FOLK MUSIC ANALYSIS/AAWM SPECIAL TOPICS
SYMPOSIUM 2019, BIRMINGHAM
COMPUTATIONAL APPROACHES TO WORLD MUSIC ANALYSIS

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LOCAL ORGANISING COMMITTEE
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A – Royal Birmingham Conservatoire

Venue for:

Conference registration on first morning – open from 09:00 in Conservatoire Café (Ground Floor). Welcome and official opening at 10:00.

Concerts held in Conservatoire Jazz Club (Ground floor).

B – Millennium Point

Venue for:

Conference presentations – Room MP388 (3rd floor balcony, can be accessed directly from foyer via lift/escalators).

Lunch – Refectory is on 3rd floor, access through 2nd floor security barrier.

C – Woodman Pub, venue for Tuesday evening from 19:30
Programme: Tuesday, July 2nd

09:00 – 10:00 : Registration – Royal Birmingham Conservatoire - Café

10:00 – 10:30 : Welcome, RBC Folk Ensemble Concert – Royal Birmingham Conservatoire – Recital Hall

10:30 – 12:00 : AAWM Paper Session 1 – Millennium Point – MP388

• 10:30-11:15 - Eli Marshall (Cornell University), "What Can We Learn from Theoretical Phonetics? Segmentation of Musical Sound as a Basis for Analysis of Blues Vocalists"
• 11:15-12:00 - Babak Nikzat (University of Music and Performing Arts Graz), "Elastic scales or elastic hearing? The significance of ethnographic fieldwork in understanding the emic perception of musical pitch: A case study on south Iranian bagpipe music"

12:00 - 13:00 : Lunch – Millennium Point Refectory – Floor 3

13:00 – 16:00 pm : FMA Paper Session 1 – Millennium Point – MP388

• 13:00-13:30 - Anders Erik Røine (University of South-East Norway) - Phrasing Practices in Norwegian Slåtte Music - Preliminary results and methodological considerations
• 13:30-14:00 - Frank Scherbaum (University of Potsdam), Nana Mzhavanadze (University of Potsdam), Sebastian Rosenzweig (University of Erlangen) and Meinard Mueller (University of Erlangen) - Multi-media recordings of traditional Georgian vocal music for computational analysis
• 14:00-14:30 Geert Maessen (Gregoriana Amsterdam) - Aspects of melody generation for the lost chant of the Mozarabic Rite
• 14:30-15:00 - Sauhaarda Chowdhuri (Resoniq Research) - PhonoViz: Chroma Feature Visualization for Hindustani Classical Music
• 15:00-15:30 - Robertas Budrys and Rytis Ambrazevičius (Kaunas University of Technology, Lithuania) - On the singer’s formant in Lithuanian traditional singing
• 15:30-16:00 - Mats Johansson (University of South-Eastern Norway) - Timing-sound interactions in traditional Scandinavian fiddle music: Preliminary findings and implications

16:30 - 18.00 : AAWM Paper Session 2 – Millennium Point – MP388
• 16:30-17:15 - Jay Rahn (York University), "Reformulating Traditional Burmese Tunings"

• 17:15-18:00 - Michael Clarke (University of Huddersfield), Jonathan Stock (University College Cork). Cristina Ghirardini (University of Huddersfield), and Laurens Van Der Wee (University of Huddersfield), "IRiMaS: An interactive aural approach to analysing world music "

18:00 - 19.00 : Keynote – Bryan Duggan (Dublin Institute of Technology - DIT) – Millennium Point – MP388

Bryan will be detailing the development of Tunepal, a query-by-playing search engine for traditional melodies used by over 30,000 musicians around the world.

19:30 Onwards : Traditional tune session – Upstairs at The Woodman Pub

• Address: New Canal St, Birmingham B5 5LG
• Phone: 0121 643 4960
• Directions: Exit Millennium point form the ground floor exit (opposite end from the Conservatoire), follow the path to the right and the Woodman is around 100m from Millennium Point.
• If you play traditional or folk music, you are most welcome to join in so please bring an instrument. There will be a few players of English and Irish tunes but anything goes and it would be nice to hear music from other traditions!
Programme: Wednesday, July 3rd

10:30 – 12:00: FMA Paper Session 2 – Millennium Point – MP388

- 10:30-11:00 - Rytis Ambrazevičius (Kaunas University of Technology, Lithuania) - Modelling of local tempo change with applications to Lithuanian traditional singing
- 11:00-11:30 - Per Åsmund Omholt (University of South-Eastern Norway) - Painting blue – on measuring intonation in Hardanger fiddle tunes
- 11:30-12:00 - Geert Maessen (Gregoriana Amsterdam) - Toledo, Rome and the origins of Gregorian chant - An alternative hypothesis

12:00 - 13.00: Concert – Greg Russell and Ciaran Algar – Conservatoire Jazz Club – Royal Birmingham Conservatoire

13:00 - 13.30: Lunch – Millennium Point Refectory – Floor 3


- 13:30-14:15 - Kendra Stepputat (University of Music and Performing Arts Graz) and Christopher S. Dick (University of Music and Performing Arts Graz), "The importance of 'the beat' for tango dancers: Using motion capture to access culturally embedded and embodied knowledge"
- 14:15-15:00 - David Kirkland Garner (University of South Carolina School of Music), "Tempo, Drive & Identity in Cape Breton Traditional Fiddle Music"
- 15:00-15:45 - Rainer Polak (Max Planck Institute for Empirical Aesthetics), "What data to compute? The role of corpus construction: Three examples from Mali"

16:00 – 17:00: FMA Paper Session 3– Millennium Point – MP388

- 16:00-16:30 - Polina Proutskova (Queen Mary, University of London) - Towards singing perception universals
- 16:30-17:00 - Pierre Beauguite and Hung-Chuan Huang (Technological University Dublin) - Content-based music retrieval of Irish traditional music via a virtual tin whistle

