

CMMR 2019

MARSEILLE

Perception **R**epresentations
Image **S**ound
Music

14 - 18 october

14 TH International

**Symposium on Computer Music
Multidisciplinary Research**

Marseille public transportation network



Welcome to CMMR2019

We are happy to welcome you to the 14th edition of CMMR in Marseille. This is the second CMMR event that takes place in Marseille, but in a slightly different context than in 2013, since the present edition is organized by the new interdisciplinary art-science laboratory, PRISM (Perception, Representations, Image, Sound, Music), which very much reflects the spirit of the CMMR conference cycle. PRISM hosts researchers within a large variety of fields, spanning from physics and signal processing, art and aesthetic sciences to medicine and neuroscience that all have a common interest in the perception and representation of image, sound and music. The scientific challenge of PRISM is to reveal how the audible, the visible and their interactions generate new forms of sensitive and/or formal representations of the contemporary world.

CMMR2019 will be the occasion to celebrate the creation of the PRISM and at the same time honor one of its co-founders, researcher, composer and computer music pioneer Jean-Claude Risset who sadly passed away in November 2016, only two months before the laboratory was officially acknowledged. A scientific session followed by an evening concert will be dedicated to him on the first day of the conference.

From the first announcement of the CMMR2019 we received a large response from both scientists and artists who wanted to participate in the conference, either by organizing special sessions, presenting demos or installations or proposing workshops and concerts. Among the 15 scientific sessions that will take place during the conference, eight special sessions that deal with various subjects from sound design, immersive media and mobile devices to music and deafness, embodied musical interaction and phenomenology of the conscious experience are scheduled. We are also lucky to have three internationally renowned keynote speakers with us during this edition: John Chowning, Professor Emeritus at Stanford University who will talk about his friend and colleague Jean-Claude Risset, Geoffroy Peeters, Professor at Télécom ParisTech who will talk about past and present research within Music Information Research and Josh McDermott, Associate Professor in the Department of Brain and Cognitive Sciences at MIT who will present classic and recent approaches to auditory scene analysis.

The artistic program that has been elaborated in collaboration with “n+n corsino” and GMEM includes a tribute concert to Jean-Claude Risset, scheduled on Monday evening, a virtual/augmented concert on Tuesday evening and a contemporary music concert on Wednesday evening. During the last evening, an interactive music concert will take place under the direction of Christophe Héral. Sound installations and a videomusic presentation are also scheduled during the conference.

Finally, in addition to the scientific paper, poster and demo sessions and the artistic program, five satellite workshops are programmed right after the conference on Friday October 18th.

We hope that CMMR2019 will be an unforgettable event for all of you, and wish you a pleasant stay in Marseille.

R. Kronland-Martinet, S. Ystad and M. Aramaki
The CMMR2019 symposium chairs

Overview

	Monday 14 October	Tuesday 15 October
8h30	Registration	Registration
9h00	Welcome	
9h30		<i>Special session:</i> The Process of Sound Design
10h00	Computational Musicology 1	
10h30	Coffee break	Coffee break
11h00	Computational Musicology 2	
11h30		<i>Special session:</i> Sonic Interaction for Immersive Media: Virtual and Augmented Reality
12h00	Music Production and Composition Tools	
12h30		
13h00	Lunch	Lunch
14h00		Artistic Performance
14h30	<i>Special session:</i> Jean-Claude Risset and beyond	
15h00		<i>Special session:</i> Music and Deafness : From the Ear to the Body
15h30	Coffee break	
16h00		Coffee break
16h30	Bus transfer to La Friche Belle de Mai	
17h00		<i>Special session:</i> Embodied Musical Iteration
17h30	Presentation of the PRISM lab	
18h00		<i>Special session:</i> Phenomenology of Conscious Experience
18h30	Keynote & concert: J. Chowning	
19h00		Cosmophone concert (La Friche Belle de Mai GMEM)
19h30		
20h00	Buffet	Sound installation (La Friche Belle de Mai GMEM)
20h30		
21h00		Concert VR/AR (La Friche Belle de Mai Le module GMEM)
21h30	Concert: Tribute to J.C. Risset (La Friche Belle de Mai Grand Plateau)	
22h00		
22h30		

Symposium chairs

Mitsuko Aramaki
(PRISM, AMU-CNRS, France)

Richard Kronland-Martinet
(PRISM, AMU-CNRS, France)

Sølvi Ystad
(PRISM, AMU-CNRS, France)

Paper chairs

Mitsuko Aramaki
(PRISM, AMU-CNRS, France)

Ivan Magrin-Chagnolleau
(PRISM, AMU-CNRS, France)

Proceedings chair

Olivier Derrien
(UTLN, PRISM, France)

Programme chairs

Richard Kronland-Martinet
(PRISM, AMU-CNRS, France)

Sølvi Ystad
(PRISM, AMU-CNRS, France)

Artistic programme chairs

Norbert Corsino
(n+n corsino, France)

Jacques Sapiega
(PRISM, AMU-CNRS, France)

Christian Sebillé
(GMEM, France)

Workshop chair

Mathieu Barthet
(QMUL, United Kingdom)

Demo chair

Adrien Vidal
(PRISM, AMU-CNRS, France)

Sponsoring chairs

Antoine Bourachot
(PRISM, AMU-CNRS, France)

Simon Fargeot
(PRISM, AMU-CNRS, France)

Samuel Poirot
(PRISM, AMU-CNRS, France)

Webmaster

Antoine Bourachot
(PRISM, AMU-CNRS, France)

Poster chair

Samuel Poirot
(PRISM, AMU-CNRS, France)

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Mathieu Barthet
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Antoine Bourachot
(PRISM CNRS-AMU, France)

Olivier Derrien
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Simon Fargeot
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Antoine Gonot
(PRISM CNRS-AMU, France)

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Claudine Le Van Phu
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Samuel Poirot
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Adrien Vidal
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Sølvi Ystad
(PRISM CNRS-AMU, France)

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Matthew Davies
(INESC TEC, Portugal)

Richard Kronland-Martinet
(PRISM, AMU-CNRS, France)

Sølvi Ystad
(PRISM, AMU-CNRS, France)

Paper committee

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Jonathan Berger
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Matthew Roger
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Charalampos Saitis
(Technical University of Berlin, Germany)

Emery Schubert
(University of New South Wales, Sydney, Australia)

Diemo Schwarz
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Rod Selfridge
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Stefania Serafin
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Peter Sinclair
(PRISM CNRS-AMU, France)

Julius Smith
(Stanford University, USA)

Bob L. Sturm
(Aalborg University, Denmark)

Patrick Susini
(IRCAM, France)

Atau Tanaka
(Goldsmiths, University of London, UK)

Vincent Tiffon
(PRISM CNRS-AMU, France)

Bruno Torrèsani
(I2M CNRS-AMU, France)

Jérôme Villeneuve
(Université Grenoble Alpes, France)

Jean Vion-Dury
(PRISM CNRS-AMU, France)

Gregory Wallet
(Université de Rennes 2, France)

Marcelo Wanderley
(McGill University, Canada)

Duncan Williams
(University of York, UK)

Sølvi Ystad
(PRISM CNRS-AMU, France)

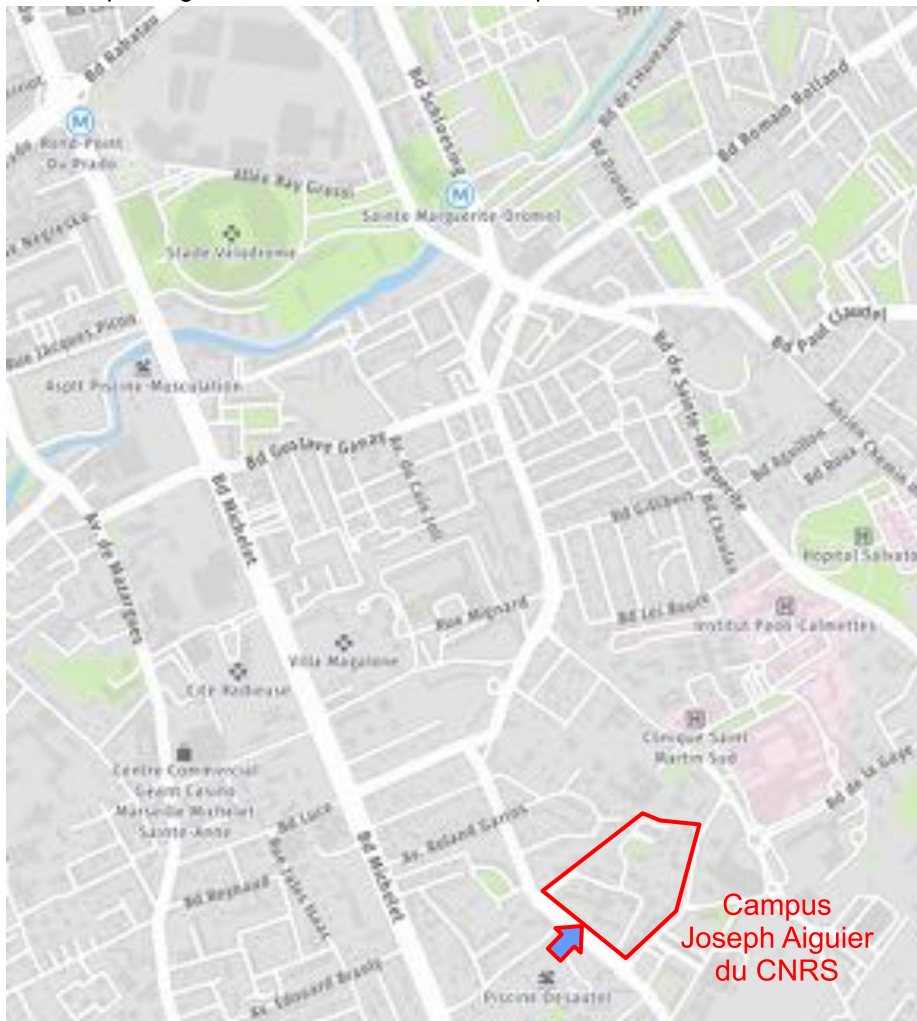
The scientific part of CMMR2019 will mainly take place at the **Campus Joseph Aiguier du CNRS** that hosts the PRISM laboratory.

From **Marseille-Provence** airport:
Take the shuttle bus that will drive you to **Saint-Charles** Railway Station (**Gare Saint Charles**).

From **Saint-Charles** railway station:
Take the subway line #2 towards “**Sainte Marguerite / Dromel**” and go either to **Rond-point du Prado** or to the end of the line: **Sainte Marguerite - Dromel**.

From subway stations:
Rond-point du Prado : take bus #B1 to station **Michelet Bonneaude**.
Sainte Marguerite - Dromel : take bus #48 to station **Aiguier CNRS**.

A visitor parking is also available on the Campus.



- At the center for artistic creation and innovation **la Friche de la Belle de Mai**, which hosts the **GMEM**.

- In the studios of the **n+n corsino** company,

These facilities are located near the **Saint-Charles** railway station.



Scientific Programme

Oral Session

“Computational Musicology 1”

Chairman: Satoshi Tojo (JAIST, Japan)

09h30 - 09h50

Modal Logic for Tonal Music. *Satoshi Tojo*

Abstract. It is generally accepted that the origin of music and language is one and the same. Thus far, many syntactic theories of music have been proposed, however, all these efforts mainly concern generative syntax. Although such syntax is advantageous in constructing hierarchical tree, it is weak in representing mutual references in the tree. In this research, we propose the annotation of tree with modal logic, by which the reference from each pitch event to regions with harmonic functions are clarified. In addition, while the generative syntax constructs the tree in the top-down way, the modal interpretation gives the incremental construction according to the progression of music. Therefore, we can naturally interpret our theory as the expectation–realization model that is more familiar to our human recognition of music.

