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Erasmus Intensive Program
International School on Systematic Musicology and Sound and Music Computing

Joint events: EU Culture MetaBody Workshop and 4th EyesWeb Week

9-20 March 2014
Casa Paganini – InfoMus Research Centre, DIBRIS-University of Genoa, Piazza S.Maria in Passione 34, Genoa

Sunday 9 March – joint event: 4th EyesWeb Week and EU Culture MetaBody Workshop
9:30 – 10:00 4th EyesWeb Week - Registration and Welcome address
10:00 – 11:00 Roberto Doati
Lecture: Artistic projects using EyesWeb: a composer's perspective

11:00 – 12:30 Presentations and work on the ongoing MetaBody projects related to EyesWeb research and software platform: The Monster, Illegible Affects, Motion Composer (partners of EU Culture MetaBody).

12:30 – 14:30 Lunch

14:30 – 18:00 (*cont'd*) Presentations and work on the ongoing MetaBody projects related to EyesWeb research and software platform: The Monster, Illegible Affects, Motion Composer.

Monday 10 March – joint event: 4th EyesWeb Week
9:30 – 9:45 ISSSM Introduction
9:45 – 12:30 Brief presentations of ISSSM students (5min/3slides each)

12:30 – 14:30 Lunch

14:30 – 17:30 EyesWeb XMI
Introduction to the EyesWeb platform in research in systematic musicology and in sound and music computing: measure and analysis of multimodal data (movement, audio, biometric) of human behavior in joint music performance and in audience (expressive gesture, emotions, non verbal social signals).

Tuesday 11 March – joint event: 4th EyesWeb Week
9:00 – 11:00 Parallel sessions (i):

Track 1 (novice EyesWeb users): build simple real-time EyesWeb patches on audio and gesture processing;

Track 2 (advanced EyesWeb users): how to extend EyesWeb with new software blocks; how to develop EyesWeb applications using mobiles.

11:00 – 12:30 Conference Press: Public presentation of ISSSM 2014, 4th EyesWeb Week, EU Culture MetaBody Workshop

12:30 – 14:30 Lunch

14:30 – 18:00 Parallel sessions (ii):

Track 1 (novice EyesWeb users): build simple real-time EyesWeb patches on audio and gesture processing;

Track 2 (advanced EyesWeb users): EyesWeb SDK; EyesWeb applications with mobiles.

18:00 End of 4th EyesWeb Week

Wednesday 12 March
9:00 – 11:00 Group Projects: presentation, discussion, and assignment of Group Projects to students

11:00 – 11:30 coffee break, discussion

11:30 – 12:30 Group Projects: presentation, discussion, and assignment to students of Group Projects

12:30 14:30 lunch

14:30 – 18:00 Startup and consolidation of Group Projects work (students in separate groups)

Thursday 13 March
9:00 – 10:00 Antonio Camurri
Lecture: EU funding programs: music and the arts in science and technological research
10:00 – 11:00 Jukka Lohivuori
Lecture: The role and function of ethnomusicology in systematic musicology - past, present and future

11:00 – 11:30 coffee break, discussion

11:30 – 12:30 Marc Thompson and Jukka Lohivuori (part 1)
Mocap Toolbox: A MATLAB toolbox for analyzing Motion Capture data

12:30 14:30 lunch

14:30 – 15:30 Marc Thompson and Jukka Lohivuori (part 2)
Mocap Toolbox: A MATLAB toolbox for analyzing Motion Capture data

15:30 – 18:00 Group Projects

Friday 14 March
9-00 – 10.00 Min-Ho Song and Rolf Inge Godøy
Lecture: Coarticulation in the production and perception of music
10:00 – 11:00 Rolf Bader
Lecture: Inverse Problems in Musical Acoustics

11:00 – 11:30 coffee break, discussion

11:30 – 12:30 Rolf Bader and Malte Münster
Workshop: Physical Modeling software for the Classical Guitar

12:30 14:30 lunch

14:30 – 18:00 Group Projects

Saturday 15 March
9-00 – 10.00 Leon Van Noorden
Lecture: Resonance and entrainment in the synchronous reproduction of musical pulse: developments in childhood
10:00 – 11:00 Richard Parncutt
Lecture: A comparative evaluation of current theories of the origin of music

11:00 – 11:30 coffee break, discussion

11:30 – 12:30 Leon Van Noorden
Workshop: Movement experiment

12:30 14:30 lunch

14:30 – 18:00 Group Projects

Sunday 16 March
10.30 – 12.30 Social event
Guided tour of the historical centre of Genoa

Monday 17 March
9-00 – 10.00 Seifert Uwe
Lecture: Comparative Biomusicology: Toward an Action-oriented Biological Framework for Comparative Music Research
10:00 – 11:00 Micheline Lesaffre
Lecture: Embodied Music Cognition: from conceptual framework to experimentation and therapeutic approaches

11:00 – 11:30 coffee break, discussion

11:30 – 12:30 Presentation of intermediate results from group projects

12:30 14:30 lunch

14:30 – 18:00 Group Projects

Tuesday 18 March
9-00 – 10.00 Giovanni De Poli
Lecture: Human vs computer generated music performances: how expression is judged?
10:00 – 11:00 Mario Baroni
Lecture: Expression, a controversial and elusive concept. Can we find any definition of it?