18:00 - 19.00 (Doors open 17:45): Concert – Urban Folk Quartet – Conservatoire Jazz Club – Royal Birmingham Conservatoire
19:30 – Banquet Meal – The Karczma (www.karczma.co.uk)

- Classic Polish food
- Address: Polish Millennium, Bordesley St, Birmingham B5 5PH
- Phone: 0121 448 0017
- If you have not booked and pre-paid for this you can contact the restaurant directly.
Programme: Thursday, July 4th

09:00 – 12:00: AAWM Paper Session 4 – Millennium Point – MP388

- 09:00-09:45 - Rafael Caro Repetto (Music Technology Group, Universitat Pompeu Fabra, Barcelona) and Xavier Serra (Music Technology Group, Universitat Pompeu Fabra, Barcelona), "Seeing for better listening: Computational tools for enhancing music understanding"
- 09:45-10.30 - Martín Rocamora (Universidad de la República, Uruguay) and Luis Jure (Universidad de la República, Uruguay), "carat: A toolbox for computer-assisted rhythm analysis"
- 10.30-11.15 - Panos Mavromatis (New York University), "Toward Cognitive Models of Improvisation: Perspectives from Computational Corpus Analysis"
- 11.15-12.00 - André Holzapfel (KTH Royal Institute of Technology), "Towards the analysis of long participatory music performances"

12:00 - 13.00: Concert – Will Pound – Conservatoire Jazz Club – Royal Birmingham Conservatoire

13:00 - 13.30: Lunch – Millennium Point Refectory – Floor 3

13:30 – 15:30 pm: FMA Paper Session 4– Millennium Point – MP388

- 13:30-14:00 - Cornelia Metzig (Queen Mary University, London), Roshani Abbey (Royal Academy of Music, London), Mark Sandler (Queen Mary University, London), and Caroline Colin (Simon Fraser University, Canada) - Country classification with feature selection and network construction for folk tunes
- 14:00-14:30 - Nana Mzhavanadze (University of Potsdam) and Madona Chamgeliani (Lidbashi Foundation) - Analysis of mutual influence of music and text in Svan songs
- 14:30-15:00 - Shoichiro Sato (Keio University, Japan), Joren Six (Ghent University, Belgium), Peter Pfordresher (University at Buffalo, NY, USA), Shinya Fujii (Keio University, Japan) and Patrick Savage (Keio University, Japan) - Automatic comparison of global children’s and adult songs
- 15:00-15:30 - Jiei Kuroyanagi (Keio University, Japan), Shoichiro Sato (Keio University, Japan), Meng-Jou Ho (Keio University, Japan), Gakuto Chiba (Keio University, Japan), Joren Six (Ghent University, Belgium), Peter Pfordresher (University at Buffalo, NY), Adam Tierney (Birbeck, University of London), Shinya Fujii (Keio University, Japan) and Patrick Savage (Keio University, Japan) - Automatic comparison of human music, speech, and bird song suggests uniqueness of human scales
15:45 – 17:15: Panel Discussion – Millennium Point – MP388

- Rainer Polak, André Holzapfel, Panos Mavromatis, Sarah Weiss, and Luis Jure

20:00 Onwards: The Spotted Dog, Digbeth, Birmingham

- A place to meet up and relax after the conference!
- Address: 104 Warwick St, Birmingham B12 0NH
- Phone: 0121 772 3822
- Please note if you would like to walk there from the conservatoire, we will be leaving the Conservatoire café at 19:30.
"What Can We Learn from Theoretical Phonetics? Segmentation of Musical Sound as a Basis for Analysis of Blues Vocalists"

Eli Marshall (Cornell University, USA)

Abstract

The phonetics approach toward measurement of syllable-length segments may offer benefits to digital music analysis. Where the latter often depends on simple onset/offset times or single parameters such as pitch deviation to define a segment, the former may involve many factors of emphasis (e.g. amplitude, pitch contour, timbral change) in order to determine which moment(s) of a syllable should be measured.

This paper attempts to apply the phonetics method to vocal melody excerpts, creating sub-segments of the linguistic data as a phoneticist might, then measuring their musical values – in this case, pitch.

By way of demonstration, I employ this method as a means to an end; the end is to address a research topic discussed in recent computational studies: the nature and distribution of microtonality in blues-influenced vocals. The means is to derive discrete microtonal measurements from a continuous and changing vocal fabric. The method is the phonetic technique described above.

I suggest that the accuracy of measuring blues tuning is potentially improved through this approach, as it targets key moments of goal emphasis in the vocal-melodic texture, reflecting perception; based on these findings, I argue for a nuanced understanding of tonality based on ratios and tolerance.

Generalizing the method above may present interesting problems, including abstraction to non-vocal music and questions on musical cognition and phonology. At a minimum, I suggest that the phonetics approach to segmentation, when possible to be implemented, enables contextual accuracy and refines, rather than replaces, sound analysis tools such as Praat and Tony, supporting a human-driven computational approach.
“Elastic scales or elastic hearing? The significance of ethnographic fieldwork in understanding the emic perception of musical pitch: A case study on south Iranian bagpipe music”

Babak Nikzat (University of Music and Performing Arts Graz)

Abstract

Introduction: This paper presents an ethnomusicological study of the neyhambune (bagpipe) music called bandari, a festive genre in southern Iran. I employ both technical analysis and ethnographic fieldwork data to understand the local conceptions of intonation. The neyhambune’s pitch range consists of seven basic tones (less than an octave), whereupon each tone can be altered through changing the air pressure or fingering. Most songs of the traditional repertoire can be played within this range, but there are some songs that employ a wider range or contain some parts with a different tuning. Almost all vocal repertoire is accompanied by neyhambune. This is true despite the fact that instrumental interpretations of specific vocal melodies can be noticeably varied in their intervallic structures. There is no standard tuning established for neyhambune, both tones and scales are variable.