09h50 - 10h10

John Cage's Number Pieces, a Geometric Interpretation of “Time Brackets” Notation. *Benny Sluchin, Mikhail Malt*

Abstract. Conceptual musical works that lead to a multitude of realizations are of special interest. One can't talk about a performance without considering the rules that lead to the existence of that version. After dealing with similar works of open form by Iannis Xenakis, Pierre Boulez and Karlheinz Stockhausen, the interest in John Cage's music is evident. His works are “so free” that one can play any part of the material; even a void set is welcomed. The freedom is maximal and still there are decisions to consider in order to make the piece playable. Our research was initially intended to develop a set of conceptual and software tools that generates a representation of the work as an assistance to performance. We deal here with the *Number Pieces* Cage composed in the last years of his life. Over time, we realized that the shape used to represent time brackets, brought important information for the interpretation and musical analysis. In the present text, we propose a general geometric study of these time brackets representations, while trying to make the link with their musical properties to improve the performance.

10h10 - 10h30

Modelling 4-dimensional Tonal Pitch Spaces with Hopf Fibration. *Hanlin Hu, David Gerhard*

Abstract. The question of how to arrange harmonically related pitches in space is a historical research topic of computational musicology. The primitive of note arrangement is linear in 1-D, in which ordered ascending pitches in one direction correspond to increasing frequencies. Euler represented harmonic relationships between notes with a mathematical lattice named Tonnetz, which extends the 1-D arrangement into 2-D space by reflecting consonances. Since then, mathematicians, musicians, and psychologists have studied this topic for hundreds of years. Recently, pitch-space modelling has expanded to mapping musical notes into higher-dimensional spaces. This paper aims to investigate existing tonal pitch space models, and to explore a new approach of building a pitch hyperspace by using the Hopf fibration.

Monday 14 October

Oral Session

“Computational Musicology 2”

Chairman: Satoshi Tojo (JAIST, Japan)

11h00 - 11h20

Automatic Dastgah Recognition using Markov Models.

Luciano Ciamarone, Baris Bozkurt, Xavier Serra

Abstract. This work focuses on automatic Dastgah recognition of monophonic audio recordings of Iranian music using Markov Models. We present an automatic recognition system that models the sequence of intervals computed from quantized pitch data (estimated from audio) with Markov processes. Classification of an audio file is performed by finding the closest match between the Markov matrix of the file and the (template) matrices computed from the database for each Dastgah. Applying a leave-one-out evaluation strategy on a dataset comprised of 73 files, an accuracy of 0.986 has been observed for one of the four tested distance calculation methods.

11h20 - 11h40

Chord Function Identification with Modulation Detection Based on HMM.

Yui Uehara, Eita Nakamura, Satoshi Tojo

Abstract. This study aims at identifying the chord functions by statistical machine learning. Those functions found in the traditional harmony theory are not versatile for the various music styles, and we envisage that the statistical method would more faithfully reflect the music style we have targeted. In machine learning, we adopt hidden Markov models (HMMs); we evaluate the performance by perplexity and optimize the parameterization of HMM for each given number of hidden states. Thereafter, we apply the acquired parameters to the detection of modulation. We evaluate the plausibility of the partitioning by modulation by the likelihood value and, as our innovative method, the result is reduced back to the number of states conversely. As a result, we found that the six-state model outperformed the other models both for the major keys and for the minor keys although they assigned different functional roles to the two tonalities.

Oral Session

“Music Production and Composition Tools”

Chairman: Mathieu Barthet (QMUL, London, UK)

11h40 - 12h00

(Re)purposing Creative Commons Audio for Soundscape Composition using Playsound. *Alessia Milo, Ariane Stolfi, Mathieu Barthet*

Abstract. Playsound is an open-source web-based interface allowing users to search for, edit and process Creative Commons (CC) sounds from Freesound. In this paper, we present the results from a user study conducted with 17 music production students who created short soundscape compositions only using CC-licensed audio retrieved with tools including Playsound. The students completed an online survey which included the System Usability Scale (SUS) and Creativity Support Index (CSI) questionnaires and open-ended questions. Although Playsound was found helpful to predict how various sounds would blend together and sketch musical ideas, the results suggest that usability and specific creativity factors (exploration and expressiveness) should be improved. We discuss Playsound's strengths and weaknesses and provide insights for the design of tools to support soundscape composition using crowd-sourced audio.

12h00 - 12h20

Generating Walking Bass Lines with HMM. *Ayumi Shiga, Tetsuro Kitahara*

Abstract. In this paper, we propose a method of generating walking bass lines for jazz with a hidden Markov model (HMM). Although automatic harmonization has been widely and actively studied, automatic generation of walking bass lines has not. With our model, which includes hidden states that represent combinations of pitch classes and metric positions, different distributions of bass notes selected at different metric positions can be learned. The results of objective and subjective evaluations suggest that the model can learn such different tendencies of bass notes at different metric positions and generates musically flowing bass lines that contain passing notes.

12h20 - 12h40

Programming in Style with Bach. *Andrea Agostini,
Daniele Ghisi, Jean-Louis Giavitto*

Abstract. Different programming systems for computer music are based upon seemingly similar, but profoundly different, programming paradigms. In this paper, we shall discuss some of them, with particular reference to computer-aided composition systems and Max. We shall subsequently show how the bach library can support different programming styles within Max, improving the expression, the readability and the maintainance of complex algorithms. In particular, the forthcoming version of bach introduces bell, a small textual programming language embedded in Max and specifically designed to facilitate programming tasks related to manipulation of symbolic musical material.

12h40 - 13h00

Method and System for Aligning Audio Description to a Live Musical Theater Performance. *Dirk Vander Wilt,
Morwaread Mary Farbood*

Abstract. Audio description, an accessibility service used by blind or visually impaired individuals, provides spoken descriptions of visual content. This accommodation allows those with low vision the ability to access information that sighted people obtain visually. In this paper a method for deploying pre-recorded audio description in a live musical theater environment is presented. This method uses a reference recording and an online time warping algorithm to align audio descriptions with live performances. A software implementation that is integrated into an existing theatrical workflow is also described. This system is used in two evaluation experiments that show the method successfully aligns multiple recordings of works of musical theater in order to automatically trigger pre-recorded, descriptive audio in real time.

Oral Special Session

“Jean-Claude Risset and Beyond”

Chairman: Vincent Tiffon (PRISM, AMU-CNRS, Marseille, France)

14h30 - 14h50

Jean-Claude Risset and his Interdisciplinary Practice: What do the Archives Tell Us? *Vincent Tiffon*

Abstract. In 2017, Jean-Claude Risset gave his archives to the PRISM's laboratory. Thereby the researchers' community will have soon at their disposal a fund, especially interdisciplinary art and science oriented. For the moment, the archives are divided into two main parts: one within scientific research and one within artistic creation activity. More specifically, Jean-Claude Risset's own story shaped major interdisciplinary orientations: first of all, his pioneering research at Bell Labs, then back to “french reality” (his half-failure with Ircam and his difficulties concerning Marseille-Luminy), afterwards his quest for solutions as a political lever, especially through the Art-Science-Technology's report in 1998, and finally his turning point with his CNRS 1998 Gold Medal, consequently increasing conferences and mostly concerts. In addition, the study of material aspects (sharing activities between the laboratory and his home, place and content of documentation, etc.) is also necessary to understand “Risset's practice” of interdisciplinary.

14h50 - 15h10

Spatial Perception of Risset Notches. *Julián Villegas*

Abstract. The apparent movement of Risset tones and Risset notches (i.e., the opposite of Risset tones, replacing silence by noise and frequency components by notches) are investigated. Contrary to previous findings, no significant differences between horizontal and vertical movement associations were found, regardless of stimuli. However, whereas the tones were more likely to be subjectively associated with approaching sources, notches were associated with receding ones. The direction of frequency glide also had a significant effect: ascending glides were more likely to be associated with horizontal movements and descending ones with vertical movements. These findings suggest that although both stimuli evoke similar illusions, the perception of their spatial attributes are different.

15h10 - 15h30

Machine Learning for Computer Music Multidisciplinary Research: A Practical Case Study. *Hugo Scurto, Axel Chemla-Romeu-Santos*

Abstract. This paper presents a multidisciplinary case study of practice with machine learning for computer music. It builds on the scientific study of two machine learning models respectively developed for data- driven sound synthesis and interactive exploration. It details how the learning capabilities of the two models were leveraged to design and implement a musical instrument focused on embodied musical interaction. It then describes how this instrument was employed and applied to the composition and performance of *ægo*, an improvisational piece with interactive sound and image for one performer. We discuss the outputs of our research and creation process, and build on this to expose our personal insights and reflections on the multidisciplinary opportunities framed by machine learning for computer music.

15h30 - 15h50

Connecting Circle Maps, Waveshaping, and Phase Modulation via Iterative Phase Functions and Projections. *Georg Essl*

Abstract. In memoriam of Jean-Claude Risset's recent passing, we revisit two of his contributions to sound synthesis, namely waveshaping and feedback modulation synthesis as starting point to develop the connection of a plethora of oscillatory synthesis methods through iterative phase functions, motivated by the theory of circle maps, which describes any iterated function from the circle to itself. Circle maps have played an important role in developing the theory of dynamical systems with respect to such phenomena as mode-locking, parametric study of stability, and transitions to chaotic regimes. This formulation allows use to bring a wide range of oscillatory methods under one functional description and clarifies their relationship, such as showing that sine circle maps and feedback FM are near-identical synthesis methods.

15h50 - 16h10

Mathematics and Music: Loves and Fights. *Thierry Paul*

Abstract. We present different aspects of the special relationship that music has with mathematics, in particular the concepts of rigour and realism in both fields. These directions are illustrated by comments on the personal relationship of the author with Jean-Claude, together with examples taken from his own works, specially the “Duos pour un pianiste”.

“Inauguration of the PRISM Lab and Tribute to Jean-Claude Risset.”

Richard Kronland-Martinet, Vincent Tiffon

17h30 - 18h30

PRISM (www.prism.cnrs.fr) is a new interdisciplinary laboratory officially created in 2017, which brings together CNRS researchers, associate and full professors from the AMU and artists from the ESA art school in Aix en Provence. PRISM promotes interdisciplinarity around the issues of perception, representations and their uses. The members of PRISM are specialized in different disciplines, spanning from physics and signal processing to art and aesthetic sciences, medicine and neuroscience. Their all work with different tools and viewpoints on the three main research objects image, sound and music. The scientific challenge of PRISM is to reveal how the audible, the visible and their interactions generate new forms of sensitive and/or formal representations of the contemporary world.

Jean-Claude Risset (1938-2016) is one of the founding members of the PRISM laboratory. His scientific career is very embodied interdisciplinarity. Both recognized in the scientific field as a researcher in sound synthesis and a pioneer in computer music (whose Gold Medal of the CNRS is the consecration), Jean-Claude Risset was also a pianist and a composer who played all over the world. He has offered us a wide repertoire of instrumental, electroacoustic and mixed works, which are nourished by scientific research (including John Chowning's research) as much as they feed scientific research. As John Chowning points out, Jean-Claude Risset is a musician, a composer, a scientist: in short a humanist.

Keynote

“Jean-Claude Risset: Humanist, composer, musician and scientist”

John M. Chowning



18:30 - 19h15

Abstract. The impact of Jean-Claude's death in 2016 was immediate and stunning — the news traveled fast in the worlds of music and of science that had been so enriched by his life's work. But it was not always so. The path that he had chosen in his first years at Bell Labs, research in acoustics and psychoacoustics, was not guaranteed to be productive in music composition, yet his remarkable ability to hear inside sound pushed him toward discoveries that still resonate these many years later. I will recount my understanding of his gradual acceptance by the colleagues whom he cared about, whom he admired, as they learned that behind his modest presence there was genius.