11:00 – 11:30 coffee break, discussion

11:30 – 12:30 Sergio Canazza, Antonio Rodà
Workshop: Expressive information processing: modeling of and for music performance

12:30 14:30 lunch

14:30 – 18:00 Group Projects

Wednesday 19 March
9:00 – 10:00 Nicola Bernardini
Lecture: Systematic archiving and browsing of large music corpora: another Sound and Music Computing application

10:00 – 10:30 coffee break, discussion

10:30 – 12:30 Group Projects

12:30 14:30 lunch

14:30 – 15:30 Alvise Vidolin
Lecture: Use of motion capture systems in music composition and artistic projects

15:30 – 18:00 Group Projects

Thursday 20 March
9:00 – 11:00 Final presentation and evaluation of group projects
11:00 – 11:30 coffee break, discussion
11:30 – 12:30 (*cont'd*) Final presentation and evaluation of group projects

12:30 14:30 lunch

14:30 – 18:00 Final discussion: results of evaluations, feedback from students, future plans of ISSSM, publications and related activities.

End of ISSSM 2014

ISSSM 2014: Abstract of lecture/seminars

Lecture: Artistic projects using EyesWeb: a composer's perspective, Roberto Doati

Following a first period of strictly synthetic music, I became attentive to the relationship between instrumental and the creation of new electronic languages, and during the last 15 years I concentrated my attention to interactive technologies that allow performer's gestures to have control over electronics.

After a work for a Hyperviolin realized by Matteo Ricchetti within the InfoMus Lab, I soon started to use EyesWeb as it was at the time the less invasive technology to keep track of the performer gesture. I will analyze some of my works from the conceptual, esthetical and realization points of view.

- *bastone armonico* (1999) for hyperviolin, rainsticks, and electronics;
- *Allegoria dell'opinione verbale* (2000) for one actress, EyesWeb and electronics;
- *L'apparizione di tre rughe* (2001-2004) for acoustic guitar, EyesWeb and live electronics
- *Un avatar del diavolo* (2005) a musical theatre piece for 2 actors, video, EyesWeb and live electronics based on an Artaud text;
- *Noli me tangere* (2010) videomusic.

Lecture: Inverse Problems in Musical Acoustics, Rolf Bader

Inverse problems are the core of many investigations in musicology, where the output of a system is given and the aim is to investigate or calculate how a system would look like producing such an output. This backward task is more complex than investigating a so-called forward one where a system is given and its output is simulated using algorithms representing the system. In Musical Acoustics examples of such inverse problems are to know about the geometry of an instrument which produces a desired output. Another example is back-propagating a soundfield to the sources, where the soundfield is known and the source points need to be calculated. In terms of psychoacoustics an example is the production of a perception space with a desired size, density or and semantic associations as input, calculating the geometrical or algorithmic parameters for such a model. Inverse problems are often very complex in terms of calculation and may contain a arbitrariness or noise. Existing solutions for such problems are discussed and further aims for the future are presented.

Lecture: The role and function of ethnomusicology in systematic musicology - past, present and future, Jukka Lohivuori

The aim of the lecture is to increase understanding of the role and function of ethnomusicology in the field of systematic musicology. Folk music study, anthropology of music, music ethnology, traditional music, ethnomusicology etc. are the terms closely related to systematic musicology from the very beginning of its history. In addition to clarifying the historical background and the key researchers in the field, the main findings that has had an important role in the development of systematic musicology, will be introduced. Also the changes in methodologies from the past to present will be discussed. Main focus will be in going through the most recent findings, new methodologies, research tools etc. in the field of ethnomusicology. Examples will be given from the field work in Africa (South Africa and Kenya) done by the lecturer.

