

# Culture specific approaches in music technology

## Turkish Music Case

**Date:** 23 February 2015, Tuesday, 09:00 - 12:00

**Location:** EE-01, EE Building, Bilkent University

**Organizers:** Asst. Prof. Dr. Cem Tekin (Bilkent University) and CompMusic team (Universitat Pompeu Fabra)

Music Information Retrieval (MIR) is an emerging field foremost concerned with the extraction and inference of meaningful features from music, indexing of music using these features, and the development of different search and retrieval schemes. The field takes advantage of approaches from different disciplines such as audio signal processing, machine learning, music cognition, musicology and human-computer interaction. In the recent years, there is an increased interest within the MIR community in computational research on different music traditions across the world. Being the spearhead initiative, CompMusic project is a research project funded by the European Research Council, coordinated by Xavier Serra from the Music Technology Group of the Universitat Pompeu Fabra, Barcelona (Spain). The project aims to advance in the automatic description of music by emphasizing cultural specificity.

In this seminar, we will present an overview of analysis, description and retrieval of Turkish makam music from a music technology perspective. In the first session we will first describe the problems, challenges and opportunities of computational research on Turkish makam music and present the available data sources. We will then review the state of the art applied on this music tradition, focusing on research done on processing music scores and audio analysis. The second session is dedicated to the content-based and knowledge-driven technologies developed within the CompMusic project. We will demonstrate several tools and applications aimed to assist automatic content description and retrieval, musicological studies, education and discovery of Turkish makam music. We will also showcase some open and reproducible research opportunities brought by these technologies.

## **Music Information Retrieval from a Cultural Perspective**

Xavier Serra, Universitat Pompeu Fabra, Barcelona

Music is a universal phenomenon that manifests itself in every cultural context with a particular personality. The technologies supporting music need to take into account the specificities that every musical culture might have. This is particularly evident in the field of Music Information Retrieval, in which we aim at developing technologies to analyse, describe and explore any type of music. From this perspective we started the project CompMusic (<http://compmusic.upf.edu>) in which we focus on a number of MIR problems through the study of five music cultures: Hindustani (North India), Carnatic (South India), Turkish-makam (Turkey), Arab-Andalusian (Maghreb), and Beijing Opera (China). We work on the extraction of musically relevant features from audio music recordings related to melody and rhythm, and on the semantic analysis of the contextual information of those recordings. In this talk, I will do an overview of CompMusic and also briefly mention other research projects being carried out at the Music Technology Group of the Pompeu Fabra University in Barcelona that relate to the analysis, description and synthesis of sound and music signals.

## **An Overview of Computational Methods Applied on Turkish makam music**

Sertan Şentürk, Universitat Pompeu Fabra, Barcelona

Turkish makam music is a profound music culture that has many unique melodic, rhythmic, structural and expressive characteristics. Studying these aspects holds certain opportunities and challenges in further developing the current state of the art in music information retrieval and extending our understanding in music cognition and human creativity, in general. Computational research on Turkish makam music has been gaining attention in the recent years. In this presentation, I will give an overview of computational studies on Turkish makam music such as melody analysis, tonic identification, makam recognition, tuning analysis, automatic transcription, audio-score alignment, audio-lyrics alignment and usul detection. I will present the state of the art to fulfill these tasks and also discuss future directions for computational studies of Turkish makam music.

## **CompMusic Turkish makam music corpus**

Sertan Şentürk, Universitat Pompeu Fabra, Barcelona

To analyse, discover and explore the culture-specific characteristics of a music tradition, we need music collections, which are representative of the studied aspects of that music. For Turkish makam music, there are various resources available such as audio recordings, music scores, lyrics and editorial metadata. However, most of these resources are not typically suited for computational analysis, are hard to access, do not have sufficient quality or do not include adequate descriptive information. To satisfy this need for representative music collections suitable for computational research, we have created a corpus of Turkish makam music, consisting more than 6500 audio recordings, 2200 music scores with lyrics, 26000 instances of editorial metadata related to the classical and folk repertoires of Turkish makam music. The primary considerations during the creation of the corpus reflect some criteria, namely, purpose, coverage, completeness, quality and reusability. Currently, this corpus is the biggest corpus of

Turkish makam music intended for computational research. We have additionally compiled several test datasets from the corpus, providing a ground truth for specific computational tasks and we have also started using the corpus to generate a knowledge base for a domain ontology describing Turkish makam music. We hope that this research corpus will facilitate academic studies in several fields such as music information retrieval and computational musicology.