Monday 14 October

John M. Chowning was born in Salem, New Jersey in 1934. Following military and university studies, he studied composition in Paris in 1959 for three years with Nadia Boulanger. In 1966 he received the doctorate in composition from Stanford University, where he studied with Leland Smith. In 1964 with the support of Max Mathews and David Poole, he began his research in computer music. Following the work of Stockhausen, he programmed the first generalized surround sound localization algorithm in 1968. He discovered the FM synthesis algorithm in 1967. Inspired by the acoustic and perceptual research of Jean-Claude Risset, he developed the algorithm, which Stanford University patented and licensed to Yamaha in 1973. It became the most successful synthesis engine in the history of electroacoustic instruments. From 1964 until 1996, Chowning taught computer-sound synthesis and composition at Stanford University's Center for Computer Research in Music and Acoustics (CCRMA). Among his awards are Diplôme d'Officier dans l'Ordre des Arts et Lettres from the French Ministre de la Culture 1995, and the Doctorat Honoris Causa from the Université de la Méditerranée in 2002.

Oral Special Session

“The Process of Sound Design (Tools, Methods, Productions)”

Chairman: Patrick Susini (IRCAM, Paris, France)
and Elif Ozcan Vieira (TU Delft, Netherlands)

09h00 - 09h20

Exploring Design Cognition in Voice-Driven Sound Sketching and Synthesis. *Stefano Delle Monache, Davide Rocchesso*

Abstract. Conceptual design and communication of sonic ideas are critical, and still unresolved aspects of current sound design practices, especially when teamwork is involved. Design cognition studies in the visual domain represent a valuable resource to look at, to better comprehend the reasoning of designers when they approach a sound-based project. A design exercise involving a team of professional sound designers is analyzed, and discussed in the framework of the Function-Behavior-Structure ontology of design. The use of embodied sound representations of concepts fosters team-building and a more effective communication, in terms of shared mental models.

09h20 - 09h40

Morphing Musical Instrument Sounds with the Sound Morphing Toolbox. *Marcelo Caetano*

Abstract. Sound morphing stands out among the sound transformation techniques in the literature due to its creative and research potential. There are several sound morphing proposals in the literature, yet few open-source implementations are freely available, making it difficult to reproduce the results, compare models, or simply use them in other applications such as music composition, sound design, and timbre research. This work describes how to morph musical instrument sounds with the sound morphing toolbox (SMT). The SMT is freely available and contains open-source implementations in MATLAB® of a sound morphing algorithm based on sinusoidal modeling.

09h40 - 10h00

Mapping Sound Properties and Oenological Characters by a Collaborative Sound Design Approach – Towards an Augmented Experience. *Nicolas Misdariis, Patrick Susini, Olivier Houix, Roque Rivas, Clément Cerles, Eric Lebel, Alice Tetienne, Aliette Duquesne*

Abstract. The paper presents a specific sound design process implemented upon a collaboration with an important stakeholder of the wine (Champagne) industry. The goal of the project was to link sound properties with oenological dimensions in order to compose a sonic environment able to realise a multisensory experience during the wine tasting protocol. This creation has resulted from a large scale methodological approach based on the semantic transformation concept (from wine words to sound words) and deployed by means of a codesign method – after having shared respective skills of each field (sound and oenology). A precise description of the workflow is detailed in the paper. The outcomes of the work are presented, either in terms of realisation or conceptual knowledge acquisition. Then, future perspectives for the following of the work are sketched, especially regarding the notion of evaluation. The whole approach is finally put in the broad conceptual framework of 'sciences of sound design' that is developed and argued in the light of this study.

10h00 - 10h20

Kinetic Design - From Sound Spatialisation to Kinetic Music. *Roland Cahen*

Abstract. This paper explores the process of kinetic music design. The first part of this paper presents the concept of kinetic music. The second part presents the sound design and compositional process of this type of music. (to develop). The third part presents some excerpts from the composition logbook of a piece called Kinetic Design to illustrate the process of kinetic design as work in progress. This paper focuses on the question of sound spatialisation from a theoretical, as well as an empirical, point of view, through the experience and experiments of an electroacoustic music composer trying to make the imaginary concept of kinetic music real. It is a form of research by design, or research by doing. The kinetic design project examined here is the first time an experimental approach of research by design has been applied to kinetic music.

Oral Special Session

“Sonic Interaction for Immersive Media – Virtual and Augmented Reality”

Chairman: Tifanie Bouchara (CNAM-ENJMIN, Paris, France)

11h00 - 11h20

Augmented Live Music Performance using Mixed Reality and Emotion Feedback. *Rod Selfridge, Mathieu Barthet*

Abstract. This paper presents an experimental study into the use of mixed reality (MR) visuals generated from performers' expression and emotion sensing augmenting a live music performance. A laptop instrument was used to trigger melodic samples which influenced MR visuals based on musical properties. The MR visuals were viewed either on a Microsoft HoloLens or a mobile device with participants free to move in the performance venue as they chose. An emotion sensor tracked participants' facial expressions and predicted their expressed emotion which was mapped to emoticons on a screen. Results show that the MR visuals were very positively received but less so the emoticons. Results also provide guidelines to improve such system by adapting the visuals to better fit the field of view, supporting mapping of more subtle expressive variations, and interactive content that can be curated.

11h20 - 11h40

Designing Virtual Soundscapes for Alzheimer's Disease Care. *Frédéric Voisin*

Abstract. Sound environment is a prime source of conscious and unconscious information which allows listeners to place themselves, to communicate, to feel, to remember. The author describes the process of designing a new audio interactive apparatus for Alzheimer's care, in the context of an active multidisciplinary research project led by the author in collaboration with a longterm care centre (EHPAD) in Burgundy (France), a geriatrician, a gerontologist, psychologists and caregivers. The apparatus, named Madeleines Sonores in reference to Proust's madeleine, have provided virtual soundscapes sounding for a year for 14 elderly people hosted in the dedicated Alzheimer's unit of the care centre, 24/7. Empiric aspects of sonic interactivity are discussed in relation to dementia and to the activity of caring. Scientific studies are initiated to evaluate the benefits of such a disposal in Alzheimer's disease therapy and in caring dementia.

11h40 - 12h00

ARLooper: a Mobile AR Application for Collaborative Sound Recording and Performance. *Sihwa Park*

Abstract. This paper introduces ARLooper, an AR-based iOS application for multi-user sound recording and performance, that aims to explore the possibility of actively using mobile AR technology in creating novel musical interfaces and collaborative audiovisual experience. ARLooper allows the user to record sound through microphones in mobile devices and, at the same time, visualizes and places recorded sounds as 3D waveforms in an AR space. The user can play, modify, and loop the recorded sounds with several audio filters attached to each sound. Since ARLooper generates the world map information through iOS ARKit's tracking technique called visual-inertial odometry which tracks the real world and a correspondence between real and AR spaces, it enables multiple users to connect to the same AR space by sharing and synchronize the world map data. In this shared AR space, the user can see each other's 3D waveforms and activities, such as selection and manipulation of them, as a result, having a potential of collaborative AR performance.

12h00 - 12h20

Singing in Virtual Reality with the Danish National Children's Choir. *Stefania Serafin, Ali Adjorlu, Lars Andersen, Nicklas Andersen*

Abstract. In this paper we present a Virtual Reality (VR) system that allows a user to sing together with the Danish National Children choir. The system was co-designed together with psychologists, in order to be adopted to prevent and cope with social anxiety. We present the different elements of the system, as well as a preliminary evaluation.

12h20 - 12h40

gravityZERO, an Installation Work for Virtual Environment. *Suguru Goto, Satoru Higa, John Smith, Chihiro Suzuki*

Abstract. This paper reports the exposition of an artistic installation, gravityZERO, and its ongoing technical development. It consists of virtual sound, VR and robotic technologies in order to simulate the state of zero gravity. Audience members can experience a floating sensation within this virtual environment.

Oral Special Session

“Music and Deafness: From the Ear to the Body”

Chairman: Olivier Macherey (LMA, AMU-CNRS, Marseille, France)
and Sylvain Brétéché (PRISM, AMU-CNRS, Marseille, France)

14h30 - 14h50

Why People with a Cochlear Implant Listen to Music.

Jérémy Marozeau

Abstract. The cochlear implant (CI) is the most successful neural prosthetic device in the market. It allows hundreds of thousands of people around the world to regain a sense of hearing. However, unlike a pair of glasses that can restore vision perfectly, the CI still has some short-comings for non-speech sounds such as music and environmental sounds. Many studies have shown that most CI users have great difficulties perceiving pitch differences or recognizing simple melodies without words or rhythmical cues. Consequently, CI users report finding music less pleasant compared to their pre-deafness period. Despite this, many of those users do not entirely reject music, and it is not uncommon to see young CI users listening to music all day, or even playing an instrument. Listening to music is an experience that arises from more than the sum of the sensations induced by the basic elements of music: pitch, timbre and rhythm. Listening to music is a pleasant experience because it prompts high-level cognitive aspects such as emotional reactions, needs to dance, or the feeling of musical tension. Therefore, CI users still engaged in musical activities might experience some of these high-level features. In this paper, I will review recent studies on music perception in CI listeners and demonstrate that, although most CI users have difficulties with perceiving pitch, additional music cues such as tempo and dynamic range might contribute positively to their enjoyment of music.

14h50 - 15h10

The 'Deaf listening'. Bodily Qualities and Modalities of Musical Perception for the Deaf. Sylvain Brétéché

Abstract. This paper focuses on 'Deaf listening' and more specifically on the involvement of the body in the Deaf musical experience. More precisely, it proposes to consider the sono-sensitive qualities of the body, from the Deaf experience, and by the investigation of a fundamental principle of the human experience: the 'corpaurality'. On the other hand, they are the natural modalities of Deaf hearing that will be discussed here, modalities who, detached from the ordinary aural perceptions, position the body at the center of the musical experience.

15h10 - 15h30

Objective Evaluation of Ideal Time-Frequency Masking for Music Complexity Reduction in Cochlear Implants.

Anil Nagathil, Rainer Martin

Abstract. Previous studies have shown that music becomes more preferable for CI listeners if the accompaniment in polyphonic music is moderately attenuated while the leading voice is fully retained. However, a recently proposed approach based on reduced-rank approximations of music signals suggests that reducing the spectral complexity of both leading voices and accompaniments can result in even higher benefits for CI users. In this paper we investigate this assumption in a simulated scenario. By applying ideal binary masks with different levels of attenuation to music signals, the relationship between a sole accompaniment attenuation and a reduction of higher-order leading voice harmonics is studied. An objective evaluation with an auditory-distortion measure and a music complexity prediction model for CI listeners predicts significant improvements. Hence, a benefit for CI users can be expected if the spectral complexity of leading voices is reduced in addition to an attenuation of the accompaniment.

15h30 - 15h50

Evaluation of New Music Compositions in Live Concerts by Cochlear Implant Users and Normal Hearing Listeners.

Waldo Nogueira

Abstract. Cochlear implants (CI) have become very successful in restoring hearing abilities of profoundly hearing-impaired people. However, music perception remains generally poor for CI users. Typically, music perception with CIs is investigated under laboratory conditions. The present work investigates music perception in CI users in a real live concert. With this purpose a group of CI users, musicians and researchers worked together to compose music pieces. These compositions were interpreted in a concert where the appreciation of the music was evaluated by means of a questionnaire to compare the different audience listening groups (CI users and normal hearing listeners). In total, 253 people registered for the musIC 1.0 concert, 133 filled the questionnaire from which 37 were CI users and 8 were hearing aid users. As expected, the group of CI users rated melody, timbre and rhythm perception significantly lower than the group of normal hearing listeners, however no significant group differences were found on measures of enjoyment and cognitive aspects such as interest, emotion and understanding. In general, CI users preferred simple music with clear melodies.

