

**The Second International Symposium on Computer Music Modeling and Retrieval  
(CMMR 2004)  
May 26--29, 2004.  
Aalborg University Esbjerg,  
Esbjerg, Denmark.**

Reviewed by  
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7 June 2004

## **Introduction**

The Second International Symposium on Computer Music Modeling and Retrieval (CMMR 2004) was held at Aalborg University Esbjerg on the South West coast of Denmark on May 26 - 29, 2004. The goal of this symposium series is to provide an opportunity to meet and interact with peers concerned with the cross-influence of the technological and creative in computer music. The interdisciplinary nature of the field was reflected in the organisation of the conference into session topics in areas such as the synthesis of instrument timbres, music analysis, music information retrieval and computer music composition. This diversity was also reflected in the opening and closing keynote speeches given, respectively, by Cort Lippe (State University of New York at Buffalo), who spoke about tools for real-time interaction of traditional and computer instrumentalists; and Marc Leman, who summarised some of the research carried out at the Institute for Psychoacoustics and Electronic Music at the University of Ghent in Belgium. Over three days, 25 paper presentations were made and the limit of 20 pages meant that the papers in the conference proceedings (to be published in the Springer Lecture Notes in Computer Science series) were generally reasonably complete in their presentation of background and discussion of results. To complement the technical presentations in the conference sessions, CMMR 2004 also included a panel session on computer music composition and three concerts of computer music.

## **Music Information Retrieval**

One recurring issue which arose during the conference was how to define a ground truth for the evaluation of proposed measures of perceived musical features. Many of the presentations at CMMR 2004 concerned the development of systems and techniques for Music Information Retrieval (MIR) and in this context, Stephan Baumann from the German Research Centre for Artificial Intelligence illustrated one method of obtaining a ground truth. The presentation concerned a system for musical artist recommendation based on clustering using Self-Organising Maps of artist reviews obtained from the Amazon web site. The improved quality of recommendations using a modified scheme for weighting terms extracted from the reviews was demonstrated by comparing matches between the recommendations of the presented system with those of another system based on user playlists.

## **Music Analysis**

Another topic represented at the conference was music analysis where the ground truth is often indicated in the score. For example, Elaine Chew from the University of Southern California presented work on separating voices in symbolic representations of polyphonic music. The approach described depends on assumptions derived from the perceptual principles for voice leading of David Huron. First, a piece is segmented into "contigs" at boundary points where the number of voices changes. In a second stage, starting from contigs with the maximal number of voices present, fragments in adjacent contigs are ordered by pitch height and reconnected according to pitch proximity. The implemented algorithm was tested on contrapuntal music composed by J. S. Bach yielding promising results.

Other presentations were concerned with the analysis of performances rather than compositions. Maarten Grachten from Pompeu Fabra University in Barcelona, for example, gave an interesting presentation on the

automatic annotation of live jazz saxophone performances using edit operations such as insertion, deletion, consolidation, fragmentation and transformation according to a cost function parameterised to control the influence of pitch, duration and onset and each of the edit operations. An evolutionary approach was adopted to optimising the parameter values for test sets of hand annotated performances. While the solutions significantly improved the annotation performance over random parameter settings, the solutions obtained did not converge to a single optimum across disjoint test sets.

## **Sound Synthesis and Timbre**

As well as research concerning symbolic representations of music, many of the presentations at CMMR 2004 were concerned with the processing and manipulation of digital audio. One strand of this research concerned sound synthesis and the modeling of instrument timbre. Julien Bensa from the Université Pierre et Marie Curie in Paris, for example, presented a cognitive approach to modeling piano timbre. The goal of this research was to associate objective parameters of acoustic synthesis models of piano timbre with subjective experiential descriptions obtained in a free association task carried out with pianists. In another presentation, Philippe Guillemain from the CNRS Laboratoire de Mécanique et d'Acoustique in Marseille analysed the relationship between two control parameters of a physical model of the clarinet (blowing pressure and reed aperture) and four objective timbre descriptors of the generated audio signal. Both of these presentations were concerned with the association of intuitively meaningful domains (e.g., natural language descriptions of sound and physical properties of instruments) with low level audio descriptors. In his keynote speech, Marc Leman also discussed the problem of associating subjectively perceived musical qualities with objective acoustic descriptors of audio signals in the context of MIR.

## **Audio-to-Score Transcription and Feature Extraction**

One topic represented strongly at CMMR 2004 was audio-to-score transcription and, in particular, the extraction of features for MIR. Indeed, about a third of the papers presented were concerned in one way or another with the extraction of perceived structure from musical audio signals. Rui Paiva from the University of Coimbra presented a method for extracting the melody from a polyphonic musical audio signal based on a model of the cochlea. Meinard Müller described a system developed at the University of Bonn which automatically synchronises a score or MIDI file of a work with an audio file. The system worked by matching the "ground truth" MIDI file with another MIDI file extracted from the waveform data using novelty curves for note onset detection and multirate filter banks in combination with note templates for pitch extraction. Kristoffer Jensen from the University of Copenhagen also used a novelty measure, in this case extracted from a self-similarity matrix calculated from a beat histogram ("rhythmogram"), to automatically identify segment boundaries in rock and techno music.

## **A Dichotomy between "Composers" and "Scientists"**

Another theme of the conference was the perceived cultural and methodological dichotomy between "composers" and "scientists". The "composers" seemed to be far more sensitive to this dichotomy than the "scientists". One of the 90 minute sessions was devoted to an open panel discussion of this issue, chaired by the composer Lars Graugaard (Aalborg University Esbjerg). Cort Lippe opened the discussion by proposing that today's electro-acoustic composer is a parasite who derives his techniques from the results of research in fields such as signal processing. Harvey Thornburg from the CCRMA at Stanford University responded to this by claiming that he had on several occasions been motivated by the creative needs of composers to develop new signal processing techniques. Two of the panelists, Juraj Kojs (a composer from the University of Virginia) and Stefania Serafin (a researcher in physical modeling at Aalborg University Esbjerg), insisted that their collaborative relationship was definitely symbiotic rather than parasitic.

David Meredith (City University, London) then asked the panel whether they ever found that their creativity was paralysed rather than enhanced by the almost limitless power of the computer-based tools available to them which essentially afforded an infinite template of possibilities. Leonello Tarabella (CNR, Pisa) suggested that someone who is bewildered by the technology should probably not be engaged in computer-based composition! Lars Graugaard explained that he avoided this problem by always being motivated in his compositions by an initial idea of the sound structure that he desired which he would then attempt to realise using technology.

## Conclusions

The conference attendance was relatively small consisting of not many more than the sum total of the conference organisers and those presenting or performing. This prompts one to ask whether there is a need for another conference on computational modeling of music. Conferences such as DAFX cover the signal processing end of the research field, ISMIR covers engineering approaches and practical applications such as MIR, ICMC covers computer music, ICMPC covers cognitive modeling of music and ICMAI covers the abstract modeling of music. Perhaps the only criticism of CMMR 2004 in terms of its scope is that it tended strongly towards the practical rather than the theoretical end of the spectrum. However, possibly because of its small size, the atmosphere at CMMR 2004 was particularly relaxed and friendly and the interdisciplinary research presented prompted interesting discussion from a range of different viewpoints. If the bias towards practical applications could be redressed by the inclusion of more theoretical modeling and cognitive scientific research, CMMR would fill a niche as an intimate forum for the presentation of interdisciplinary research in modeling music.