## SELECTED PROJECTS

### DELOS

**Network of Excellence
on Digital Libraries**
IST FP6- 507618,
01.01.2004 – 31.12.2007
http://www.delos.info

- Knowledge Extraction and Annotation of Audio
- Visualization of Digital Libraries
- Multimedia Interfaces for Mobile Applications

### MUSCLE

**Network of Excellence
on Multimedia Understanding
through Semantics,
Computation and Learning**
IST FP6-507752
01.03.2004 – 29.02.2008
http://www.muscle-noe.org

- Content Description for Audio and Text
- Machine Learning and Computation applied to Multimedia
- Interfaces to Music Collections integrating acoustic and textual data

## Further Information:

Ao.Univ.Prof. Dr. Andreas Rauber
rauber@ifs.tuwien.ac.at

www.ifs.tuwien.ac.at/mir

**Vienna University of Technology**

Institute of Software Technology and
Interactive Systems

www.ifs.tuwien.ac.at

Favoritenstrasse 9-11/188/1
A-1040 Vienna, AUSTRIA
Tel.: +43 1 58801 18826
Fax: +43 1 58801 18899

## Vienna University of Technology

Institute of
Software Technology and Interactive Systems

Information & Software Engineering Group

# Music
# Information Retrieval

## www.ifs.tuwien.ac.at/mir

# MUSIC INFORMATION RETRIEVAL

The growing size of digital music collections in both the professional and personal domains created the need for advanced methods for efficient organization and retrieval of music. Music Information Retrieval is a relatively young research domain which addresses the development of methods for computation of semantics and similarity within music, in order to enable acoustics-based organization of large music archives.

## OUR ACTIVITIES

### Audio Feature Extraction
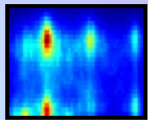
The process of extracting features from audio by the use of digital signal processing methods and psycho-acoustic models enables computers to "understand" music and therefore to find similar music automatically. These methods provide a numeric description of music, capturing different types of semantics, such as rhythmics or timbre. They are fundamental to many subsequent tasks, such as music classification or automatic music organization. Our group has developed several feature sets, e.g. Rhythm Patterns, Statistical Spectrum Descriptors and Rhythm Histograms, and is researching further types of music descriptors, to better capture the wide range of different characteristics present in music.

### Chord Detection
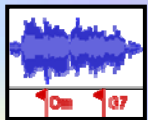
Chords, while being musical structures easy to understand for humans, are difficult to recognize for computer systems. We are working on a system for the detection of chords, which is a valuable contribution to many Music IR tasks, as chords are able to describe the harmonic properties of a piece of music.

### Audio Segmentation
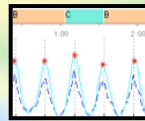
Automatic audio segmentation aims at detecting the structure of a song, i.e. segment boundaries and semantic labels like verse, chorus, bridge, etc. This information can be used to create representative song excerpts or summaries, to facilitate browsing in large music collections or to improve results of subsequent music processing applications such as, e.g., query by humming or classification.

### Music Classification
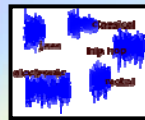
Using features extracted from music and machine learning methods a number of automatic music classification tasks is made possible. The system is trained on a small set of music with specific labels, such as genre categories. It is then able to sort new music into these categories. Music classification tasks comprise:

- Genre recognition and categorization
- Artist identification
- Detection of mood and emotions in music

Music Classification is particularly beneficial for the organization of large music collections.

Our group participates actively in the international MIREX evaluation campaigns and achieved top positions in several of the benchmarking events.

### Visualization of Music Archives
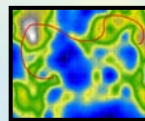
To overcome the need for manual annotation of music with genres – which often are defined in an ambiguous and overlapping manner – we are applying clustering methods, which organize music collections solely by sound similarity. Moreover, we are developing intuitive visualizations which provide a completely new view of a music collection, having the advantage of identifying groups of music with similar style at a glance.

## APPLICATIONS

### PlaySOM
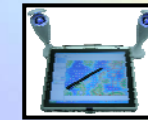
Our PlaySOM application employs Self-Organizing Maps to create interactive "Maps of Music", which group music by acoustic similarity and provide an overview of music collections offering different visualizations. PlaySOM allows zooming and exploration of music collections by navigation on the map and thus facilitates discovering music from unknown artists. Moreover, it is the ideal interface for creating situation-based playlists simply by drawing a path through the music landscape.

### PocketSOMPlayer

The PocketSOMPlayer brings "Music Maps" to the mobile phone, PDA or the future audio player. Its map interface provides an overview of a music collection and allows selecting the music one likes quickly without having to browse through long lists of albums or song directories. It is possible to play music directly on the mobile device, to stream music from another site, or to use the PocketSOMPlayer as a remote control for one's music collection stored on a PC.

### Map of Mozart
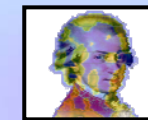
By extracting acoustic features from the complete works of Mozart and applying the new MnemonicSOM algorithm we created the "Map of Mozart". This interactive map not only provides an immediate overview of all works composed by W. A. Mozart. It managed to group the works by categories such as operas, string ensembles or violin sonatas solely by acoustic similarities. The "Map of Mozart" thus provides a playful alternative to the Köchel-Verzeichnis.