Oral Special Session

“Embodied Musical Interaction”

Chairman: Atau Tanaka (Goldsmiths University, London, UK)

16h30 - 16h50

Embodied Cognition in Performers of Large Acoustic Instruments as a Method of Designing New Large Digital Musical Instruments. *Lia Mice, Andrew P. McPherson*

Abstract. We present The Large Instrument Performers Study, an interview-based exploration into how large scale acoustic instrument performers navigate the instrument's size-related aesthetic features during the performance. Through the conceptual frameworks of embodied music cognition and affordance theory, we discuss how the themes that emerged in the interview data reveal the ways size-related aesthetic features of large acoustic instruments influence the instrument performer's choices; how large scale acoustic instruments feature microscopic nuanced performance options; and how despite the preconception of large scale acoustic instruments being scaled up versions of the smaller instrument with the addition of a lower fundamental tone, the instruments offer different sonic and performative features to their smaller counterparts and require precise gestural control that is certainly not scaled up. This is followed by a discussion of how the study findings could influence design features in new large scale digital musical instruments to result in more nuanced control and timbrally rich instruments, and better understanding of how interfaces and instruments influence performers' choices and as a result music repertoire and performance.

16h50 - 17h10

An Ecosystemic Approach to Augmenting Sonic Meditation Practices. *Rory Hoy, Doug Van Nort*

Abstract. This paper describes the design and creation of an interactive sound environment project, titled *dispersion.eLabOrate*. The system is defined by a ceiling array of microphones, audio input analysis, and synthesis that is directly driven by this analysis. Created to augment a Deep Listening performative environment, this project explores the role that interactive installations can fulfill within a structured listening context. Echoing, modulating, and extending what it hears, the system generates an environment in which its output is a product of ambient sound, feedback, and participant input. Relating to and building upon the ecosystemic model, we discuss the benefit of designing for participant incorporation within such a responsive listening environment.

17h10 - 17h30

Gesture-Timbre Space: Multidimensional Feature Mapping Using Machine Learning & Concatenative Synthesis.

Michael Zbyszyński, Balandino Di Donato, Atau Tanaka

Abstract. This paper presents a method for mapping embodied gesture, acquired with electromyography and motion sensing, to a corpus of small sound units, organised by derived timbral features using concatenative synthesis. Gestures and sounds can be associated directly using individual units and static poses, or by using a sound tracing method that leverages our intuitive associations between sound and embodied movement. We propose a method for augmenting corporal density to enable expressive variation on the original gesture-timbre space.

Oral Special Session

“Phenomenology of Conscious Experience”

Chairman: Jean Vion-Dury (PRISM, AMU-CNRS, Marseille, France)

17h30 - 17h50

Beyond the Semantic Differential: Timbre Semantics as Crossmodal Correspondences. *Charalampos Saitis*

Abstract. This position paper argues that a systematic study of cross-modal correspondences between timbral dimensions of sound and perceptual dimensions of other sensory modalities (e.g., brightness, fullness, roughness, sweetness) can offer a new way of addressing old questions about the perceptual and cognitive mechanisms of timbre semantics, while the latter can provide a test case for better understanding crossmodal correspondences and human semantic processing in general. Furthermore, a systematic investigation of auditory-nonauditory crossmodal correspondences necessitates auditory stimuli that can be intuitively controlled along intrinsic continuous dimensions of timbre, and the collection of behavioural data from appropriate tasks that extend beyond the semantic differential paradigm.

17h50 - 18h10

Generative Grammar Based on Arithmetic Operations for Realtime Composition. *Guido Kramann*

Abstract. Mathematical sequences in N_0 are regarded as time series. By repeatedly applying arithmetic operations to each of their elements, the sequences are metamorphised and finally transformed into sounds by an interpretation algorithm. The efficiency of this method as a composition method is demonstrated by explicit examples. In principle, this method also offers laypersons the possibility of composing. In this context it will be discussed how well and under what kind of conditions the compositional results can be predicted and thus can be deliberately planned by the user. On the way to assessing this, Edmund Husserl's concept of 'fulfillment chains' provides a good starting point. Finally, the computer-based board game MODULO is presented. Based on the here introduced generative grammar, MODULO converts the respective game situation directly into sound events. In MODULO, the players behave consistent to the gaming-rules and do not care about the evolving musical structure. In this respect, MODULO represents an alternative draft to a reasonable and common use of the symbols of the grammar in which the user anticipates the musical result.

18h10 - 18h30

A Phenomenological Approach to Investigate the Pre-reflexive Contents of Consciousness during Sound

Production. *Marie Degrandi, Gaëlle Mougin, Thomas Bordonné, Mitsuko Aramaki, Sølvi Ystad, Richard Kronland-Martinet, Jean Vion-Dury*

Abstract. This article describes a listening experiment based on elicitation interviews that aims at describing the conscious experience of a subject submitted to a perceptual stimulation. As opposed to traditional listening experiments in which subjects are generally influenced by closed or suggestive questions and limited to predefined, forced choices, elicitation interviews make it possible to get deeper insight into the listener's perception, in particular to the pre-reflexive content of the conscious experiences. Inspired by previous elicitation interviews during which subjects passively listened to sounds, this experience is based on an active task during which the subjects were asked to reproduce a sound with a stylus on a graphic tablet that controlled a synthesis model. The reproduction was followed by an elicitation interview. The trace of the graphic gesture as well as the answers recorded during the interview were then analyzed. Results revealed that the subjects varied their focus towards both the evoked sound source, and intrinsic sound properties and also described their sensations induced by the experience.

Oral Special Session

“Notation and Instruments Distributed on Mobile Devices”

Chairman: Jonathan Bell (PRISM, AMU-CNRS, Marseille, France)

09h00 - 09h20

Mobile Music with the Faust Programming Language.

Romain Michon, Yann Orlarey, Stéphane Letz,
Dominique Fober, Catinca Dumitrascu

Abstract. The Faust programming language has been playing a role in the mobile music landscape for the past ten years. Multiple tools to facilitate the development of musical smartphone applications for live performance such as `faust2ios`, `faust2android`, `faust2api`, and `faust2smartkeyb` have been implemented and used in the context of a wide range of large scale musical projects. Similarly, various digital musical instruments leveraging these tools and based on the concept of augmenting mobile devices have been created. This paper gives an overview of the work done on these topics and provide directions for future developments.

09h20 - 09h40

COMPOSITES 1: An Exploration into Real-Time Animated Notation in the Web Browser. Daniel McKemie

Abstract. *COMPOSITES 1 for Modular Synthesizer Soloist and Four Accompanists* is a real-time, graphically notated work for modular synthesizer soloist and four accompaniment parts that utilizes the power of Node.js, WebSockets, Web Audio, and CSS to realize an OS-agnostic and web-deliverable electroacoustic composition that can be accessed on any device with a web browser. This paper details the technology stack used to write and perform the work, including examples of how it is used compositionally and in performance. Recent developments in web browser technology, including the Web Audio API and Document Object Model (DOM) manipulation techniques in vanilla JavaScript, have improved the possibilities for the synchronization of audio and visuals using only the browser itself. This paper also seeks to introduce the reader to the aforementioned technologies, and what benefits might exist in the realization of creative works using this stack, specifically regarding the construction of real-time compositions with interactive graphic notations.

09h40 - 10h00

Realtime Collaborative Annotation of Music Scores with Dezrann. *Ling Ma, Mathieu Giraud, Emmanuel Leguy*

Abstract. Music annotation is an important step in several activities on music transcribed in common music notation. We propose a protocol to annotate collaboratively such scores in real time. Based on a paradigm with commutative operations, this protocol guarantees consistency between distributed editions while providing a fluid user experience, even behind possible network lags. It is being implemented into Dezrann, a web platform for sharing music analysis. We report efficiency and scalability tests on the current implementation, including usage by up to 100 simulated clients.

10h00 - 10h20

Distributed Scores and Audio on Mobile Devices in the Music for a Multidisciplinary Performance. *Pedro Louzeiro*

Abstract. In an attempt to uncover the strengths and limitations of web technologies for sound and music notation applications, driven by aesthetic goals and prompted by the lack of logistic means, the author has developed a system for animated scores and sound diffusion using browser-enabled mobile devices, controlled by a host computer running Max and a web server. Ease of deployment was seen as a desirable feature in comparison to native application computer-based systems – such as Comprovisador, a system which has lent many features to the one proposed herein. Weaknesses were identified motivating the design of mitigation and adaptation strategies at the technical and the compositional levels, respectively. The creation of music for a multidisciplinary performance has served as a case study to assess the effectiveness of those strategies.

10h20 - 10h40

The BabelBox: an Embedded System for Score Distribution on Raspberry Pi with INScore, SmartVox and BabelScores.

*Jonathan Bell, Dominique Foer, Daniel Fígols-Cuevas,
Pedro Garcia-Velasquez*

Abstract. The slow but steady shift away from printed text into digital media has not yet modified the working habits of chamber music practitioners. If most instrumentalists still heavily rely on printed scores, audiences increasingly access notated music online, with printed scores synced to an audio recording on youtube for instance. This paper proposes to guide the listener and/or the performer with a cursor scrolling on the page with INScore, in order to examine the consequences of representing time in this way as opposed to traditional bars and beats notation. In addition to its score following interest for pedagogy and analysis, the networking possibilities of today's ubiquitous technologies reveal interesting potentials for works in which the presence of a conductor is required for synchronization between performers and/or with fixed media (film or tape). A Raspberry Pi-embedded prototype for animated/distributed notation is presented here as a score player (such as the Decibel ScorePlayer, or SmartVox), in order to send and synchronize mp4 scores to any browser capable device connected to the same WIFI network. The corpus will concern pieces edited at BabelScores, an online library for contemporary classical music. The BabelScores pdf works, composed in standard engraving softwares, will be animated using INScore and video editors, in order to find strategies for animation or dynamic display of the unfolding of time, originally represented statically on the page.

Wednesday 16 October

Oral Session

“Music Information Retrieval – Music, Emotion and Representation 1”

Chairman: Davide Rocchesso (University of Palermo, Italy)

11h00 - 11h20

Methods and Datasets for DJ-Mix Reverse Engineering.

Diemo Schwarz, Dominique Fourer

Abstract. DJ techniques are an important part of popular music culture. However, they are also not sufficiently investigated by researchers due to the lack of annotated datasets of DJ mixes. Thus, this paper aims at filling this gap by introducing novel methods to automatically deconstruct and annotate recorded mixes for which the constituent tracks are known. A rough alignment first estimates where in the mix each track starts, and which time-stretching factor was applied. Second, a sample-precise alignment is applied to determine the exact offset of each track in the mix. Third, we propose a new method to estimate the cue points and the fade curves which operates in the time-frequency domain to increase its robustness to interference with other tracks. The proposed methods are finally evaluated on our new publicly available DJ-mix dataset. This dataset contains automatically generated beat-synchronous mixes based on freely available music tracks, and the ground truth about the placement of tracks in a mix.

11h20 - 11h40

Identifying Listener-informed Features for Modeling Time-varying Emotion Perception.

Simin Yang, Elaine Chew, Mathieu Barthet

Abstract. Music emotion perception can be highly subjective and varies over time, making it challenging to find salient explanatory acoustic features for listeners. In this paper, we dig deeper into the reasons listeners produce different emotion annotations in a complex classical music piece in order to gain a deeper understanding of the factors that influence emotion perception in music performance. An initial study collected time-varying emotion ratings (valence and arousal) from listeners of a live performance of a classical trio; a follow-up study interrogates the reasons behind listeners' emotion ratings through the re-evaluation of several pre-selected music segments of various agreement levels informed from the initial study. Thematic analysis of the time-stamped comments revealed themes pertaining primarily to musical features of loudness, tempo, and pitch contour as the main factors influencing emotion perception.

The analysis uncovered features such as instrument interaction, repetition, and expression embellishments, which are less mentioned in computational music emotion recognition studies. Our findings lead to proposals for ways to incorporate these features into existing models of emotion perception and music information retrieval researches. Better models for music emotion provide important information for music recommendation systems and applications in music and music-supported therapy.