Lecture: A comparative evaluation of current theories of the origin of music, Richard Parncutt

Across cultures and periods, music is social (coordinating group behavior, strengthening group identity), emotional (evoking basic and everyday emotions but especially pleasure, wonder, tenderness, nostalgia), and melodic/rhythmic (within physical constraints of the human body). It is generally accepted that music and speech had a common ancestor called musilanguage; the two may have split between 10^6 and 10^5 years ago. The split must have occurred because music acquired a special non-linguistic function, e.g. to facilitate group cohesion (like grooming), mate selection (flirting), or cognitive skill acquisition (childplay). In other approaches, music developed in a continuous line from protomusical primate behaviors, or emerged accidentally because it was somehow pleasurable. Another candidate for music's origin is motherese, which emerged some 10^6 years ago because it promoted infant survival when gestation became shorter due to increased brain size and a narrower pelvis, in turn due to bipedalism (Mithen, 2009). Musilanguage and

motherese may even be the same thing.
We do not know enough about ancient environments and behaviors - let alone ancient music or protomusic - to evaluate such theories directly. But we can evaluate how well each theory predicts the apparently universal social functions, emotional qualities, and structural features of music as we know it today. That may be the most objective way that we have to evaluate and compare competing theories.
In this presentation I will attempt to systematically list the main characteristic features of music as we know it today and evaluate the extent to which each theory predicts each feature. A list of such features is essentially just a definition of music. A major difficulty in defining music has always been to distinguish it from speech, with which it shares many characteristics. A possible solution is first to list the common features of music and speech (comparable with a definition of musilanguage) and then to list the ways in which music and speech differ. Music and speech are both acoustic signals, and both are structured (gestural, rhythmic, melodic, syntactic) and both are social (meaningful, emotional, intentional). By comparison to speech, music is less lexical, less socially essential, more spiritual, more repetitive, more exact in pitch/time, less exact in timbre, and more expertise-oriented. A careful analysis of the extent to which each theory predicts these features does not clearly distinguish four leading theories from each other (group cohesion, mate selection, skill acquisition, motherese) but it does seem to eliminate primate behaviors and non-adaptive pleasure seeking.
Mithen, S. (2009). The Music Instinct. Annals of the New York Academy of Sciences, 1169(1), 3-12.

Lecture: Coarticulation in the production and perception of music, Min-Ho Song and Rolf Inge Godøy
The term 'coarticulation' designates the fusion of small-scale events such as single sounds and single sound-producing actions into larger chunks of sound and body motion, resulting in qualitative new features at the medium-scale level of the chunk. Coarticulation has been extensively studied in linguistics and to a certain extent in other domains of human body motion, but so far not so much in music, so the main aim of our lecture is to provide a background for how we can explore coarticulation in music. The contention is that coarticulation in music should be understood as based on a number of physical, biomechanical and cognitive constraints, and that it is an essential shaping factor for several perceptually salient features of music.

Lecture: Resonance and entrainment in the synchronous reproduction of musical pulse: developments in childhood, Leon Van Noorden
Van Noorden and Moelants (1999) postulated a resonance around 2 Hz in the human perceptual system to explain the range of tempi in which one can perceive a pulse or beat in music. In this paper, the question how this resonance develops in childhood is addressed: Is the resonance already present in young children? Is it at the same tempo range and is it weaker or stronger than in adults? To answer these questions an experiment was performed on how well children between the ages of 3 and 11 years (N=421), can synchronise their tapping to the beat of common children's songs with a tempo of 80 to 160 beats per minute. To make sure that even the youngest children could understand the task an avatar tapping along with the pulse of the music was projected during part of each song. To prevent that the children would feel alone in front of the experimenters, which can be a problem for the youngest ones, they did the tapping in groups of 4. The seating had two conditions: seeing their peers and not seeing their peers. It was confirmed that children aged 3 and 4 can only tap in a narrow range around 2 Hz. Between the ages of 4 and 7 children expand the range in which they can synchronise, from a little faster, but primarily towards much slower tempi. This supports a resonance model for pulse perception in which the characteristic frequency, near 2 Hz, remains the same, but in which the damping of the resonance increases with age, even up to critical damping. Also, the phase of tapping changes with the tempo according to a resonance model. Seeing their peers helped the children of 4 to 6 years old to perform better on the tapping task, children of 8 to 9 performed worse, especially the boys.