Analysis: To examine the intonation which is used in practice, I abstract the scales of many different bagpipes from recorded songs. A comparison of scales played on different bagpipes by the same players demonstrates the flexibility of intervals both on the instruments themselves and as performed. The musicians often play the same songs on different instruments. Although it is abundantly clear to an outsider, the diversity of intervallic structures is rarely mentioned by local musicians, they only comment about intervallic differences in cases of extreme variance.

I asked well-respected singers to sing the same songs. The vocal versions of these traditional songs are almost identical even when the accompaniment was played on a bagpipe with significant tuning variance. The main question of this study is whether the variability of bagpipe’s intonation is an aesthetical characteristic for this genre—suggesting elastic scales—or is an insignificant feature, which could be accepted by local listeners because of their flexibility in perception of intervals—suggesting elastic hearing. To determine an answer to this question, I applied three strategies for data collection: I asked neyhambune players to sing the melodies that they already played on their instruments. Using these recordings I made a comparative analysis to show the intervallic differences between what they played (sounded intonation) and what they sing (notional intonation). I also conducted ethnographic research in recording studios during the editing process for some bandari albums in order to observe musicians’ aesthetic criteria for intonation. I
observed them manipulating the intervallic structure of neyhambune tracks so they were more similar to the vocal versions. Observing the verbal communication between neyhambune players and instrument makers while ordering a new instrument, especially the importance performers placed on the capability of the instrument to play certain songs was an additional source of information concerning the preferred vocal scale by producing an ideal neyhambune.

Three interpretations of “Ǧumene Weyle Čāpi”, neyhambune players:
Nozar Saādatpur (top), Bahrām Mehrbaḥš (middle) and Ali Riāzi (bottom). The vertical axis shows the pitch in semitones (each unit is 100 cents), and the zero line signifies the lowest pitch of a neyhambune. I transposed all three versions so that the lowest pitch of each curve is shown on the zero line to make it easier to compare the intervals.

Conclusions: The flexibility of intervallic structures of scales is a common phenomenon in many musical cultures. However, we need to consider whether this flexibility, from an emic perspective, is a deliberate distinction with specific musical meaning (elastic scales) or an insignificant parameter, which is tolerable for local listeners (elastic hearing). This distinction has not been dealt with sufficiently in ethnomusicological research. My observations and analysis show that the tuning variability of the neyhambune is not an intentional aesthetical characteristic of this musical genre, but rather an unintentional feature, which can be tolerated by local listeners because of their capability of elastic hearing. This research is intended to demonstrate how technical analysis and ethnographic fieldwork can work together as complementary methods for understanding the musical perceptions and aesthetics of particular groups of people.
Introduction
This paper presents some findings from a broader investigation that aims at a comprehensive mapping of phrasing practices in the older layer of Norwegian traditional music referred to as slåtter (literally “tunes”). It also proposes a method for the visualization and subsequent comparison of different styles of phrasing. Phrasing, in this context, refers to how musicians use different tools and techniques to combine individual notes into rhythmic patterns. The sounding result of this practice is a significant stylistic feature of traditional tunes. At the same time, phrasing is largely an area of tacit knowledge among traditional musicians, meaning that no explicit vocabulary is developed for its description and dissemination.
MULTI-MEDIA RECORDINGS OF TRADITIONAL GEORGIAN VOCAL MUSIC FOR COMPUTATIONAL ANALYSIS

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Abstract

Traditional multipart-singing is an essential component of the national identity of Georgia. It has been an active field of ethnomusicological research since more than 100 years, with a whole of thematically very diverse research questions. Here, we report on the generation of a new research corpus of traditional Georgian vocal music collected during a three-month field expedition in 2016. It employs new and partially unconventional field recording techniques and is intended particularly for the application of modern computational analysis methods. To circumvent the source separation problem for multiple singing voices in field expeditions, we used larynx microphones to record skin vibrations close to the larynx (additionally to using conventional audio and video equipment). The resulting multi-media recordings comprise audio and video material for more than two hundred performances, including more than fourteen hundred audio tracks based on different types of microphones (headset, larynx, ambient, directional), video tracks, as well as written documents of interviews with the performers. We demonstrate that the systematic use of larynx microphones, which to our knowledge has never been used before on a larger scale in ethnomusicological field expeditions, opens up new avenues for subsequent computational analysis regarding a multitude of aspects including pitch tracking, harmonic and melodic analysis, as well as for documentation and archiving purposes.
ASPECTS OF MELODY GENERATION FOR THE LOST CHANT OF THE MOZARABIC RITE

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Introduction

In medieval Europe several textually and musically related monophonic liturgical chant traditions existed. Most famous is the Franco-Roman chant of the Roman rite, better known as Gregorian chant. Most other rites and traditions were abolished at some point in favor of the Roman rite and its chant (Hiley, 1993).