11h40 - 12h00

Towards Deep Learning Strategies for Transcribing Electroacoustic Music. *Matthias Nowakowski, Christof Weiß, Jakob Abeßer*

Abstract. Electroacoustic music is experienced primarily through hearing, as it is not usually based on a prescriptive score. For the analysis of such pieces, transcriptions are sometimes created to illustrate events and processes graphically in a readily comprehensible way. These are usually based on the spectrogram of the recording. Although transcriptions are often time-consuming, they provide a useful starting point for any person who has interest in a work. Deep learning algorithms, which learn to recognize characteristic spectral patterns using supervised learning, represent a promising direction of research to automatize this task. This paper investigates and explores the labeling of sound objects in electroacoustic music recordings. We test several neural network architectures that enable classification using musicological and signal processing methods. We also show future perspectives how our results can be improved and how they can be applied to a new gradient-based visualization approach.

Keynote

“From Shallow-MIR to Deep-MIR: Is That Really What It Looks Like?”

Geoffroy Peeters (Telecom ParisTech, France)



12h00 - 13h00

Abstract. MIR usually stands for Music Information Retrieval but can be extended in the broader sense to Music Information Research. It is then the interdisciplinary research field which focuses on the processing of digital data related to music, including gathering and organisation of machine-readable musical data, development of data representations, and methodologies to process and understand that data. It appeared around the year 2000 probably as an answer to the development of digital library and the massive amount of accessible music data (first through peer-to-peer, today through streaming). It initially (and naturally) took its roots around research fields such as musicology (computational musicology), perception and cognition of sound, musical acoustic, audio signal processing and machine learning. In the first MIR systems, named knowledge-driven (named "shallow" by the deep-learning community), the knowledge of these fields (such as harmonic rules, perceptual rules or signal processing algorithms) were encoded by a human in a computer. Progressively data-driven approaches, through machine-learning, helped to acquire the knowledge for under-explored fields (such as finding the relationship between audio and music genre) by analyzing large music data-sets. The climax of this trend are the recent "end-to-end" systems where deep neural networks (aka deep learning) approaches are used to acquire all the knowledge (including the signal processing one). Source separation is now easily achieved using a completely agnostic deep-Wave-U-Net rather than using Computational auditory scene analysis premise. In this talk we discuss this evolution, why it appeared, the pros and cons of it and where it leads.

Geoffroy Peeters received his PHD on signal processing for speech processing in 2001 and his Habilitation (HDR) on Music Information Retrieval in 2013 from University Paris VI. From 2001 to 2018, he led research related to MIR at IRCAM. His research topics concern signal processing and machine learning (including deep learning) for the automatic analysis of music (timbre description, audio features, singing voice, source separation, beat/downbeat/rhythm estimation, chord/key/multi-pitch estimation, music structure/summary, audio-identification, cover-version, auto-tagging), evaluation methodologies and corpus creation. Since 2018, he is full professor in the Image-Data-Signal department of Télécom Paris, Institut Polytechnique de Paris where he teaches those topics. He is the author of numerous articles and several patents in these areas and co-author of the ISO MPEG-7 audio standard. He has been co-general chair of the DAFx-2011 and ISMIR-2018 conferences and is member of the DAFx board, IEEE Task Force on Computational Audio Processing and has been elected in the ISMIR board in 2016.

Oral Special Session

"Improvisation, Expectations and Collaborations"

Chairman: Christine Esclapez (PRISM, AMU-CNRS, Marseille, France)

14h00 - 14h20

Improvisation and Environment. *Christophe Charles*

Abstract. To improvise is to "create and perform spontaneously or without preparation" and without being able to predict the outcome. One often distinguishes composed music and improvised music, but as it is impossible to write everything, and all music necessarily has a part of improvisation, we can consider that all music, beyond a certain degree of (non) writing, is improvised. John Cage has long rejected improvisation which would often favor subjective choice and intention, but he eventually found a way to accept the idea of "structural improvisation", through a re-definition of space and time in music. Other composers, such as Christian Wolff, John Russell, Pauline Oliveros or Kosugi Takehisa, have also developed different ways to improvise by questioning the self in relation to its environment. With information technologies, the composer is now able to be a performer and a listener at the same time. Composing-performing-listening can be considered as the activity of exploring what is happening in real-time, not only between the subject and its environment, but also between different levels of consciousness of the subject or between subjects. This "in-between" is called "aida" by Kimura Bin. The above forms of improvisation might be useful to explore the "aida".

14h20 - 14h40

Improvisation: Thinking and Acting the World.

Carmen Pardo Salgado

Abstract. This article argues that musical improvisation practices represent a way of thinking and acting in the world that is diametrically opposed to that of a highly managed and automated society. Having accepted Houchard's description of musical improvisation as the decantation of previously learned music, we will use Félix Guattari's eco-sophy to discuss improvisation practices as exercises that take place within a mental ecology and a social ecology. Within the mental ecology, one achieves the creation of an existential territory that needs to activate a state of oblivion to produce this decanting. Within the social ecology, this existential territory manifests itself in a collective temporality that can serve as a model to dismantle that other temporality created by an economic system that serves as the origin of individual and collective decisions.

14h40 - 15h00

Developing a Method for Identifying Improvisation Strategies in Jazz Duos. *Torbjörn Gulz, Andre Holzapfel, Anders Friberg*

Abstract. The primary purpose of this paper is to describe a method to investigate the communication process between musicians performing improvisation in jazz. This method was applied in a first case study. The paper contributes to jazz improvisation theory towards embracing more artistic expressions and choices made in real life musical situations. In jazz, applied improvisation theory usually consists of scale and harmony studies within quantized rhythmic patterns. The ensembles in the study were duos performed by the author at the piano and horn players (trumpet, alto saxophone, clarinet and trombone). Recording sessions involving the ensembles were conducted. The recording was transcribed using software and the produced score together with the audio recording was used when conducting in-depth interviews, to identify the horn player's underlying musical strategies. The strategies were coded according to previous research.

15h00 - 15h20

Instruments and Sounds as Objects of Improvisation in Collective Computer Music Practice. *Jérôme Villeneuve, James Leonard, Olivier Tache*

Abstract. This paper presents the authors' first attempt at a new (and unexpected) exercise: that of observing, contextualising and problematising their own collective Computer Music experiences. After two years practising emergent collective improvisation in private and public settings, which has led the authors to fundamentally reconsider both individual and collective musical creation, came the desire to methodologically deconstruct this process - one that they never anticipated and, until now, had never formalised. By starting from the very notions of performance and improvisation in the context of Computer Music, and crossing prolific literature on these topics with humble observations from their own experience, the authors then elaborate on what appears to them as the most enticing perspective of this creative context: the systematic improvisation of both their tools and sounds in an unique flow.

Poster Session

Chairman: Samuel Poirot (PRISM, AMU-CNRS, Marseille, France)

15h20 - 16h10

Oral presentations of posters

Flexible Interfaces: Future Developments for Post-WIMP Interfaces. *Benjamin Bressolette, Michel Beaudouin-Lafon*

Abstract. Most current interfaces on desktop computers, tablets or smartphones are based on visual information. In particular, graphical user interfaces on computers are based on files, folders, windows, and icons, manipulated on a virtual desktop. This article presents an ongoing project on multimodal interfaces, which may lead to promising improvements for computers' interfaces. These interfaces intend to ease the interaction with computers for blind or visually impaired people. We plan to interview blind or visually impaired users, to understand how they currently use computers, and how a new kind of flexible interface can be designed to meet their needs. We intend to apply our findings to the general public, to design adapted multimodal interfaces that do not always require visual attention.

Geysir: Musical Translation of Geological Noise.

Christopher Luna-Mega, Jon Gomez

Abstract. The sounds of geological phenomena are generally noise. Wind, glaciers, oceans, streams, and other geological sounds present a vast content of frequencies that often obscures individual pitches or groups of pitches. However, noise varies from sound to sound with different pitch predominance and patterns. This variance contributes to the signature that makes several noise-sounds unique. In this study, the sound of one of the geysers in the Geysir system of the Haukadalur valley, 180 miles Northeast of Reykjavik, Iceland, is recorded and analyzed in multiple time segments, each with its own pitch predominance and, therefore, signature. The analysis is further adapted into a piece for seven spatialized pianists and electronics titled Geysir, which features the amplitude and predominant pitch class fluctuations throughout the geyser sample. This paper reports the process of the analysis and the compositional applications of the pitch class predominance analysis.

Visual Representation of Musical Rhythm in Relation to Music Technology Interfaces - an Overview. *Mattias Sköld*

Abstract. The present paper presents an overview of the ways we make sense of rhythm through visual means in music in terms of visual representation and notation, relating this to the user interfaces of music technology. Besides enabling the communication of rhythmical ideas, our systems of music representation reflect how we make sense of rhythm as a music parameter. Because of the complexity of visually representing rhythm, only software-based solutions provide flexible enough representations of rhythm in user interfaces. While the user interfaces of much rhythm oriented music technology deal with rhythm in looped phrases of 4/4 time, there are several examples of tools that challenge conventional ways of working with and visually representing rhythm.

A Tree Based Language for Music Score Description.

Dominique Fober, Yann Orlarey, Stéphane Letz, Romain Michon

Abstract. The presented work is part of the INScore project, an environment for the design of augmented interactive music scores, oriented towards unconventional uses of music notation and representation, including real-time symbolic notation capabilities. This environment is fully controllable using Open Sound Control [OSC] messages. INScore scripting language is an extended textual version of OSC messages that allows you to design scores in a modular and incremental way. This article presents a major revision of this language, based on the description and manipulation of trees.

Surveying Digital Musical Instrument Use Across Diverse Communities of Practice. *John Sullivan, Marcelo M. Wanderley*

Abstract. An increasing number of studies have examined the active practice of performers who use digital musical instruments (DMIs) and applied findings towards recommendations for the design of new technologies. However, the communities of practice typically considered in these works tend to be closely aligned with the design communities themselves, predominantly found in academic research and experimental and technology-based music practices. Here we report on an online survey of musicians designed to look beyond these distinct communities to identify trends in DMI use across a wide variety of practices. Compared with current literature in the field, our diversified group of respondents revealed a different set of important qualities and desirable features in the design of new instruments. Importantly, for active and professional performers, practical considerations of durability, portability and ease of use were prioritized. We discuss the role of musical style and performance practice in the uptake and longitudinal use of new instruments, and revisit existing design guidelines to allow for the new findings presented here.

Systematising the Field of Electronic Sound Generation.

Florian Zwißler, Michael Oehler

Abstract. There is a striking disproportion between the omnipresence of electronic sound, both in all art forms and everyday life, and the shortage of terminological tools capable of apprehending this phenomenon in a suitably scientific way. A method is proposed to develop a refined terminology which in turn will provide new tools for a discourse on electronically produced sounds. The key element is an in-depth survey of several electronic music studios: a large proportion of the innovations and impulses that defined a new type of musical practice originated here, however a vast number of their informational resources have not yet been explored. Besides the detailed discussion of the structure and nature of the studio as the “instrument of electronic music”, the focus of this approach will be an examination of the actual working processes of each studio as well as the interdependencies between studios. This relates to the transfer of knowledge and technology as well as possible interconnections between composers, technicians, scientists etc. The information gained will be collated in a database using a newly defined classification, which should elucidate lines of development that aren't immediately obvious from the raw data. A synoptic analysis of the collected data will then serve as a foundation for refining the basic terminology concerned with electronically produced sound.

Movement Patterns in the Harmonic Walk Interactive

Environment. *Marcella Mandanici, Cumhur Erkuş, Razvan Paisa, Stefania Serafin*

Abstract. “Harmonic Walk” is a responsive environment where users accompany chords to a given tonal melody by moving to specific points in the environment. To help users in this melody harmonization task, this paper suggests two ways that rely on spatial sound or on motor resonance. An empirical comparison between these two cues is the main focus and contribution of the paper. Results indicate that sound spatialization causes no difference in task performance, whereas the movement patterns provided to the participants show significant difference in task performance. These findings seem to indicate that movement pattern is the most efficient way to communicate information and to foster learning processes in the “Harmonic Walk” environment.

Embodiment and Interaction as Common Ground for Emotional Experience in Music.