### **Audio and symbolic score processing for analysis and discovery of Turkish makam music**

Sertan Şentürk, Universitat Pompeu Fabra, Barcelona

Music is a complex phenomenon and there are many types of data sources that can be used to study it. Each type of data source offers different ways to study, experience and discover appreciate the music. In this talk, I will review various tasks Turkish makam music and the proposed audio signal processing and machine learning approaches on music scores and audio recordings to fulfill these tasks. The presentation will focus on how parallel information extracted from audio-score alignment, along with the relevant musicological and editorial metadata may facilitate the computational analysis and discovery of Turkish makam music by taking advantage of their complementary aspects. I will also present some of the findings resulting from the applied analysis on the CompMusic Turkish makam music corpus.

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## **Mode recognition and tonic identification in Turkish makam music using pitch distributions**

Altuğ Karakurt, Bilkent University, Ankara

Tonic and “mode” are two fundamental concepts for many music traditions. Tonic acts as the reference tuning pitch for the melody, whereas the mode underlies the melodic structure of studied performance. Automatic mode recognition and tonic identification are two musically relevant steps in the music signal processing tasks such as automatic transcription, tuning analysis and intonation analysis. In this talk, these musical concepts and their importance for computational musicology and audio signal processing fields will be introduced. The current state of the art methods, namely the pitch distribution based machine learning approaches, will be explained, with an emphasis on their application to Turkish makam music.

## **An Interactive Rhythm Training Tool for Usuls of Turkish Makam Music**

Burak Uyar, Bahçeşehir Üniversitesi, İstanbul

The education of the Turkish makam music practice is carried out by face-to-face sessions with the masters. Our aim in this work is to present a rhythm training software that helps users imitate recording of a master and receive visual feedback about their performances compared to the recording of the master. The system automatically detects onsets in the recordings and then performs comparison of the onset locations with a novel approach defined here. We present a demonstration of the software and preliminary test results on basic rhythmic patterns of Turkish makam music.

## **A melody training tool for Turkish makam music**

Hasan Sercan Atlı, Bahçeşehir Üniversitesi, İstanbul

It is a computer based training system specifically designed for Turkish makam music that helps the user to practice the musical intervals of an audio recording with a specific makam or a makam with related audio recordings. The system provides an ability to practice a reference audio recording. It extracts the predominant melody, identifies the tuning, analyses the style and the tuning of the performance in the audio recording. Moreover, the score of the selected performance is aligned with the related audio recording. Hence the user can select a part of the performance and practice the melody with following the music score. The tool is mainly built in Python and it is able to manage stored data in SQLite, analyse the data and control the user interaction via the interface built in Qt. The talk will also include a demonstration of the tool in action.

## **MakamBox: A Java-based tool and application for intonation analysis**

Bilge Miraç Atıcı, Bahçeşehir University, İstanbul

Each traditional music culture has unique melodic features. Computational analysis of audio recordings of Turkish makam music and other traditional musics often requires culture-specific technologies and solutions. In this study, we present an interactive intonation analysis tools that can be used for both Turkish makam music and other traditional music recordings, which shares

similar features. In the presentation, We will also demonstrate how to use this tool effectively with customizable settings provided by the user.

### **Dunya: A tool for computational analysis and discovery of Turkish makam music**

Sertan Şentürk, Universitat Pompeu Fabra, Barcelona

Dunya is a web application for the analysis and discovery of Turkish makam music. This prototype is aimed to showcase the technologies developed within the CompMusic project. The tool stores the musical data such as audio recordings, music scores and relevant metadata. It also manages the information about the stored data and submits analysis tasks on the data from the administration panel. In the visual interface, the extracted features and analysis results are shown in an audio player, rendering music score and audio representation synchronous to the playback. The prototype is highly flexible and can be further developed to support tasks in music information retrieval, music discovery, musicological research and music education. You can try the web application at <http://dunya.compmusic.upf.edu/makam/>.