Seminar

Music Information Retrieval

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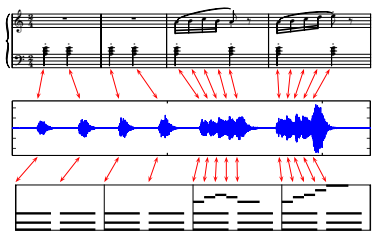

1 Organization

- Winter term 2008/2009, Thu. 16-18, Room 023, Campus E1-4
- First preparatory meeting: Thu. 24.07.2008, 16-18
- Second preparatory meeting: Thu. 23.10.2008, 16-18
- First seminar talk: Thu. 30.10.2008
- http://www.mpi-inf.mpg.de/departments/d4/teaching/ws2008-2009/mir_mm/index.html
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2 Content

In this seminar, we discuss a number of current research problems in the field of music information retrieval (MIR).

3 Course Prerequisite

The seminar particularly (but not exclusively) addresses the participants of the course *Information Retrieval for Music and Motion*[1]. Requirements are a solid mathematical background, a good understanding of fundamentals in digital signal processing, as well as a general background and personal interest in music. The seminar is accompanied by readings from textbooks or the research literature. Furthermore, the students are required to experiment with MATLAB.

[1] http://www.mpi-inf.mpg.de/departments/d4/teaching/sose2008/ir_mm/index.html

4 Topics

4.1 Performance Analysis

Expressive music performance is the art of shaping a musical piece by continuously varying tempo, dynamics, and articulation. Musicians give the piece of music a personal touch while, e. g., speeding up at some places, slowing down at others, or stressing certain notes instead of playing mechanically. In this regard *Performance Analysis* deals with questions like: Are there commonalities between different performers which lead to fundamental principles of music performance and allow us to find general rules? On the other hand, can one characterize formally what is special about the style of a particular pianist – can we find, e. g., a "Horowitz factor"? In order to build interpretable quantitative models of certain aspects of performance, methods from the areas of machine learning, data mining and pattern recognition are applied.

Literature: [7, 8, 10, 11, 14, 15, 16, 17, 18, 19]

4.2 Music Segmentation

Content-based processing, classification, retrieval, and indexing of music is a difficult undertaking because of the complexity and abundance of information given for a single piece of music. The goal of *music segmentation* is to cut the whole piece into smaller sections, like *intro-chorus-verse-outro* or similar segments, each with some homogeneous properties with regard to the musical content. Segment boundaries are defined by some variation of sound types that can be modelled using timbral and rhythmic features of the signal adapted to the human perception of music ("The way it sounds" [1]). Besides methods from digital signal processing, we will encounter various machine learning and pattern recognition techniques including clustering methods and Hidden Markov Models used for segment classification and boundary detection.

Literature: [1, 4, 6, 9]

4.3 Music Structure Analysis

One subtask of music segmentation is referred to as *music structure analysis*. Here, the goal is to automatically extract the repetitive structure or, more generally, the musical form of the underlying piece of music. Automated structure analysis becomes a challenging task when repeating parts reveal significant variations in dynamics, timbre, articulation, instrumentation and tempo. In this seminar block, we discuss various approaches to music structure analysis based on self-similarity matrices. Furthermore, we investigate how these approaches may be combined with segmentation strategies.

Literature: [2, 3, 5, 12, 13]

5 Course Requirement

- Reading assignments
- MATLAB experiments
- Meetings with tutors
- Seminar Talk (maximal 45 minutes, using PowerPoint template)
- Summary (2 pages, using LaTeX template)
- Participation in seminar

6 Evaluation Criteria

- Content of presentation
- Style of presentation
- Quality of summary
- Degree of participation in seminar
- Impression by tutor and fellow students

References

[1] J.-J. Aucouturier, F. Pachet, and M. Sandler. The way it sounds : Timbre models for analysis and retrieval of polyphonic music signals. *IEEE Transactions of Multimedia*, 7(6):1028–1035, December 2005.

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[19] Y.-H. Yang, Y.-C. Lin, Y.-F. Su, and H. H. Chen. A regression approach to music emotion recognition. *IEEE Transactions on Audio, Speech & Language Processing*, 16(2):448–457, 2008.