that fits a place of interest using tag information of location and music [6] This study suggests a system which generates song recommendations out of social data within the same context. This differs from preexisting context-based music recommendation systems that analyze various environmental elements in order to create similar contextual situation to make music recommendations [5,6,7]. Also, through user participation, our system attempts to calculate not only natural human moods out of similar context, but also the specific cultural factors out of location information.

Main Design

This application prototype has been developed for Android devices and provides the user with the following core components:

- Tag function where users can record a music to recommend, location, weather, and time information.

  As each user tags a song he/she is listening, location, weather, and time information is also saved.

- Notification function when the user information matches the tag information of other user's music

A notification is provided when a user becomes situated in the same context as the tag information of other users. Users are required to stay for at least 10 minutes within the 100m perimeter of the tag origin in order to receive the notification. 47 conditions codes of Yahoo weather API was simplified to 10. Temperature are divided into 3 conditions; low (<15℃), mid (16℃~ 25℃), and high (>25℃). A day is divided in to 8 three-hour sections.

- Alarm function when user experiences the same context as his/her own previous tag information
- Prioritization function in an order that received the most recommendations, if multiple tags are existent in the same area
- Setting function that lets users to select which peer users to receive tag notification from. Time, weather, and location likewise.

User Scenarios

Here are three scenarios that exemplify the merits and benefits users may experience from this system.

historical place and tourist attraction

A traveling user visits an exotic tourist attraction. It is a raining evening when the user arrives at this location. A notification arrives, informing that a person the user has been a fan of, or simply just a friend listened to a song and recommended to others. While listening to that song, the user transcends time and space and empathizes deeply the emotion and mood of the person who recommended the music. The range of experience people may gain through music and traveling will be expanded.

daily life

Users may set an option so that they can only receive tag information from the people they love or respect. During a not-so-special routine day, they may receive information of a song from an important person who shared a similar context. They can experience the sense of unification and solidarity through music.

Local community

Territories in which people are active are usually limited to places such as home and work spaces, and the bond among people within local communities are weak in contemporary society. A location-based function of this service may promote the sense of unity within local communities.

Preliminary test

A preliminary test was executed to determine the similarity of reaction to the music of the same environmental elements. 6 college students, 3 male and female each, participated in this experiment. In the first week participants were made to recommend total 20 songs in different time of the day, location, and weather. For the next week, participants are provided with a pilot version of prototype application with the data collected in the previous week. When the conditions of each of the participants are met, total three songs were provided by the application; a song recommended by other users last week in the same condition (CS), a song that reached top 20 KPOP chart last week (PS), or a randomly provided song (RS). Participants were then asked to rate their preference and appropriateness (to the context) of each song in five-point scale.

Preference decreased in order, with CS preference at $\mu=3.500$ ($\sigma=1.049$), PS preference $\mu=2.167$($\sigma=0.9832$), and RS preference $\mu=1.667$ ($\sigma=0.8165$). T-test result on preference showed that PS-CS were significantly different with the p-value of 0.0464 ($p<0.05$). RS-CS

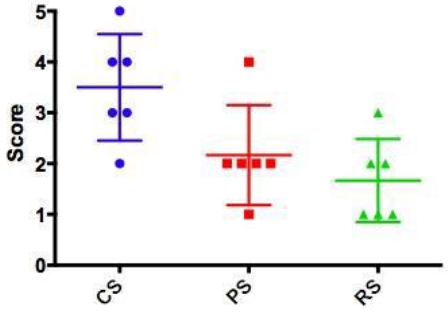

Figure2. Preference

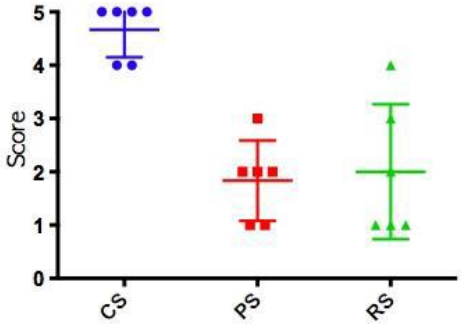

Figure3. Appropriateness

were also significantly different with the p-value of 0.0070 ($p<0.05$). Appropriateness, though, had a different result, with CS appropriateness highest at $\mu=4.667$ ($\sigma=0.5164$), PS appropriateness lowest with $\mu=1.883$ (σ _$=0.7528$), and RS appropriateness slightly higher at $\mu=2.000$ (σ _$=1.265$). T-test results on appropriateness showed that PS-CS were significantly different with the p-value of 0.0009 ($p<0.05$). RS-CS were also significantly different with the p-value of 0.0007 ($p<0.05$).

CS scored both higher at preference and appropriateness rating, but the appropriateness test showed more significant differences with higher standard deviation and average score.

CONCLUSION AND FUTURE WORK

This paper proposed music recommendation system based on user's similar environmental context and evaluated how user's preference and appropriateness satisfaction are reflected in the recommended music. As a result, the system obtained a significant, positive reaction from users in both criteria.

Based on this result, we discussed the direction we must take to improve the system. We underlined the fact that, in preliminary test, the recommended music was lower on preference rating compared to appropriateness. The selected music could reflect the mood the user may be in, but low preference on the music must be overcome in order to fundamentally improve the music experience. We must develop ways to reflect each user's taste in music type. Cooperative filtering would be a possible breakthrough, in which the system links users with significant similarities in preference and disconnects ones with significant preference differences. Users can manually rate the preference similarity of each of their peer users. Also, using additional sensors to measure other elements such as heart rate, movements, or surrounding sound may add more determinant conditions. Lastly, a degree to which each conditional element (weather, time, location, etc...) affect the sentimental experience towards music must be surveyed and weighed accordingly.

We believe that this service will utilize social resources well to make an effective music recommendation service which does not require complicated algorithms. Doing this study in this way first provides the motivation for future investigation to provide ways to develop context-based social music recommendation.

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