A Context-Aware Music Recommendation Agent in Smart Office

Donghai Guan, Qing Li, Sungyoung Lee* and Youngkoo Lee

Department of Computer Engineering
Kyung Hee University, Korea
{donghai,sylee}@oslab.khu.ac.kr
yklee@khu.ac.kr
liqing@icu.ac.kr

Abstract. In this paper, we originally propose a music recommendation agent in a smart office to recommend music for users. Personal tastes are diverse, even the same person may have different preferences in different situations. Hence, our music recommendation is not only based on the user favorite genres but also the current mood of users. By collecting and analyzing the contextual information of users, the agent can automatically senses the mood of users and recommends music.

1 Introduction

In ubiquitous computing, context is any information that can be used to characterize the situation of an entity [1]. A lot of work has been done in trying to make applications in ubiquitous computing environments context aware and many different kinds of agents have been developed [2] [3] [4] [5]. However, to the best of our knowledge, none of them considered entertainment items in ubiquitous environments. Music as a major entertainment item should be considered.

The objective of this paper is to construct an autonomous music recommendation agent which can recommend appropriate music to the users in smart office. This paper sets the stage by building a context-aware agent that can recommend music based on user preference and mood.

Several subtasks should be achieved by our proposed agent. They are music genre classification, user preference and mood deduction.

In the rest of paper, we present the components in our agent in detail. In section 2, we discuss how to classify music into genres and moods. In section 3, we propose the way to deduce user's music preference and mood. Section 4 is conclusions and future works.

* Dr. Sungyoung Lee is the corresponding author.

2 Music Genre & Mood Classification

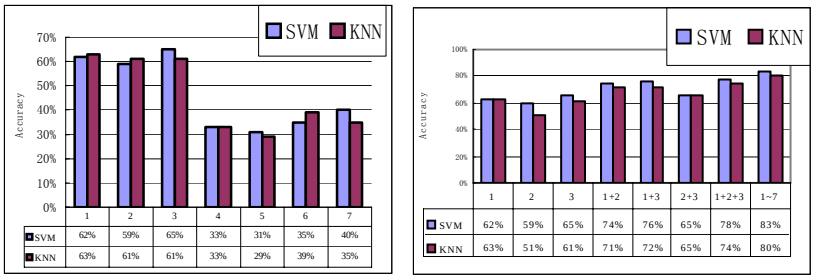
To recommend appropriate music to users, first of all, music genre and mood classification is needed.

2.1 Music Genre Classification

This component includes two parts: one is extracting features from music; the other part is using machine learning techniques to classify music based on the extracted features.

1) Feature extraction: three feature sets [6] are used in our paper. They are timbral texture features, rhythmic content features and pitch content features.

2) Classification: Fig. 1 shows the classification accuracy of two classification algorithms (svm and knn) on our dataset. In the experiments, 1,2,3,4,5,6,7 represent mfcc, centroid, rolloff, ssf (sum of scalefactors), flux, pitch and rhythmic content features accordingly. The experiments verify that each of the tradition features contains useful yet incomplete information for characterizing music signals. Here we only show two experiment results. From our experiments, we may draw the conclusion that among all of different combinations of proposed features, the performance is best when all the proposed features used together.



(a) (b)

Fig. 1. Classification performance comparison

2.2 Music Mood Classification

Three features [7] [8], relative tempo, the mean and standard deviation of average silence ratio, are used to classify mood.

1) Tempo: the rate at which notes are played, expressed in score time units per real time unit, i.e. quarter notes per minute or beats per minute.

2) Average silence ration: used to model articulation.

After getting these three features, machine learning techniques can be used to classify the music. Neural network classifier used in [8] showed that music mood could be classified.

3 User Preference & Mood Deduction

User preference and mood are decisive elements in our music recommendation agent. User preference is a long-term activity, while user mood is a state at a given time point which always changes from time to time. User's history profiles are used to deduce user preference and mood.

3.1 User Preference Deduction

To get user preference, training phase is indispensable. In this phase, system provides the genre classified music to each user. Then each user selects his/her favorite music to play. For each genre, the system records the number of music that has been played. Then, we can deduce user's preference by selecting the biggest number. For each user, three most favorite genres are extracted as user preference. For example:

User1 (Classical, Rock, Pop)
User2 (Metal, Pop, Disco)
User3 (Country, Blues, Jazz)
User4 (Metal, Classical, Jazz)

3.2 User Mood Deduction

In our paper, we use the method proposed by Anand [9]. The context used to derive mood includes user's location, the time of day, which other people are in a room with him, the weather outside and his stock portfolio. Native Bayesian algorithm is used to predict user mood.

After the knowledge of music genre, user preference and user mood is available, the recommendation process is quite simple that the music with the matched genre and mood will be selected.

4 Conclusions and Future Work

In this paper, we proposed a novel music recommendation agent, which can provide music to the users according to their preference and mood. Also, we have some issues to solve in the future.

1) Our music recommendation agent is user-centric. In the future, we propose to devise a task-centric music recommendation agent.

2) More multimedia entertainment items in smart office will be considered in the future, such as movie.

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