Lecture: Embodied Music Cognition: from conceptual framework to experimentation and therapeutic approaches, Micheline Lesaffre
The first part of this lecture introduces an overview of basic concepts of the embodied music cognition paradigm such as the body as mediator, action-perception coupling, gestures and entrainment, and musical

intentionality, expressiveness and empathy. The paradigm of embodied music cognition assumes that music experience is based on a tight relationship between sounds and experiences that are mediated by the body. This assumption offers an exiting framework for the exploration of specific forms of non-verbal communication wherein a person may reveal clues to unspoken intention or emotion through physical behavior in response to music. Current research at IPEM makes an important contribution to the development of novel music-driven applications that foster the sense for body movement and social interaction. Examples are given of projects and studies that aim at understanding concepts of embodied music cognition and employ the acquired knowledge in applications for music education, music performance, art and other domains. In the second part of the lecture studies are discussed that investigate the challenges and implications of the embodied music cognition paradigm for health and rehabilitation.The scientific expertise to be gained from using such approach in promoting music and movement participation for well-being is quite significant.A case study is presented that aims at monitoring the effect of live singing on motor activity in people with dementia. The study proposes new ideas involving sensors that were not tested in the domain of music therapy for people with dementia.

Lecture : “Expressive Information Processing” by Giovanni De Poli.

Music performance has being studied since long time and several computational systems were developed for gener- ating expressive music performances. These models are generally evaluated by comparing their predictions with actual performances, both from a quantitative and a subjective point of view, often focusing on very specific aspects of the model. However little is known about how listeners evaluate the generated performances and which are the factors influencing their judgement and appreciation.

- During the lessons, experiments methodology will be presented to understanding how the audience judges the entire performances.- In the lab activities possible different preferences and expectations of the listeners and influencing factors, such as cognitive styles, will be analyzed.

Lecture: Systematic archiving and browsing of large music corpora: another Sound and Music Computing application, Nicola Bernardini

This lecture will present the author's recent work in the field on extended music corpora such as the import of the archive of the national institute of Verdi studies (INSV) into the archive of the Istituto Centrale dei Beni Sonori e Audiovisivi and the digital transfer of the private archive of the late composer Giacinto Scelsi. These extended works on large corpora have triggered a number of considerations on the lack of adequate tools of intelligent archiving and browsing in such contexts. While powerful tools have been developed and are indeed available (for example in the field of Music Information Retrieval), the necessary technology transfer to systematic archiving and browsing is yet to be achieved to a large extent.

Lecture: Comparative Biomusicology: toward an action-oriented biological framework for comparative music research, Uwe Seifert

Variance of human's capacity for music is indicated by socio-cultural, historical, and ethnomusicological findings as well as clinical neuropsychology of cognitive musical impairments , developmental studies, and studies on bimusicality. Comparative biomusicology – as the research program of comparative biolinguistics – deals with these challenges and challenges of the standard social science model.

The comparative method in this approach concerns comparison of cognitive domains such as music and language as well as comparison of different species such as animals, humans, and machines. Proximate and ultimate analyses are key strategies of the integrative framework provided by comparative biolinguistics. Proximate analyses form the focus of comparative biomusiology's research program. The goal of proximate analyses is to reveal a capacity's functional architecture and it's causal mechanisms. Ultimate analyses, i.e. phylogeny and adaptation, provide further explanatory foundations as well as heuristics for proximate research. In addition, an action-oriented approach highlights the importance of studying (social) interactions and situations. Comparative biomusicology in connection with situated music cognition and computational cognitive modeling provides an integrative framework and research program for investigating the "musical mind". This research program avoids the physicalistic trap in research on the mind. It takes also the current explanatory gap concerning the mind-body relation into account.

The lecture introduces comparative biomusicology, discusses methodological issues, gives an overview of current proximate research on music in relation to language research, and points out implications for

ultimate research questions.

Lecture: Expression, a controversial and elusive concept. Can we find any definition of it?, Mario Baroni
In computer simulations of a musical performance the terms “expression”, “expressivity”, and “expressive” are mainly used to indicate “non automatic” or “human like” results. My paper has the aim of proposing some intergrations to these meanings on the basis of the following principles:
1. according to the common use of these words, and the best dictionaries, terms of "expression" are most frequently used in direct forms of communication (communication “in presence”): in a theater performance the face of an actor or his pronunciation can be defined “expressive”; a written discourse, on the contrary, is rather described as “well done”, or “beautiful”. Similarly, a music performance can be considered “expressive”, while a composition is rather defined as “fine”, “magnificent”, but not “expressive”: expressivity seems to be mainly used for performance.

2. A listener can give sense to music in a silent, intuitive form, and can communicate it by means of metaphors, gestures, or shades of voice. Musicological research, however, has tried to transform intuition into explicit categories. This happened in the field of semiotics and more recently in that of music emotion studies: in both fields a precise analysis of musical structures has been linked with forms of knowledge of their signification properties. However, while analysis and interpretation, in the case of written music, are now quite mature and sophisticated disciplines, analysis of performance (not based on scores, but on computer representations of sound such as spectrograms) were only recently born and the associated theories have not yet reached the same level of conceptual clarity: expression can be partially explicited but still has some elusive aspects.