Hiroko Terasawa, Reiko Hoshi-Shiba, Kiyoshi Furukawa

Abstract. Physical activities and social interaction play crucial roles in the experience of musical emotion. This paper first discusses the physiological functions and social aspects related to music. Upon the observations we introduce the network structure underlying the emotional experience in traditional music, and extend the framework to contemporary computer music, in which computer-aided embodiment, interaction, and collaboration provide emotional experiences to the players.

Computer Generation and Perception Evaluation of Music-Emotion Associations. *Mariana Seïça, Ana Rodrigues, F. Amílcar Cardoso, Pedro Martins, Penousal Machado*

Abstract. Music is intertwined with human emotions as an artistic form with expressive qualities. We present a pilot study of music-emotion associations based on a generative system, which produces parameter-based music to represent four emotions: Happiness, Sadness, Calm, and Anger. To study the perceptual relevance of each parameter, we performed a series of user tests where participants explored multiple combinations of musical parameters to reach a representation for each emotion. Results were compared with the ones from previous studies and empirical experiments proposed by other authors, which gave us a starting point to evaluate each association and discover new possible connections. Although most of the associations were confirmed, a few discrepancies were found, such as the user preference for low pitch in Anger over the expected high pitch. These findings provide better insight and validation of the relationship between music and emotions, and thus a starting point to explore novel representations.

Situating Research in Sound Art and Design: The Contextualization of Ecosound. *Frank Pecquet*

Abstract. Discussed below are the implications resulting from the association of the following related disciplines: sound art and design. While each of these disciplines has a distinct meaning of its own, combining sound with art raises philosophical questions in aesthetics, even musicology, as sound in art tends to be thought of as a media to compose music. Combining sound and design may on the other hand lead to sound design, underlining a techno-scientific approach of a different nature linked to design sciences and techniques. Although this paper is not strictly dedicated to the comment on the notion of ecosound¹, it rather concerns general studies that may lead to contextualizing the notion itself, giving rise to epistemological questions. Moreover, this paper concerns “sound” in emergent sound disciplines, which may furthermore relate to the Anglo-Saxon concept of “sound studies” and which interests as well diverse fields of research, both techno-scientific and socio-scientific.

The Statistical Properties of Tonal and Atonal Music Pieces. *Karolina Martinson, Piotr Zieliński*

Abstract. Two solo flute pieces: *Allemande* from *Partita in A minor*, BWV 1013 by Johann Sebastian Bach and *Syrinx L. 129* by Claude Debussy, were analyzed. The article presents the results obtained from the statistical analysis of ascending and descending intervals, pitches (frequencies of the sound) and duration times. It was found that in the double logarithmic scale histograms of occurrence frequencies exhibit significant deviations from linear functions. The gradient of a line were usually smaller than -1, which indicates that Zipf's law is not fulfilled. Autocorrelation functions and periodograms have been calculated. The aim of this article is to compare pieces that are tonal and atonal. The frequency histograms allow one to classify the time signals as 'colourful noises'. *Syrinx* is close to the pink noise and *Partita in A minor* to the brownian noise.

Webmapper: A Tool for Visualizing and Manipulating Mappings in Digital Musical Instruments. *Johnty Wang, Joseph Malloch, Stephen Sinclair, Jonathan Wilansky, Aaron Krajeski, Marcelo M. Wanderley*

Abstract. This paper describes the motivation, implementation, and usage of the application Webmapper, a tool for visualizing and manipulating mappings in the context of digital musical instrument (DMI) design. Webmapper is a user interface for interacting with devices on the libmapper network, a distributed system for making dynamic connections between signals within discrete devices that constitute a DMI. This decoupling of the mapping as a separate entity allows flexible representation and manipulation by any tool residing on the network—exemplified by Webmapper. We demonstrate the capability and potential utility of providing different representations of mappings in the work-flow of DMI design under a variety of collaborative and individual use cases, and present four visualizations applied to mappings used from a previous project as a concrete example.

The Tragedy Paradox in Music: Empathy and Catharsis as an Answer? *Catarina Viegas, António M. Duarte, Helder Coelho*

Abstract. This paper suggests an hypothetical explanation for the Tragedy Paradox in music (i.e., the possible motivation to listening music that provokes negative feelings parallelly to the tendency to avoid negative experiences). On the basis of a literature review on neurobiology, philosophy of mind, psychology of art and social cognition, it is proposed that listening to sad music might promote a rewarding cathartic process, eventually driven by empathy based on mirror-neurons system activity and cognitive empathy mechanisms.

Zero-Emission Vehicles Sonification Strategy Based on Shepard-Risset Glissando. *Sébastien Denjean, Richard Kronland-Martinet, Vincent Roussarie and Sølvi Ystad.*

Abstract. We developed a sonification strategy for electric vehicles aiming to synthesize a new engine sound to enhance the driver's dynamic perception of his vehicle. We chose to mimic internal combustion engine (ICE) noise giving information to the driver through pitch variation. However, ICE noise pitch variation is correlated to engine RPM and its dynamic is covered in a limited vehicle speed range. To inform the driver with a significant pitch variation throughout the full vehicle speed range, we based our sonification strategy on the Shepard-Risset glissando. With this illusion, we can represent even low accelerations with significant pitch variation but keeping a constrained pitch even at high speeds. In a way, we stay within the metaphor of ICE noise with unheard gearshifts. We tested this sonification strategy in a perceptual test in driving simulator and showed that the mapping of this acoustical feedback affects the drivers' perception of vehicle dynamics.

Machines that Listen: Towards a Machine Listening Model based on Perceptual Descriptors. *Marco Buongiorno Nardelli, Mitsuko Aramaki, Sølvi Ystad, Richard Kronland-Martinet*

Abstract. Understanding how humans use auditory cues to interpret their surroundings is a challenge in various fields, such as music information retrieval, computational musicology and sound modeling. The most common ways of exploring the links between signal properties and human perception are through different kinds of listening tests, such as categorization or dissimilarity evaluations. Although such tests have made it possible to point out perceptually relevant signal structures linked to specific sound categories, rather small sound corpora (100-200 sounds in a categorization protocol) can be tested this way. The number of subjects generally do not exceed 20-30, since it is also very time consuming for an experimenter to include too many subjects. In this study we wanted to test whether it is possible to evaluate larger sound corpora through machine learning models for automatic timbre characterization. A selection of 1800 sounds produced by either wooden or metallic objects were analyzed by a deep learning model that was either trained on a perceptually salient acoustic descriptor or on a signal descriptor based on the energy contents of the signal. A random selection of 180 sounds from the same corpus was tested perceptually and used to compare sound categories obtained from human evaluations with those obtained from the deep learning model. Results revealed that when the model was trained on the perceptually relevant acoustic descriptors it performed a classification that was very close to the results obtained in the listening test, which is a promising result suggesting that such models can be trained to perform perceptually coherent evaluations of sounds.

Pedaling Technique Enhancement: a Comparison between Auditive and Visual Feedbacks. *Adrien Vidal, Denis Bertin, Richard Kronland-Martinet, Christophe Bourdin*

Abstract. In cyclism, the pedaling technique is rarely optimal but could be improved using sensory feedbacks. The most common media used to display data of cycling power meter is a small screen placed on the handlebars. However, it could be dangerous by distracting the visual attention of the cyclist. That is why auditive feedback, called sonification, is investigated. In this paper, the effects of auditive or visual feedbacks on pedaling technique (evolution of the torque effectiveness) are compared using a lab experimental setup when subjects were engaged or not in a dual-task paradigm (cycling and detecting obstacles on the road). Improvement of pedaling technique is observed with both auditory and visual feedbacks, and reaction times to detect obstacles were not different between all conditions. However, sonification allows gaze behaviors more centered on the road, i.e. more secure. These results suggest that sonification could be a good solution to improve pedaling technique.

Musical Gestures: An Empirical Study Exploring Associations between Dynamically Changing Sound Parameters of Granular Synthesis with Hand Movements.

*Eirini–Chrysovalantou
Meimaridou, George Athanasopoulos, Emiliós Cambouroopoulos*

Abstract: This study explores the relationship between music and movement, focusing on hand movements in relation to electronically produced sound events (granular synthesis). This relation is studied empirically by presenting pairs of hand and sound gestures (in the form of videos) to participants, while trying to find cases where correlations exist between the two. More specifically, the focus is on properties of sound such as pitch, density and dispersion (in the context of granular synthesis), as well as on their association and description through hand gestures. A complementary goal is to examine whether any correlations exist between the properties of the hand movements (kinetic velocity, direction or surface) to the sound characteristics mentioned above. 48 participants (F: 29; R: 21-34) were asked to rate the goodness of fit between hand gestures and accompanying sound events. Participant responses confirm findings from previous studies, while new interesting observations, such as the connection between sound dispersion and kinetic energy of motion, are noted.

Concatenative Synthesis Applied to Rhythm. *Francisco Monteiro, F. Amílcar Cardoso, Pedro Martins, Fernando Perdigão*

Abstract. Music and technology have a long symbiotic history together and became even more related in recent times, when technology is so present in our everyday lives. There is an ongoing need to develop new music creation tools that explore the possibilities presented by technological breakthroughs. Different forms of sound synthesis have surfaced over the years, including concatenative synthesis, which offers the ability to create music using large databases that modern computers can handle. We propose a concatenative synthesizer oriented towards rhythmic composition, which has the ability to create its own drum kit by interpreting an input drum audio signal. The system then recreates the input through different ways, including a variation algorithm based on Euclidean rhythms. It was implemented in the programming language Max/MSP and the extension Max For Live, in order to make it usable in the DAW environment. We have also created a basic interface to interact with the user.

'Visual-Music'? The Deaf Experience. 'Vusicality' and sign-singing. *Sylvain Brétéché*

Abstract. This article aims to consider the visual dimensions of music, based on the Deaf practices represented by the vusic and the sign-singing (song in Sign Language), seeking to think how they can bring to a de-normalized consideration of music, namely the *vusicality*.

Enhancing Vocal Melody Transcription with Auxiliary Accompaniment Information. *Junyan Jiang, Wei Li, Gus G. Xia*

Abstract. Monophonic vocal melody transcription is a classic task of content-based music information retrieval. However, for note-level transcription, the performance of current systems still cannot meet practical requirements. In this paper, we propose a novel algorithm to improve the performance of note-level monophonic vocal melody transcription by combining a Convolutional Recurrent Neural Network (CRNN) and the Conditional Random Field (CRF). Moreover, we propose a context-assisted method with two kinds of widely available auxiliary information, i.e., accompaniment audio and approximate word-level lyric timestamps. Experimental results show that our system significantly outperforms the baseline, and auxiliary accompaniment information can further improve the performance even when it is partially provided.

Extraction of Rhythmical Features with the Gabor Scattering Transform. *Daniel Haider, Peter Balazs*

Abstract. In this paper we use the scattering transform to extract wide-scale information of musical pieces in terms of rhythmical features. This transform computes a layered structure, similar to a convolutional neural network (CNN) but with no learning involved. Applied to audio it is able to capture temporal dependencies beyond those possible for common time-frequency representations. This is already demonstrated by experiments for modulations of single tones. Here we provide a setup to include real world music signals, which extends the temporal range to the scale where rhythm and tempo live, allowing very intuitive explanations of how these scales are reached. In this way we also get an intuition of the mechanics inside a neural network when “listening” to rhythm.

Kuroscillator: A Max-MSP Object for Sound Synthesis using Coupled-Oscillator Networks. *Nolan Lem, Yann Orlarey*

Abstract. This paper summarizes recent research using networks of coupled oscillators in real-time audio synthesis. We present two Max-MSP objects that synthesize the dynamics of these systems in real-time using both an additive and rhythmic synthesis model to generate complex timbre and rhythmic content. This type of self-organizing system presents many useful avenues of exploration in the field of sound synthesis and rhythmic generation. These objects allow users of Max-MSP to synchronize different ensembles of sinusoidal oscillators in real-time which can then be used as a vehicle for creative sound design, composition, and sound art.