The Mozarabic rite existed from the end of the sixth till the end of the eleventh centuries on the Iberian peninsula. Its music (over 5000 chants) is preserved in pitch-unreadable neumatic notation. Figure 1 gives an example. The tradition was abolished in the time when pitch readable notation came in use. Therefore the intervals of most melodies are unknown. Only a handful of chants was ever found in pitch readable notation (Randel, 2001). We have presented two computational methods of melody generation for the lost chant of the Mozarabic rite (Maessen & Conklin, 2018). To improve this generation we examined melodic aspects to be included, experimentally and in the literature (Gregoriana Amsterdam; Hiley, 1993; Troelsgård, 2014). Some aspects appear hard to quantify, for example, the meaning of the chant texts in relation to the liturgical calendar in which all chants have their specific places. Also problematic is the recent articulation of musemes that underline specific text passages (Lousberg, 2018). We found ten quantifiable aspects of the lost melodies that can (and should) be implemented in the generation. More aspects may emerge by using a third method, based on deep learning and neural networks.
**PhonoViz: Chroma Feature Visualization for Hindustani Classical Music**  
**Sauhaarda Chowdhuri**  
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**Abstract**
Hindustani Classical music is an improvisational form of music based on melodic frameworks called ragas which are passed down from teacher to student in a fading oral tradition. PhonoViz aims to provide live visualization and feedback for a singer’s treatment of a raga in addition to digital documentation of Hindustani classical music. To accomplish this, a deep convolutional network is trained to predict the raga from approximately two minute chunks of Hindustani classical vocal music. The PhonoViz algorithm provides a method for visualizing the saliency of various melodic phrases as they relate to the network’s prediction. This visualization method when evaluated on a convolutional network for raga prediction demonstrates a 72.8% signal to noise isolation performance according to a new proposed metric and clearly identifies characteristic melodic phrases in validation audio input.
ON THE SINGER’S FORMANT IN LITHUANIAN TRADITIONAL SINGING

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Abstract
While the singer’s formant is in fact obligatory for the unamplified male operatic voice – to be heard in the context of the whole orchestra, the question of this voice quality in other vocal techniques remains open. The present pilot study aims to analyze possible manifestations of the singer’s formant in Lithuanian traditional singing and to review techniques of evaluation of the singer’s formant.

Two examples of traditional singing (recordings of vocal performances) are chosen for the analysis; a male hay making song and a female rye harvesting song. Both examples represent so-called ‘field’ genres performed outdoors and characterized by of resonant and loud voices; thus appearance of the singer’s formant is more likely compared to ‘indoor’ genres. A set of parameters proposed in previous studies and indicating presence of the singer’s formant is applied; singing power ratio (SPR), energy ratio (ER), L3–L1, and level of the singer’s formant (L_{SF}). Although reliability of the parameters is to some extent disputable, the intense spectral bands characteristic for the singer’s formant are detected. The singer’s formant in both examined performances (especially in the female example) is less prominent compared to the case of the male operatic voice.
TIMING-SOUND INTERACTIONS IN TRADITIONAL SCANDINAVIAN FIDDLE MUSIC: PRELIMINARY FINDINGS AND IMPLICATIONS
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Abstract
This paper reports from a study of concepts and practices of microrhythm among skilled performers of traditional Scandinavian fiddle music, particularly the so-called springar tradition which features non-isochronous and variable beats and subdivisions within a triple meter framework. In this context, microrhythm refers to the overall shaping of musical events at the micro level, encompassing both timing (temporal placement and duration) and sound (shape/envelope, timbre and intensity). A particular focus is to explore how these musical features interact and how timing-sound interactions in turn are understood in terms of groove-forming elements. The referred study consisted of semistructured interviews with five expert musicians, focusing on the defining features of a good groove, and how aspects of sound are envisaged to affect aspects of rhythm and timing, and vice versa.
It was found that groove is largely conceptualized in terms of movement and embodiment; that musical features (timing, accentuation, ornamentation, tone production) are seen to interact and overlap, suggesting a multiparametrical and dynamic concept of groove; and that variation in the overall melodic-rhythmic crafting of the tunes is an important groove-forming element. To further highlight some of these findings, the paper also presents an analyzed sample of a springar tune.
Reformulating Burmese Harp Tunings

Jay Rahn (York University, Toronto)

Abstract

Distinctive in shape, size, construction and playing position, the Burmese harp has been traditionally tuned by ear; that is, without the intervention of a monochord or more recent devices, such as electronic tuners. In this regard, it is similar to certain stringed instruments of Antiquity: in Mesopotamia about four millennia ago, Ancient Greece more than 2300 years ago, and Ancient India about 1700 years ago. Also of plausible relevance to Burmese harp tuning are tunings of fixed-frequency instruments in other Southeast Asian traditions, e.g., Central Javanese and Thai classical music. As well, a monograph by Muriel and Robert Williamson remains the most detailed account of Burmese harp tuning. Within a framework of quartertones suggestive of Middle Eastern practices, the Williamsons measured the fundamental frequencies in twelve renditions of four kinds of tuning.

The present report analyzes the Williamsons’ measurements, drawing on parallels with the idioms mentioned above. An analysis based on a dichotomy of small and large steps reveals Myhill’s Property among all twelve renditions and is extended to accommodate larger and smaller variants of the two basic step sizes. Thereupon, an analysis based on harmonic spectra of the tone-pairs in the tunings’ generating intervals reveals a dichotomy of roughness and slow undulation consistent with the variants of the small and large step sizes.
"IRiMaS: An interactive aural approach to analysing world music"

Michael Clarke (University of Huddersfield, UK), Jonathan Stock (University College Cork, Ireland), Cristina Ghirardini (University of Huddersfield), and Laurens Van Der Wee (University of Huddersfield)

Abstract

Computers often prove useful in extracting and analysing data from music (sounds or scores), such data then being presented in printed form in books or articles. However, computers additionally offer analysts and their readers the potential to engage directly with sound. IRiMaS (Interactive Research in Music as Sound), a five-year project funded by the ERC, is developing tools to manipulate and interact with music aurally rather than simply as written data. This builds on earlier projects researching the analysis of electroacoustic music and aims to apply this interactive aural approach to a wide range of world musics, especially those which may fit less naturally with a notationally-based approach, including folk song, improvisation and spectral music.

