DEPARTMENT OF COMPUTER SCIENCE

PhD Degree Oral Presentation

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Time:	3 July 2014 (Thursday) 10:00 am – 12:00 nn (35 mins presentation and 15 mins Q & A)
Venue:	RRS732, Sir Run Run Shaw Building, HSH Campus

"Emotion-based Music Retrieval and Recommendation"

Abstract

Digital music industry has increased dramatically during the past decades, which results in enormous amount of music data. Along with the Internet, the growing volume of quantitative data about users (e.g., users' behaviors, etc.) can be easily collected nowadays. All these factors have the potential to produce big data in music industry. By utilizing big data analysis of music related data, music can be well semantically understood (e.g., genres, emotions, etc.), and the user's high-level needs can be satisfied. For example, many commercial music companies such as Pandora, Spotify, and Last.fm have already attempted to use big data and machine learning related techniques to drastically alter music search and discovery. According to the study of musicology and psychology, music is often regarded as the heart of our soul, and emotion is the core component of music that expresses the complex and conscious experience. However, there is less research on this field. Consequently, due to the impact of emotion conveyed by music, retrieval and discovery useful music information at the emotion level from big music data are extremely important.

Over the past decades, researchers have made great strides in automated systems for music retrieval and recommendation. Music is a temporal art, involving specific emotion expression. But while it is easy for human beings to recognize emotions expressed by music, it is still a challenge for automated systems to recognize them. Although some significant emotion models (e.g., Hevner's adjective circle, arousal-valence model, etc.) established upon the discrete emotion theory and dimensional emotion theory have been widely adopted in the field of emotion research, they still suffer from limitations due to the scalability and specificity of music. As a result, the effectiveness and availability of music retrieval and recommendation at the emotion level are still unsatisfactory.

This thesis makes contribution at theoretical, technical, and empirical level. First of all, a hybrid musical emotion model named "Resonance-Arousal-Valence (RAV)" is proposed and constructed at the beginning. It explores the computational and time-varying expression of musical emotions. Furthermore, dependent on the RAV musical emotion model, a joint emotion space model (JESM) combines musical audio features and emotion tags feature is constructed. Second, corresponding to static musical emotion representation and time-varying musical emotion representation, two methods of music retrieval at the emotion level are designed: (1) a unified framework for music retrieval in joint emotion space is designed; (2) dynamic time warping (DTW) for music retrieval by using time-varying music emotions. Furthermore, automatic music emotion annotation and segmentation are naturally conducted. Third, following the theory of affective computing (e.g., emotion intensity decay, and emotion state transition), the intelligent affective system for music recommendation is designed, where conditional random fields (CRF) is applied to predict the listener's dynamic emotion state based on his or her personal historical music listening list in a session. Finally, the experiment dataset is well created and proposed systems are also implemented. Empirical results (recognition, retrieval, and recommendation) regarding accuracy compared to previous techniques are also presented and demonstrated that proposed methods enable an advanced degree of effectiveness of emotion-based music retrieval and recommendation.

Keywords: Music and emotion, Music information Retrieval, Emotion recognition and annotation, Music recommendation, Affective computing, Time series analysis

*** ALL INTERESTED ARE WELCOME ***