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CHARM symposium 4:
Methods for analysing recordings - Reflections on a symposium
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The 4th CHARM symposium was held at Royal Holloway in Egham from 12-14 April 2007, and focused on methods for analysing recordings. The symposium provided valuable insight into ongoing developments with analytical methods and their applications, but also highlighted numerous issues that still need to be confronted. For instance, the choice and suitability of a method, how to analyse data extracted from recordings, and how to interpret and evaluate findings are questions facing researchers across the entire spectrum of expertise. In addition, the broader implications of interdisciplinary cross-over beg further consideration, such as how profitably to exchange methodologies between different research domains.

On the computational front there were papers covering data extraction techniques, automatic analysis, tools with animated graphics and the use of Artificial Intelligence for performance analysis. Contributions from the musicological community were more concerned with the application of different methods for addressing research questions, and presentation topics ranged from comparative performance analysis to the transcription of Indian music and analysing popular genres. Of course, the dividing line between musicological and non-musicological interests, although often captured in witty punch-lines or reflected in terminological rifts, did not hinder interdisciplinary communication, and if temperatures rose in the room that was due more to the hot weather outside than heated temperaments inside!

Data extraction techniques and modelling expressive performance information

Timing information is a valuable tool in the study of expressive features in musical performance. Simon Dixon (*Queen Mary, University of London*) described two programs, BeatRoot and MATCH, for extracting timing data. The first is a beat tracking device while the second aligns related audio files (e.g. different performances of the same work) with one another. Both of these tools can be used for performance style recognition and have their distinct strengths - for example BeatRoot can work well with syncopation while MATCH can cope with extreme tempo variations.

Another means of extracting timing data was presented by Craig Sapp (*CHARM, Royal Holloway, University of London*). His approach uses a tapping method to obtain beat-level data which can be subsequently correlated at various timescales of the performance, from single beat and phrase level to the entire work. The method, which has been applied to comparative performance analysis of Chopin's Mazurkas, can be used to discern patterns of similarity and types of relationship between different performances.

Andrew Earis (*Royal College of Music, London*) presented a multi-stage, semi-automated process for the extraction of expressive performance information from acoustic recordings of piano music. The method relies on the use of a digitised version

of the score which is synchronised with the recording in order to locate and extract data points in time and frequency.

Expressive performance data, such as tempo and dynamics, extracted from audio recordings, are customarily displayed in static graphical representations. However, these performance parameters can be more profitably harnessed through computational methods that reflect the changes over time. Werner Goebel (*McGill University, Montréal*) presented an animated graphics tool which captures expressive performance information in an aural/visual display. This technique, better known as the 'performance worm', provides a perceptually grounded response to expression during performance, and can be used to elucidate performers' intrinsic characteristics. In fact, the 'performance worm' seemed to gather an increasing amount of interest and excitement from delegates. Be it for its visual eloquence or captivating choreography it caused quite a stir with its leading-role performance! Notwithstanding its allure, this technique raised more important issues relating to the correspondence between visual representation and the nature of the perceptual response to music.

Automatic analysis and future prospects

The automatic analysis of recorded collections promises to enhance and transform musicological research. Recent developments in the OMRAS2 project, presented here by Michael Casey and Tim Crawford (*Goldsmiths College, University of London*), seem to provide a major step in this direction. The project is aimed at integrating various methods and resources for music information retrieval on large collections of digital music, both audio and score. One example of this large-scale potential was demonstrated by the automatic detection of ornaments in performance and how it can lead to the classification of performance styles. Another potential application of OMRAS2 was demonstrated by the automatic identification of repeated structures in performed music – a tool closely associated with the CHARM Mazurkas project where the occurrence of variable repeated structures in recorded performances of the mazurkas has been a confounding factor in beat-level comparative performance analysis.

Nicolas Gold (*King's College, London*) and Neta Spiro (*CHARM, Royal Holloway, University of London*) presented a computational approach to tracing motives in performance. A pattern-matching algorithm, based on principles from Lattice Theory, is used for the automatic identification of similar repeated temporal patterns in performance. The model's capacity in accurately locating motives was demonstrated using Chopin's Etude Op. 10 No. 3, and there is scope to utilise this tool for mapping out different performers' style signatures.

Searching for performance signatures on a large-scale, Gerhard Widmer (*Johannes Kepler University, Linz*) discussed the unrivalled potential of Artificial Intelligence and Machine Learning for performance analysis. Projects based on data-intensive, bottom-up approaches were described for the identification of expression rules in performance and characterising performance styles. The presentation did stress, however, the semantic gaps that still exist between automated processes and the reality of musical performance.

Listen closely!

Automated computational tools, whilst invaluable in particular research settings, need not comprise the only means of extracting meaningful information from musical

recordings. The immense value of close listening and aural observation were frequently highlighted throughout the symposium. Using such an approach, Daniel Barolsky (*Lawrence University, Wisconsin*) focused on a unique interpretation of Beethoven's *Waldstein* Sonata from an early recording by the pianist Josef Hofmann. The presentation addressed the implications of this rare document for our understanding of the performer's individuality within the reception history of Beethoven.