IRiMaS’ goal is to produce software analyses, with readers engaging directly with musical sound by interacting with it aurally, in which ethnographical materials (e.g. videos) may be combined seamlessly into the software, and where software facilitates interactive exploration of a wide range of research materials in a flexible and open manner.

Unlike our earlier projects, IRiMaS will not only produce completed analytical studies but also a toolbox designed for use by other (non-technical) musicologists to make their own interactive analyses. This presentation will discuss examples of earlier completed studies (e.g. Hildegard Westerkamp’s Beneath the Forest Floor), current analyses in progress (improvised song/poetry from Central Italy and John Cage’s Sonatas and Interludes), and the toolbox under development. The project is in its early stages and we welcome feedback towards its further development and dialogue with those interested in using this approach themselves.
ABSTRACTS: FMA Session 2

MODELLING OF LOCAL TEMPO CHANGE WITH APPLICATIONS TO LITHUANIAN TRADITIONAL SINGING
Rytis Ambrazevičius
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Department of Ethnomusicology, Lithuanian Academy of Music and Theatre, Lithuania
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Abstract
The present study aims to develop techniques of measurement, mathematical modelling, and evaluation of temporal irregularities (first of all, local tempo changes) in vocal performance, and to test the techniques on examples of Lithuanian traditional singing.

Methods of measurements of note durations (IOIs) in vocal performance are reviewed, their problems including the identification of perceptual attack time and adequate precision based on duration JND are discussed. Three folk song recordings are chosen for modelling of temporal irregularities. The performances are more or less tempo giusto so rhythm values are easily identified. Tempo curves of the chosen folk song performances are composed and analyzed: microtiming, in terms of LS/SL divisions of rhythm values, and local tempo changes in longer time spans are evaluated. Three measures of temporal unevenness are introduced; 1) the general unevenness, 2) the note-to-note unevenness, and 3) the unevenness of smoothed local tempo.

The designed model is applied to a set of 40 song recordings (10 songs from each of the 4 Lithuanian main ethnographic regions). The vocal dialects corresponding to the ethnographic regions differ noticeably in timing expressed in terms of microtiming and the three indices. Thus different combinations of the indices are characteristic of different musical dialects. This allows us to conclude that the different parameters of rhythm interpretation in vocal style can serve as more or less reliable markers of a musical dialect.
Painting blue
-on measuring intonation in Hardanger fiddle tunes

Per Åsmund Omholt
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Abstract
This presentation is an attempt to demonstrate, by using a function in the software Melodyne as a polyphonic pitch detection tool, how patterns of variable intonations in Norwegian Hardanger fiddle music can be explored, analyzed and visually presented. The paper is a modest proposal for a reasonably accessible method of measuring and analyzing music, in this case traditional fiddling.
The main source for my research is the Hardanger fiddler Johannes Dahle from Telemark (1890-1980), who is regarded as an excellent performer with an authentic playing style, and who is well-known among other performers and insiders regarding his intonation. Nevertheless, I sense that his manner of tonal “coloring” is perceived as demanding among younger generations.

From the point of view of conventional music theory, the most striking and surprising detail in Dahle’s tonal language is the raising of the expected tonic, often in the upper part of the pitch range. In several tunes in different tunings, a tonic, or better, a tonal center/frame, is established through melody and drone strings working together. In the soundscape, this appears as polyphonic structures, and is presumably recognized as a major triad in most cases. Intonations in the upper range – mainly on the E-string – challenge this basic frame when the fiddler fingers the expected tonic “much too high”: 20, 50 or even 70 cents above the expected pitch (meaning the diatonic step). These intonations are definitely not accidental; rather, they are intended by the performer. Scales of diatonic intervals with octaves as a frame can hardly be described as basic concepts in this music. Non-diatonic intonations seem to be used as a conscious, expressive tool – the performer is “painting in blue”.

TOLEDO, ROME AND THE ORIGINS OF GREGORIAN CHANT - AN ALTERNATIVE HYPOTHESIS
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Introduction
It has long been believed that Gregory the Great (540-604) created Gregorian chant. Since the restoration of this chant in the late nineteenth century, however, the Carolingian propaganda that created this myth has been unmasked. In the 1950’s, the scholarly debate began to focus on the second half of the eighth century as the era of the origin of Gregorian chant. In that period, Roman chant was introduced in Francia, underwent some changes, and was exported throughout Europe as “Gregorian chant”, still preserved in dozens of manuscripts with music notation since ca 900. Simultaneously the chant in Rome itself also changed, and was finally written down in manuscripts since the late eleventh century: this is referred to as “Old Roman chant”. While most scholars agree on this general picture, this paper offers a new hypothesis based on computational evidence. In this hypothesis, the Carolingians deliberately created a new repertory out of Roman texts by setting them to Iberian melodies, thus replacing their own “Gallican” ones, that is, the local melodies of Francia.
"The importance of 'the beat' for tango dancers: Using motion capture to access culturally embedded and embodied knowledge"

Kendra Stepputat (University of Music and Performing Arts Graz) and Christopher S. Dick (University of Music and Performing Arts Graz)

Abstract

Learning to dance tango argentino is a long and challenging endeavor: dancers have to learn basic movement techniques, leading and following principles based on embodied communication, navigation around a room full of other dancing couples, and above all, improvising their movements jointly as a couple – in relation to music. This last part (dancing to music) is, in current translocal tango argentino dance practice (primarily practiced in the Americas, Europe, East- and Southeast Asia), considered to be of most importance, and at the same time, most difficult to achieve. Beginner dancers will often be drilled to “listen to the beat” and place their feet in close relation to it. But once they have mastered that, they will learn that they should not walk on every beat, but instead listen more to the bigger musical structures and interpret them through more advanced tango movement repertoire.