Distinguishing Chinese Guqin and Western Baroque Pieces based on Statistical Model Analysis of Melodies. *Yusong Wu, Shengchen Li*

Abstract. This paper proposes a method to determine different genres of melody according to the melodic interval of the melody with Western Baroque and Chinese Guqin music used as an example. A melodic interval histogram and a Markov chain is proposed to differentiate Western Baroque and Chinese Guqin music, where the similarity is measured with KullbackLeibler divergence. A significance test is done and the results shows that our method is capable of distinguishing between Western Baroque and Chinese Guqin pieces. This conclusion further supports that extracting melodic interval features could be a possible way to distinguish symbolic music melody from different genre.

End-to-end Classification of Ballroom Dancing Music Using Machine Learning. *Noémie Voss, Phong Nguyen*

Abstract. 'Ballroom dancing' is a term used to designate a type of partnered dancing enjoyed both socially and competitively around the world. There are 10 different types of competitive ballroom dancing, each performed to different styles of music. However, there are currently no algorithms to help differentiate and classify pieces of music into their distinct dance types. This makes it difficult for beginner and amateur ballroom dancers to distinguish pieces of music, and know which type of dance corresponds to the music they are listening to. We proposed using an end-to-end machine learning approach to help classify music into different types with efficient and high accuracy. We evaluated four machine learning models and found that a Deep Neural Network with three hidden layers is the model with highest accuracy of 83%. As a result, ballroom dancers will have an easier method of distinguishing between specific types of ballroom dancing music.

An Evidence of the Role of the Cellists' Postural Movements in the Score Metric Cohesion. *Jocelyn Rozé, Mitsuko Aramaki, Richard Kronland-Martinet, Sølvi Ystad*

Abstract. While playing expressively, cellists tend to produce postural movements, which seem to be part of their musical discourse. This article actually highlights the existence of a metric embodiment, i.e. a natural encoding of the score metric structure through specific periodicities of the musicians' postural movements. By the means of constrained postural conditions, we assess the degradation of the metric coupling between postural and bowing gestures among several cellists. Results reveal that bowing displacements should be in coherence with their postural behavior in order to ensure a correct encoding of the metric hierarchy.

Demo Session

Chairman: Adrien Vidal (PRISM, AMU-CNRS, Marseille, France)

Synchronizing Performers using Self-scrolling Proportional Music Notation. *James Tsz-him Cheung*

Abstract. This demo session shows the progress of recent developments in Hamburg, in which a system of self-scrolling music notation helps synchronizing musicians using tablets over a wireless network, achieved by the combination of two self-developed open-source softwares: MaxScore and Drawsocket. This system allows performers to synchronize between each other under circumstances in which traditional means would fail (i.e. with a conductor). This opens vast possibilities for immersive live performances, with a higher flexibility in stage setting, as illustrated by concerts in May 2019 in which 144 musicians are synchronized over 860 meters of distance in St. Pauli Elbtunnel, Hamburg: a unique experience to both performers and audience. The system also enhances and eases the performance, since complex polyrhythms have become easier to play for players of all levels.

"Tales From the Humanitat" - A Multiplayer Online Co-Creation Environment. *Geoffrey Edwards, Jocelyne Kiss, Juan Nino*

Abstract. The fruit of more than three years of effort, "Tales From the Humanitat" is an online participatory environment developed to encourage various forms of co-creation in relation to a 19-book science fiction saga, written by Geoffrey Edwards and currently undergoing publication, and a range of production modalities. In particular, the environment was designed as a complement to a project aimed at developing a participatory opera based on one of the books of the saga. As a result, stations that provide interactive and participatory tools for music composition, dance choreography, vocal production and fan fiction elements are incorporated within the environment. The environment currently supports up to about 20 simultaneous participants, and allows for group co-creation initiatives to be organized. We will provide interested conference participants with access and coaching to use the environment.

Auditory Gestalt Formation for Exploring Dynamic Triggering Earthquakes. *Masaki Matsubara, Yota Morimoto, Takahiko Uchide*

Abstract. In seismology, seismologists usually visualize seismograms by plotting them on as a function of time. Proper visualizations help them determine the nature of earthquake source processes. However it is hard to determine the time span and frequency band to be focused on beforehand. In order to help investigating seismic wave propagation especially for discovering dynamic triggering earthquakes, we have been proposing interactive sonification system. The system leverages a capability of human auditory scene analysis to generate sound to be segregated into different objects. As a preliminary result, the seismic sonification for the 2011 Tohoku-oki earthquake successfully revealed a dynamic triggering event in the Hida area, Central Japan. The sonified sounds formed auditory gestalt and showed some characteristics and distributions such that seismologists can easily determine the time span and frequency band to be focused on. In this demo, we will provide the opportunity to listen sonified sounds and demonstrate the interactive sonification process.

Minimal Reduction. *Christopher Chraca*

Abstract. *Minimal Reduction* is an interactive sound installation where individuals will be put in the Engineer's Situation. Within this situation an individual will listen and manipulate the sound traits of recorded audio. This environment should lead an individual to enter the active listening axis which has reduced listening and heightened listening as the endpoints of the axis. This interactive sound installation is a demonstration of the Engineer's Situation and is meant to express the validity of the term. *Minimal Reduction* uses a Max/MSP patch to send audio out an Ambisonics surround sound system. The patch connects to an interactive device which has fourteen potentiometers, six knobs and eight faders, for individuals to control five sound traits of the recorded audio. The audio itself is an electroacoustic composition based on the musique concrète genre. Individuals who are on the active listening axis near reduced listening can understand the sounds or music by following the changes to the sound traits

M O D U L O. *Guido Kramann*

Abstract. M O D U L O is a real-time composition tool in the form of a board game and can be played on an android device. In this game there is a close connection between the musical structure and its symbolic representation on the board. The game pieces represent arithmetic operations. These are applied one after the other along a path of the shortest adjacent distances starting from a source tile representing the sequence $id(N_0) = 0, 1, 2, 3, 4, \dots$. The resulting altered mathematical sequences are converted into sounds. The contrahents in this two-person game, place alternately tiles on the board or move them. The goal of the game is to establish an own path by skilful moves, which consists of operations and operands as mutually different as possible and at the same time to prevent the opponent from doing so.

A Real-time Synthesizer of Naturalistic Congruent Audio-Haptic Textures. *Khoubeib Kanzari, Corentin Bernard, Jocelyn Monnoyer, Sébastien Denjean, Michaël Wiertlewski, Sølvi Ystad*

Abstract. This demo paper presents a multi-modal device able to generate real-time audio-haptic signal as response to the users' motion and produce naturalistic sensation. The device consists in a touch screen with haptic feedback based on ultrasonic friction modulation and a sound synthesizer. The device will help investigate audio-haptic interaction. In particular the system is built to allow for an exploration of different strategy of mapping audio and haptic signal to explore the limits of congruence. Such interactions could be the key to more informative and user-friendly touchscreens for Human-Machine-Interfaces.

WebAudio Plugins in DAWs and for Live Performance.

Michel Buffa, Jérôme Lebrun, Guillaume Pellerin

Abstract. As part of the ANR WASABI french research project, by collaborating with researchers and developers from other groups or companies, we recently introduced a WebAudio plugin standard (aka VSTs in a browser). In this demo, we propose to showcase some of the large set of WebAudio plugins we've already been developing. These are running in different host environments such as Amped Studio, an online digital audio workstation or directly in a virtual pedal board application more suited for live performances. The plugins are of different kinds: audio effects, virtual instruments (synthesizers), guitar amp simulations. These plugins can be connected together via audio or midi routes, and written using multiple approaches/programming languages such as JavaScript, DSL languages like FAUST or C/C++. Our plugin standard is unique today, quite well suited to the Web platforms (each plugin has a URI and can be downloaded and run on the fly by host applications), and relies on recent W3C standards such as WebComponents, WebAudio and WebMidi.

UPISketch2. *Rodolphe Bourotte*

Abstract. As early as the 1950s, Iannis Xenakis had the intuition to develop a machine that enabled one to break free from the constraints of traditional music notation while simplifying the exploration of this new way of composing. In his mind, this tool should facilitate, for example, the graphic and sound transcriptions of the glissandi in his breakout work *Metastaseis* from 1954. The prototype of a machine hybridizing drawing, sound synthesis and music was born only in 1977 in the research centre founded by Xenakis (CEMAMu): the UPIC (Unité Polyagogique Informatique of CEMAMu). The “agoric” suffix evokes all parameters specific to the expressiveness of music notation; by appending this to the prefix “poly”, Iannis Xenakis opened up the field of the compositional process by making drawing the main vector of music composition (graphically incorporating musical structure, sound, dynamics, envelopes, etc.). Different versions of the UPIC evolved at the CEMAMu, adapting the system to new technological capabilities, up to the creation of the UPIX solution (UPIC software) for Windows dating from 2001, which no longer depended on the specialized equipment manufactured by the CEMAMu.

MIMES: A Tool for Sound Exploration and Sound Prototyping.

Olivier Houix, Frédéric Bevilacqua, Diemo Schwarz, Nicolas Misdariis, Patrick Susini, Manuel Poletti, Thomas Goepfer

Abstract. In design, the notion of prototype is associated with the concept of intermediate objects (OI) which designates objects that are widely used and shared by the community, allowing ideas to be shaped and serving as a medium of mediation between the different actors of a project. Sound design necessitates the creation of “prototypes” (i.e. sketches) that remains a challenging process, alternating phases of ideation and creation. In the case of sound design, part of the difficulty resides in the need for sound designers to present and discuss early version of their sketches with stakeholders, who might be not familiar with sonic material and might be able to appreciate unfinalized sound creations. As part of a European project (Skat-VG, 2014 – 17), the issue of the sound prototype was investigated starting from the following observation: the graphic designer naturally uses a paper / pencil to materialize an idea in the form of a sketch. What about the sound designer? During this project, we were interested in vocal and gestural imitation as a technique of sketching, exploration and sound prototyping. We developed interfaces able to perform actions (vocal and / or gestural) and the design of synthesis tools allowing the transformation of these productions into sound sketches. In particular, MiMes is a new Max/MSP environment capturing a vocal production and modeling it as a parametrizable sound sketch. The vocal signal is described according to its morphological and timbre dimensions. The associated acoustic descriptors are used as input parameters of a corpus-based synthesis system. The process makes it possible to generate a synthetic version of the sketch having some acoustic similarities with the original vocal production while allowing to deviate from it and to explore other dimensions. The architecture allows, moreover, to mix several sound corpora, which can correspond to different textures (materials) or sound qualities (e.g., concrete vs. abstract). In the proposed demo, we will show the new version being developed as a Max for Live plugin. The aim is to integrate the creation of sound morphologies into a standard workflow of the sound designer. We hope this tool becomes a powerful means of sound exploration and a potential vector of creativity.

Melody Slot Machine. *Masatoshi Hamanaka*

Abstract. This demo describes our interactive music system called the “Melody Slot Machine”, which enables controlling the performance of a holographic performer. Although many interactive music systems have been proposed, manipulating performances in real time is difficult for musical novices because melody manipulation requires expert knowledge. Therefore, we developed the Melody Slot Machine to provide an experience of manipulating melodies by enabling users to freely switch two original melodies and morphing melodies.

Spatialized Seismic Soundscapes: Exploring Seismic Data in Virtual Reality. *Arthur Paté, Benjamin K. Holtzman, Lapo Boschi, Gaspard Farge, Anna C. Barth, Seth A. Cluett, Martin Pratt, Jason Candler, Douglas Repetto, Leif Karlstrom, Josh Crozier, Piero Poli, Kristina Okamoto, Johanna Nelson*

Abstract. Scientific data sonification has been in use for a couple decades now. Auditory display highlights certain patterns in the data, in particular spatial-temporal changes, to which our auditory system may be more sensitive than our visual system. Our team has been involved in sonification of seismic data, with applications in scientific outreach, communication, and using sound as a scientific tool to explore and analyze data. However, most of sonification work so far has only involved one or two audio channels. In this demo, we will build on several examples to show and explore the interest of using spatial audio techniques in sonification. Ongoing perceptual tests demonstrate that spatialized sonification enhances the perception of spatio-temporal patterns, which is a key parameter to the understanding of many aspects of earthquake physics, in particular micro-earthquakes in earthquake swarms.