Daniel Leech-Wilkinson (*CHARM, King's College, London*), who also stressed the importance of close listening, presented findings from comparative analyses of Schubert's song 'Die junge Nonne'. Using spectrographic techniques to hone in on micro-level details of singers' vocal inflections, Leech-Wilkinson considered how differences in the expressive devices employed by singers in performance lead to contrasting interpretations of the song's text.

Early recordings: unleashing their potential

Early recordings offer a rare glimpse of bygone eras, reflecting changes in performance trends and shifts in aesthetic judgement. Dorottya Fabian (*University of New South Wales, Sydney*) explored stylistic differences in vibrato and portamento from early violin recordings of Chopin's Nocturne in E flat Op. 9 No. 2. Her discussion aimed at illuminating the value of contrasting methodologies for addressing stylistic aspects of early twentieth-century violin performance practice.

Colin Gough (*University of Birmingham*) also focused on violin vibrato, but from a physicist's perspective. His presentation explored the relationship between acoustical analysis of vibrato and the perceptual signal. By examining the difference between frequency and amplitude modulations, it was demonstrated how the perceived changes in the incoming stimulus influence vibrato recognition. Gough also presented findings from a comparative study of recordings in which the idiosyncratic features of different performers' styles were demonstrated in terms of the perceived quality of their vibrato.

Per Dahl (*University of Stavanger*) discussed changes in twentieth-century performance trends of Grieg's song 'Jeg elsker Dig' Op. 5 No. 3. His statistical analyses indicated a decline in singers' tempo deviations across the century, and findings were further considered in light of the impact of recording technology on levelling-out performance variability.

Following up analyses

An often overlooked aspect arising from analytical investigations is the relationship between the representation of findings and the experiential involvement of the person(s) following these. Nicolas Donin (*IRCAM, Paris*) emphasised the practical need for an applied phenomenology of the analyst's activities in order to facilitate and encourage a broader understanding of the study of music as performance - something especially apt in view of the wide range of automated methods in this field. Donin presented examples from a new multimedia tool-kit developed for this purpose, which creates an interactive aural/visual (albeit somewhat 'graphocentric') environment for following up analyses.

Ethnomusicology and musical recordings

Concerning the use and analysis of recordings in ethnomusicological research, two speakers presented contrasting approaches to the transcription of Indian music. Wim van de Meer (*University of Amsterdam*) discussed a computer-assisted method based

on a frequency model, for refining pitch-line representation of classical Indian music. These melographic transcriptions raised the issue of correspondence between the visual representation and the actual tracking of pitch, especially in fast melodic movements such as vibrato, and highlighted the perceptual gap that often exists between graphic analogues of sound and the aural experience.

Nicolas Magriel (*School of Oriental and African Studies, London*) presented a different approach for transcribing recordings of North Indian *Khyāl* based on his own listening and understanding of this music. Through microscopic listening at various playback speeds and using a symbolic system of representation, his transcriptions capture a whole new vocabulary of intertonal nuances. The vocal intricacies of these nuances were demonstrated by the speaker himself – a refreshing interlude of lively performed, albeit short, music in the symposium!

On the use of recordings in ethnographic approaches, Martin Clayton (*Open University*) demonstrated how video data can provide a more holistic understanding of sound/gesture interactions in the performance environment. Clayton's presentation raised issues about the perceptual salience of gestural metaphors, such as the relationship between performers' conceptualisation of the music and listeners' responses, and how physical gesture can constitute a form of analysis of musical structure, for example in terms of gesture phrasing underlying segmentation.

The popular front

On popular music, Serge Lacasse (*Laval University*) proposed a method for approaching the analysis of popular song recordings from a narratological perspective which takes into account the music's phonographic nature. Using Eminem's 'Stan' as a case study, his analytical model looked at the interaction between the diegetic and supradiegetic dimensions as created by the different sound layers of the recording, the discussion extending to concepts of time, space and mood in popular song.

Using popular music examples, Simon Zagorski-Thomas (*Thames Valley University*) discussed issues concerning the use and analysis of multi-track master recordings. These provide valuable insight into the creative aspects of record production by illuminating the relationship between the final musical product and various stages in the production process. Given their limited availability, however, Zagorski-Thomas demonstrated how remixes and surround tracks can also be used instead to study musical phenomena, such as microtiming and instrument blending, in the musicology of record production.

On a final note

General comments and thoughts from the symposium reflected on the value of analytical tools in context, the meaning and representation of performance data from recordings, and the discrepancy that persists between micro-level analyses and the larger-scale musical conception. Interest was also voiced for more research into timbre, an area of musical sound that is indeed under-explored. The symposium also raised the all-important issue of keeping up interdisciplinary communication and there was a consensus for an on-line interactive research forum: it is hoped that this will be provided by the OMRAS2 project website (<http://www.omras2.com>) and/or CHARM. Finally, a big thank you goes out to all speakers, participants and the organisers of course for making this symposium a successful event.