Accordingly, advanced and experienced tango dancers are often complimented on their “musicality” in dancing tango, at the same time, tango music is rated in accordance to its “danceability”. To understand this relationship between tango music and tango dance – and what the beat has to do with it – a choreomusicological approach is needed. The project "Tango-danceability of music in European perspective" (2016-19, Kunstuniversität Graz, http://www.dancetangomusic.com/) has such a focus. In addition to insider knowledge based on years of training and participation in tango culture around the world, in this project we make use of quantitative methods (data acquisition and statistical analysis), as well as music and movement analysis based on optical motion-capture technique.

Optical Motion Capture is a computer-based system designed to capture movement in great detail, not only visually, but mainly by generating large amounts of data. This data can then serve as the basis for many other analytical approaches that offer insight into movement (and in this case, its relation to music) that would be otherwise impossible to gain. In order to find out how experienced tango dancers relate their movements to tango music, we have worked with three translocally influential tango dance teaching couples in a motion capture lab. In separate sessions, we captured tango dance in relation to different musical tracks, and for
comparison to a click track of isochronous beats. Considering the complexity of tango movement repertoire due to its improvisatory nature, we decided to break down the possibilities to a very limited number of motifs, one of which was forward walking. Our research questions concerning the importance of the beat include: How strong or flexible is the relation to the beat? Is precision a feature of a dancer’s “tango musicality”? Is a clear beat important to make a piece of music “tango danceable”? In order to gain insights into the exact relation between tango step and beat, we analyzed how elements of the gait cycle (in particular heel strike) relates to beat time instants in a 4/4 bar typical for tango music. The beat time instant was determined by the complex domain algorithm, implemented in SonicVisualiser (https://sonicvisualiser.org/) (Stepputat, Kienreich and Dick 2019).

In this paper, we will present exemplary results from the “tango-danceability” project based on computational, qualitative, and quantitative methods and demonstrate their importance from a choreomusicological perspective. In particular, we will show how tango forward walking relates to beat instances as carried out by experienced tango dancers. We will conclude by suggesting how the insights gained through this kind of analysis can be used to support discourse about tango musicality and danceability within the tango dance and music community itself.
Abstract

Traditional Cape Breton fiddlers strive to achieve great "timing," "lift" and "drive"—these are terms frequently used by performers and experienced listeners. Fiddler Glenn Graham writes that drive means "to push or propel onward with force...the provide the motive power for...to move along rapidly...a strong motivating power or stimulus..."; or one way fiddlers create Epstein’s motion in music. Drive, I argue, is a description of the expressive, global micro-accelerations that a majority of fiddlers perform throughout their sets. Most medleys speed up by just a few beats per minute over the course of the entire track, making it an experience that has the feeling of an ever accelerating speed, which is riveting to listen to and propels the music from beginning to end. Through computer-aided analysis of tempo in jig medley recordings I propose answers to a number of questions about Cape Breton fiddling and more broadly about how traditional musicians perform tempo in our click-track-flooded contemporary musical landscape. Questions include: what is the specific tempo range for Cape Breton jigs? Do individual Cape Breton fiddlers have a unique tempo range in which they perform, creating a sort of temporal fingerprint? How do jig tempos change depending on the setting (concert hall, dance hall, or recording studio), gender, or age of the performers?
"What data to compute? The role of corpus construction: Three examples from Mali"

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Abstract

This talk discusses the role of fieldwork-based corpus construction for computational approaches to world music, in contrast to the compilation of existing recordings. I will briefly describe three corpora of traditional percussion music from Mali I have collected since 2006, and argue that the integration of ethnographic fieldwork and corpus construction has various advantages:

Most generally, the diversity of musics that ethnographers study, is well suited to work towards the urgent need for representing cultural diversity in scientific music research. The knowledge and publication output, on the same musics by the same ethnographers, often will represent a relevant context enhancing the interpretability of otherwise context-poor quantitative analyses. Not least, constructing corpora from scratch allows the ethnographer to bring into play specific research questions as well as particularities of the studied music, and accordingly adjust the design: How much sonic detail is required (separate tracks for each performer in the case of ensemble music)? How ecologically valid does the performance need to be (include the dance in the case of dance music)? And so forth.

In conclusion, I suggest that computational approaches to world music can profit from the qualitative knowledge and access to social fields that most music ethnographers have with regard to specific musical practices. While extra effort, time, and funding is required, constructing and providing corpora in my experience – as a music scholar – is a costly yet productive way to invest the much more costly humanistic academic “capital,” which is embodied in an ethnographer’s lifetime experience, into collaborative scientific research.
Towards Singing Perception Universals  
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Introduction  
How do we talk about singing? When describing a difference between two performers singing the same song, we may mention the mood they create, their skill, list musical choices they make (tempo, dynamics, etc.). Yet when we try to characterise what they sound like, we are left to invoking metaphors and comparisons to other areas of life.  
It seems that there is no widely understood vocabulary about vocal production in singing, not even within an established and theorised tradition such as Western classical  
Music. Or is there? If we learn that someone's singing is somewhat husky or really twangy, wouldn't we understand similarly? Are there any terms we would interpret in the same way?
INTRODUCTION
We present a mobile phone application associating a virtual musical instrument (emulating a tin whistle) to a content-based music retrieval system for Irish Traditional Music (ITM). It performs tune recognition, following the architecture of the existing query-by-playing software Tunepal. Tunepal has become a popular tool among practitioners of ITM, with more than 20 thousand monthly active users. It allows searching for a tune by playing a short excerpt on an instrument. Tunepal transcribes the audio into a sequence of notes, and attempts to identify the tune by finding the most similar sequence in a database of existing tune notations. Obtaining a good transcription of the recorded audio is challenging, especially as Tunepal is often used in rather noisy environments (typically a pub where an Irish session is taking place). By offering a similar tune recognition system using a virtual instrument instead of a real one, thus requiring no audio input, we believe that our app can be a useful alternative or complement to Tunepal.
Several reasons guided our choice of the tin whistle. First, its dimensions and the simplicity of its fingering, consisting of combinations of six tone holes, make it a good fit for the limited input capabilities of a smartphone. Second, the tin whistle is among the most popular instruments in ITM, and most practitioners have at least some rudiments of this instrument and will thus be able to use the app.
"Seeing for better listening: Computational tools for enhancing music understanding"