3. A performance is obviously based on the performed composition and (through the choice of particular sound features) gives a specific interpretation of it: the choices of a performer, however, depend on his/her cultural preferences and orientations. Traditional analysis in the history of performance, studied (in metaphorical terms) aspects of expressive coherence in the choices of some eminent performers or schools of performance. There is, however, an area of research, recently developed inside the domain of sociology, that could offer more specific approaches to this problem: so-called cultural studies have highlighted the presence of preferences and orientations in many works of art, depending on particular social movements or conflicts, and there is no reason to exclude musical performance from the wide context of such artistic ideologies. To conclude we can say that expressive phenomena are a complex topic at the crossing between different scientific studies: only a possible synthesis of them can try to give a description of the main semantic aspects of the word “expressivity”.

Lecture: Use of motion capture systems in music composition and artistic projects, Alvise Vidolin
This lecture presents recent artistic works that make use of motion capture in music compositions, with composers Claudio Ambrosini, Adriano Guarnieri, Nicola Sani and performers including Roberto Fabbriciani, Giancarlo Schiaffini, Debora Petrina, applied to several musical instruments (bass clarinet, violin, cello, pianoforte, iperbass flute, trombone). All works described were created using a motion capture system (Impulse Phasespace) to track the soloist movements. This system is made out of a variable number of infrared cameras which can detect the movements of the leds that are placed on the body part/object that is being tracked.

ISSSM 2014: Brief descriptions of proposed experiments and workshops

Workshop: Mocap Toolbox: A MATLAB toolbox for analyzing Motion Capture data, Marc Thomson and Jukka Lohivuori
The MoCap Toolbox is a set of functions written in MATLAB for analyzing and visualizing motion capture data. In the first hour of the workshop, we will provide an overview of the toolbox, providing examples of how to read-in data, create animations and perform kinematic feature analyses of a musical performance (velocity, acceleration, bounding rectangle). We will then demonstrate how it has been used in a cross-cultural music performance study carried out at the University of Jyväskylä. This portion of the presentation will compliment

Jukka Louhivuori's talk on ethnomusicology in systematic musicology. The second hour will function as a guided tutorial in which students will explore the main features of the toolbox. Students will learn how to extract kinematic features, build animations of motion capture data, run a periodicity analysis, and perform a Principal Components Analysis within the toolbox.

Workshop: Physical Modeling software for the Classical Guitar, Rolf Bader and Malte Münster
The workshop demonstrates a software for geometrical construction and simulation of classical guitars using methods of Physical Modeling. The aim is to predict the sound of an instrument before it is built by an instrument builder. Furthermore it is able to start from a desired guitar sound and makes suggestions how an instrument would need to be built to meet this sound. The connection between sound and geometry can therefore be systematically studied and new geometries as well as new sound colors can be achieved. In the future the geometrical output of the software may serve as a basis of a 3D plotter to print a desired instrument according to the specifications indicated.

Workshop: Movement experiment, Leon Van Noorden
Why do people prefer slightly an-isochronous auditory sequences above isochronic ones? Holger Hennig has shown that people prefer an-isochronous sequences above isochronic ones. Van Noorden has evidence that people when tapping to isochronic music start tapping in a tempo that is very near the tempo of the music, However after some time they discover that the are getting out of phase with the music and make a small correction to their tempo. this process continuous on and on. One possible explanation for the preference of an-isochronic sequences could be that if the metronome is not completely regular the subject can detect sooner that they are out of phase and can lake corrections. This is a kind of stochastic resonance, i.e. the phenomenon that something can be better perceived when adding some noise. Several experiments can be performed by the students: 1 what is the maximum amount of an-isochrony that can be tolerated and what are the appreciation of listeners to these sequences of noisy metronomes. 2 the synchronization in tapping/moving to sequences with various degrees of anisochrony. The movement experiments can be executed with the EyesWeb software.

ISSSM 2014 and EyesWeb Week Professors
Rolf Bader, Mario Baroni, Nicola Bernardini, Antonio Camurri, Sergio Canazza, Corrado Canepa, Paolo Coletta, Giovanni De Poli, Roberto Doati, Simone Ghisio, Rolf Inge Godøy, Giacomo Lepri, Micheline Lesaffre, Maurizio Mancini, Alberto Massari, Malte Münster, Radek Newiadomski, Richard Parncutt, Stefano Piana, Antonio Rodà, Roberto Sagoleo, Uwe Seifert, Min-Ho Song, Marc Thompson, Leon Van Noorden, Giovanna Varni, Gualtiero Volpe.

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