Rafael Caro Repetto (Music Technology Group, Universitat Pompeu Fabra, Barcelona) and Xavier Serra (Music Technology Group, Universitat Pompeu Fabra)

Abstract

The development of information and communication technologies is increasing accessibility to musical data from around the world, thus raising the demand for related educational materials. Many textbooks have been published to support the growing number of courses and workshops on the world’s musics, usually accompanied by CDs with recorded audio examples. However, a gap remains between the theoretical verbal explanation and its aural perception, which usually is aimed to be solved with transcriptions in staff notation, limiting their outreach to learners with music literacy. Besides, due to their physical limitations, accompanying CDs might contain just one single example for the concepts addressed in the textbooks, usually being a reduced or simplified version of a real performance. The goal of the Musical Bridges project is to address these issues by drawing on a series of publicly accessible data-sets from different music traditions, and by developing open source, online educational tools. These computational tools aim to bridge the gap between verbal explanation and aural perception by offering intuitive visual cues, which guide the user’s attention during the listening experience. They also allow the user to interactively toggle different layers of visualizations, thus self-pacing the learning progress towards exclusively aural perception. Through these tools, users also have access to an important number of recordings of full performances, what increases their exposure to the studied music tradition. In this paper, we present the first working prototypes of the tools developed for aiding the understanding of selected musical characteristics of the Hindustani khayāl and Chinese jingju.
carat: A toolbox for computer-assisted rhythm analysis

Martín Rocamora (Universidad de la República, Uruguay) and Luis Jure
(Universidad de la República)

Abstract

We introduce carat, a python toolbox for computer-assisted rhythm analysis from audio recordings, that includes a set of ready-to-use tools in order to maximise its usability by the musicological community.

In this initial release, the toolbox includes functions and applications to tackle rhythmic pattern analysis. A representation in the form of a map of rhythmic patterns, that is computed from the audio file, enables the inspection of the similarities and differences between patterns, as well as their evolution over time. Through in an interactive process, the rhythmic patterns can be automatically clustered into groups based on its similarity. The toolbox also allows for the analysis of the micro-temporal deviations of the rhythmic patterns with regards to a regular metrical grid.

The usefulness of the toolbox is illustrated by the analysis of pieces from three different music datasets from the Afro-Atlantic tradition, which, among other aspects, shows that the tools provided are able to manage cycles of different length and beat subdivision.
Toward Cognitive Models of Improvisation: Perspectives from Computational Corpus Analysis

Panayotis Mavromatis (New York University, USA)

Abstract

Previous research has suggested that real-time cognitive constraints involved in improvisation are reflected in the structure of improvised music. For example, Pressing (1988) proposes event clusters as units of improvisational output that streamline real-time decisions, thereby reducing cognitive load in performance. For Johnson-Laird (1991, 2002), the real-time algorithmic demands of improvisation entail a low-complexity regular, or finite-state, generative grammar. Given the recent surge of interest in computational corpus analysis, the present paper seeks to identify data-analytic techniques that could algorithmically retrieve such structures from a corpus of transcribed improvisations.

Combining and extending Pressing and Johnson-Laird’s approaches naturally leads to Hierarchical Markov Models, which represent musical structure as a hierarchy of formulas, phrase prototypes, and large-scale formal plans. Such models can be systematically extracted from a corpus of examples using a straightforward, if somewhat computationally intensive algorithm. This algorithm is illustrated using world music idioms from the Mediterranean and Middle East.

The paper then proceeds to discuss the cognitive implications of Hierarchical Markov Models. First, such models efficiently represent an expert improviser’s knowledge at different levels of musical structure as stored in long-term memory. A hierarchical model is much simpler to store and access than a more complex, non-hierarchical pathway of possibilities. Second, such a structure arguably helps reduce working memory load: at any given point in time, there are fewer possibilities to consider; therefore, less information is needed to keep track of one’s place in the process, and decisions only need to be made at appropriately spaced time-intervals.
"Towards the analysis of long participatory music performances"

André Holzapfel (KTH Royal Institute of Technology, Sweden)

Abstract

During a summer evening on the island of Crete, hundreds of people gather on the square of a village. Dozens of tables have been set up for them in a semicircle around a dance floor, on the other side of which a stage has been prepared. After dusk, musicians enter the stage and start performing traditional Cretan music. The glendi - a festivity that is an important venue for social interaction - has begun. The goal of the musicians is to attract large parts of the audience to active dance participation, which involves the challenge to cater the preferences of a very large audience from a particular area of Crete. Depending on the amount of dance participation, the glendi may last until the early morning hours.

The main problem that I would like to discuss is how a music performance of long duration and with a pronounced participatory character can be approached analytically. Structures of the performance concern, for instance, the choice and function of musical repertoire, the communication among the musicians, and between the musicians and the other event participants. I explore the structure of several events using a combination of methods. Audiovisual recordings of whole events will be annotated regarding the encountered repertoire, focused analysis of particular pieces will reveal interactions between participants, and computational methods will be used to document rhythmic processes. The quantitative methods are intentionally simple, in order to discuss the value of emerging visualizations for exploring local particularities of the repertoire and interactions between dancers and musicians.
Country Classification with feature selection and network construction for folk tunes
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Abstract
We explore two approaches to quantify folk song similarity. In the first part of this paper, we investigate to what extent folk tunes differ by country of origin. Since it is possible for a human with a limited set of tunes in mind to guess the country of origin correctly, it seems like that there is a signal that can be detected with automatic classification. This question has been addressed in the literature, where classifiers were trained both on global and local features [6, 5, 3]. In this paper, we aim at predicting a song's country of origin based on features extracted from the melody. We use a large number of local features (n-grams of note successions and rhythm successions), for a MIDI dataset of songs from England, Scotland, Ireland, Germany, USA, Spiritual songs and African songs. Each group contains 80 song. These extracted features contain information about overall song properties such as mode and time signature. Since we use a high number of initially extracted features (= 7000 that are not 0) we reduce this number with statistical filtering methods, before performing random forest classification. We use feature selection, based on the importances of the random forest classifier, and find that this increases accuracy. Our method allows us to predict country of origin with up to 91% accuracy, depending also on the degree of similarity of the two countries that were used for training. We use 10-fold cross validation to reduce overfitting, and compare results to a classifier trained on the same data with randomly assigned country labels. The feature importance values help to reveal typical patterns of tunes for each country. Interestingly, rhythm grams and melodic grams of different lengths are all relevant. The results depend strongly on the country pair. They confirm established results from musicology but also have the potential to complement them, due to the systematic way they are found.

However, country of origin is not the only relevant aspect when studying song similarity. We construct similarity networks of songs, based on these extracted features. This approach can reveal song families that share similarities not defined by country of origin, and may highlight, for example, links between Scottish and American songs, or between African songs and Spirituals. To construct a network, we first calculated Hamming and Euclidean distances between the vectors of extracted features from the songs. We link songs whose vectors are sufficiently similar. This simple method bears the problem of so-called “hubness” [1, 2], which is an aggregation artefact due to the fact that the distances are calculated in very high-dimensional spaces. Songs without apparent similarity will appear close (and therefore connected in our network), and highly connected hub songs will emerge.
We explore two methods correcting for this: (i) to use fewer dimensions, which are selected based on random forest importances in the classification. This reduces hubness and creates plausible networks, however some highly connected songs remain, unless the number of dimensions is reduced to a number where the interesting similarities disappear as well. We compare our feature selection approach with a method of reducing hubness in audio similarity introduced by [4], the so-called mutual proximity (MP). Based on the idea of using only the closest songs and constructing a symmetric distance from it, this reduces hubness at a cost of losing interesting information as well. We propose a combination of MP and feature selection. We find strong clusters that belong within one country, and also that songs from certain countries of origin (e.g. Germany) are much more distant than others. Also heterogeneity within one country group differs strongly. Genre seems to be much less informative than country, e.g. drinking songs and Christmas carols of one country are often connected.

The classification method has the potential to be applied to smaller geographic regions than countries, as a tool to help location prediction, and to other classification tasks.

References
Analysis of mutual influence of music and text in Svan songs

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ABSTRACT
The present paper discusses the influence of musicological, linguistic, and ethnological aspects on the music-text relation in Svan songs. In a lot of cases, there is a deep bond between verbal texts and their musical counterparts. Despite the fact that the lyrics of songs are of critical importance to the rituals in which they are performed, many of them are difficult (at times impossible) to transcribe. The present analysis shows that the reservoir of Svan melos is relatively modest in comparison with the verbal texts. In songs in which musical patterns repeat and texts alter, the latter get modified and often distorted to the degree to make them incomprehensible. This is also true for texts of pre-Christian origin, which has interesting ethnological consequences. The results of the current study challenge the isolated linguistic interpretation of verbal texts of Svan songs and emphasize the need for a joint analysis of lyrics, musical, and ethnological context.
AUTOMATIC COMPARISON OF GLOBAL CHILDREN’S AND ADULT SONGS SUPPORTS A SENSORIMOTOR HYPOTHESIS FOR THE ORIGIN OF MUSICAL SCALES
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ABSTRACT
Music throughout the world varies greatly, yet some musical features like scale structure display striking crosscultural similarities. Are there musical laws or biological constraints that underlie this diversity? The “vocal mistuning” hypothesis proposes that cross-cultural regularities in musical scales arise from imprecision in vocal tuning, while the integer-ratio hypothesis proposes that they arise from perceptual principles based on psychoacoustic consonance. In order to test these hypotheses, we conducted automatic comparative analysis of 100 children’s and adult songs from throughout the world. We found that children’s songs tend to have narrower melodic range, fewer scale degrees, and less precise intonation than adult songs, consistent with motor limitations due to their earlier developmental stage. On the other hand, adult and children’s songs share some common tuning intervals at small-integer ratios, particularly the perfect 5th (~3:2 ratio). These results suggest that some widespread aspects of musical scales may be caused by motor constraints, but also suggest that perceptual preferences for simple integer ratios might contribute to cross-cultural regularities in scale structure. We propose a “sensorimotor hypothesis” to unify these competing theories.
AUTOMATIC COMPARISON OF HUMAN MUSIC, SPEECH, AND BIRD SONG
SUGGESTS UNIQUENESS OF HUMAN SCALES
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Abstract
The uniqueness of human music relative to speech and animal song has been extensively debated, but rarely directly measured. We applied an automated scale analysis algorithm to a sample of 86 recordings of human music, human speech, and bird songs from around the world. We found that human music throughout the world uniquely emphasized scales with small-integer frequency ratios, particularly a perfect 5th (3:2 ratio), while human speech and bird song showed no clear evidence of consistent scale-like tunings. We speculate that the uniquely human tendency toward scales with small-integer ratios may relate to the evolution of synchronized group performance among humans.