CompoVOX 2: Generating Melodies and Soundprint from Voice in Real Time. *Daniel Molina Villota, Antonio Jurado-Navas, Isabel Barbancho*

Abstract. This project involves the development of an interactive application for musical sequence generation from human voice. There are used different characteristics of voice, as vowel sounds, central frequencies and level. Differences sequences of programming are developed in MAX MSP to parallelly make different layers of sounds related closely to properties of voice signal before stated. This application also allows to visualize a graphic interface that changes with the sounds produced by this software. At the end, we obtain an automatic and tonal musical composition and a sound print of human voice.

Open Mass-Interaction Toolkits for Creative Physical Modelling.

James Léonard, Jérôme Villeneuve

Abstract. We propose a demo session on the topic of mass-interaction physical modelling for sound and digital art, focusing on recent developments led within GIPSA-Lab's new ANIS (Arts Numériques et Immersions Sensorielles) research cell.

In particular, we will introduce a series of open-source software components that allow integrating modular mass-interaction models into various popular environments for digital creation: *mi-gen* a new and efficient library for Max/MSP, *mi_faust* which offers similar possibilities within FAUST, and *miPhysics* a Java library for interactive 3D physical models including visual, audio and haptic capabilities.

Starting from the very basics of mass-interaction physical modelling, we will assist participants in designing simple interactive virtual objects/musical instruments that can be interacted with in a variety of ways (MIDI controllers, multi-touch interfaces, open-source haptic devices, etc.). In addition, more advanced concepts and examples will be demonstrated (extensive real-time control of physical parameters and topology, mapping and control strategies for complete virtual instruments), including models used within the experimental music project *Orcae*.

Coretet: a 21st Century Virtual Interface for Musical Expression.

Rob Hamilton

Abstract. Coretet is a virtual reality musical instrument that explores the translation of performance gesture and mechanic from traditional bowed string instruments into an inherently non-physical implementation. Built using the Unreal Engine 4 and Pure Data, Coretet offers musicians a flexible and articulate musical instrument to play as well as a networked performance environment capable of supporting and presenting a traditional four-member string quartet. This paper discusses the technical implementation of Coretet and explores the musical and performative possibilities enabled through the translation of physical instrument design into virtual reality as realized through the composition and performance of *Trois Machins de la Grâce Aimante*.

Oral Session

“Audio Signal Processing - Music Structure Analysis”

Chairman: Keiji Hirata (Future University Hakodate, Japan)

09h00 - 09h20

Melody Slot Machine: Controlling the Performance of a Holographic Performer. *Masatoshi Hamanaka*

Abstract. This paper describes our interactive music system called the “Melody Slot Machine,” which enables controlling the performance of a holographic performer. Although many interactive music systems have been proposed, manipulating performances in real time is difficult for musical novices because melody manipulation requires expert knowledge. Therefore, we developed the Melody Slot Machine to provide an experience of manipulating melodies by enabling users to freely switch two original melodies and morphing melodies.

09h20 - 09h40

MUSICNTWRK: Data Tools for Music Theory, Analysis and Composition. *Marco Buongiorno Nardelli*

Abstract. We present the API for MUSICNTWRK, a python library for pitch class set and rhythmic sequences classification and manipulation, the generation of networks in generalized music and sound spaces, deep learning algorithms for timbre recognition, and the sonification of arbitrary data. The software is freely available under GPL 3.0 and can be downloaded at www.musicntwrk.com.

09h40 - 10h00

Feasibility Study of Deep Frequency Modulation Synthesis.

Keiji Hirata, Masatoshi Hamanaka, Satoshi Tojo

Abstract. Deep Frequency Modulation (FM) synthesis is the method of generating approximate or new waveforms by the network inspired by the conventional FM synthesis. The features of the method include that the activation functions of the network are all vibrating ones with distinct parameters and every activation function (oscillator unit) shares an identical time t . The network learns a training waveform given in the temporal interval designated by time t and generates an approximating waveform in the interval. As the first step of the feasibility study, we examine the basic performances and potential of the deep FM synthesis in small-sized experiments. We have confirmed that the optimization techniques developed for the conventional neural networks is applicable to the deep FM synthesis in small-sized experiments.

10h00 - 10h20

Description of Monophonic Attacks in Reverberant Environments via Spectral Modeling.

Thiago A. M. Campolina, Mauricio Alves Loureiro

Abstract. Note attack has an important role in music performance. By manipulating note attack quality, musicians are able to control timbre, articulation, rhythm, essential parameters for conveying their expressive intentions. We explored the idea of describing content of monophonic musical note attacks via Spectral Modeling Synthesis decomposition considering, independently, the harmonic content of reverberation in the attack region of the note being played. This approach allowed inferences about the interaction with room acoustics, enriching the study of musical performances in everyday practice condition where reverberant environments are always present. We tested the approach in a case study using recordings of an excerpt of a clarinet piece of the traditional classical repertoire, played by six professional musicians. A 2D confrontation of the extracted components was proposed. MANOVA tests indicated significant differences ($p < 0.05$) when considering the musician as a factor. We examined different legato, as well as articulated note transition presenting different performance technique demands.

Oral Session

“Auditory Perception and Cognition – Music and the Brain 1”

Chairman: Bruno Giordano (INT, Marseille, France)

11h00 - 11h20

Modeling Human Experts' Identification of Orchestral Blends Using Symbolic Information. *Aurélien Antoine, Philippe Depalle, Philippe Macnab-Séguin, Stephen McAdams*

Abstract. Orchestral blend happens when sounds coming from two or more instruments are perceived as a single sonic stream. Several studies have suggested that different musical properties contribute to create such an effect. We developed models to identify orchestral blend effects from symbolic information taken from scores based on calculations related to three musical properties/parameters, namely onset synchrony, pitch harmonicity, and parallelism in pitch and dynamics. In order to assess the performance of the models, we applied them to different orchestral pieces and compared the outputs with human experts' ratings in the Orchestration Analysis and Research Database (orchard.actor-project.org). Using different weights for the three parameters under consideration, the models obtained an average accuracy score of 81%. These preliminary results support the initial developments. Nevertheless, future work aims to investigate the weights of each musical property and to include audio analyses to take into account timbral properties as well.

11h20 - 11h40

The Effect of Auditory Pulse Clarity on Sensorimotor Synchronization. *Prithvi Kantan, Rareş Ştefan Alecu, Sofia Dahl*

Abstract. This study investigates the relationship between auditory pulse clarity and sensorimotor synchronization performance, along with the influence of musical training. 27 participants walked in place to looped drum samples with varying degrees of pulse clarity, which were generated by adding artificial reverberation and measured through fluctuation spectrum peakiness. Experimental results showed that reducing auditory pulse clarity led to significantly higher means and standard deviations in asynchrony across groups, affecting non-musicians more than musicians. Subjective ratings of required concentration also increased with decreasing pulse clarity. These findings point to the importance of clear and distinct pulses to timing performance in synchronization tasks such as music and dance.

11h40 - 12h00

The MUST Set and Toolbox. Ana Clemente, Manel Vila-Vidal, Marcus T. Pearce, Marcos Nadal

Abstract. We introduce a novel set of 200 Western tonal musical stimuli (MUST) for research on music perception and valuation. It consists of four subsets of 50 4-s motifs varying in balance, contour, symmetry, or complexity. They are musically appealing and experimentally controlled. The behavioral assessment aimed to determine whether musically untrained participants could identify variations in each attribute. Inter-rater reliability was high, and the ratings mirrored the design features well. Agreement served to create an abridged set. The computational assessment required developing a specific battery of computational measures that describe each stimulus in terms of its structural parameters. The distilled non-redundant composite measures proved excellent predictors of participants' ratings, and the complexity composite resulted better or as good as existing models of musical complexity. The MUST set and MATLAB toolbox constitute valuable resources for research in many fields and are freely available through OSF and GitHub.

Thursday 17 October

Keynote

“Computational Auditory scene Analysis as Causal Inference”

Josh McDermott (MIT, USA)



12h00 - 13h00

Abstract. A central computational challenge of everyday hearing, and of music perception, is the need to separate the distinct causes of sound in the world. The most commonly discussed version of this problem occurs with concurrent sound sources, often termed the ‘cocktail party problem’. However, analogous problems are posed by reverberation, in which the sound from a source interacts with the environment (via reflections) on its way to the ears, as well as by sound-generating object interactions, in which the physical properties of multiple objects jointly determine the sound. Dating back to Helmholtz, perceptual judgments have been considered the result of unconscious inference, in which our perceptual systems determine the most likely causes of sensory stimuli in terms of structures and events in the world. Despite the conceptual appeal of this view, perceptual inference has historically been difficult to instantiate in working computational systems for all but the simplest perceptual judgments. In this talk I will revisit the notion of scene analysis as inference, leveraging recent computational developments that make inference newly feasible and exploring neglected classes of everyday scene analysis problems along with classical auditory scene analysis.

Josh McDermott is a perceptual scientist studying sound and hearing in the Department of Brain and Cognitive Sciences at MIT, where he is an Associate Professor and heads the Laboratory for Computational Audition. His research addresses human and machine audition using tools from experimental psychology, engineering, and neuroscience. McDermott obtained a BA in Brain and Cognitive Science from Harvard, an MPhil in Computational Neuroscience from University College London, a PhD in Brain and Cognitive Science from MIT, and postdoctoral training in psychoacoustics at the University of Minnesota and in computational neuroscience at NYU. He is the recipient of a Marshall Scholarship, a James S. McDonnell Foundation Scholar Award, an NSF CAREER Award, and the Troland Award from the National Academy of Sciences.

Oral Session

“Music Information Retrieval – Music, Emotion and Representation 2”

Chairman: Diemo Schwarz (IRCAM, Paris, France)

14h30 - 14h50

Ensemble Size Classification in Colombian Andean String Music Recordings. *Sascha Grollmisch, Estefanía Cano, Fernando Mora Ángel, Gustavo López Gil*

Abstract. Reliable methods for automatic retrieval of semantic information from large digital music archives can play a critical role in musicological research and musical heritage preservation. With the advancement of machine learning techniques, new possibilities for information retrieval in scenarios where ground-truth data is scarce are now available. This work investigates the problem of counting the number of instruments in music recordings as a classification task. For this purpose, a new data set of Colombian Andean string music was compiled and annotated by expert musicologists. Different neural network architectures, as well as pre-processing steps and data augmentation techniques were systematically evaluated and optimized. The best deep neural network architecture achieved 80.7% file-wise accuracy using only feed forward layers with linear magnitude spectrograms as input representation. This model will serve as a baseline for future research on ensemble size classification.

14h50 - 15h10

Towards User-informed Beat Tracking of Musical Audio. *António Sá Pinto, Matthew E. P. Davies*

Abstract. We explore the task of computational beat tracking for musical audio signals from the perspective of putting an end-user directly in the processing loop. Unlike existing “semi-automatic” approaches for beat tracking, where users may select from among several possible outputs to determine the one that best suits their aims, in our approach we examine how high-level user input could guide the manner in which the analysis is performed. More specifically, we focus on the perceptual difficulty of tapping the beat, which has previously been associated with the musical properties of expressive timing and slow tempo. Since musical examples with these properties have been shown to be poorly addressed even by state of the art approaches to beat tracking, we re-parameterise an existing deep learning based approach to enable it to more reliably track highly expressive music. In a small-scale listening experiment we highlight two principal trends: i) that users are able to consistently disambiguate musical examples which are easy to tap to and those which are not; and in turn ii) that users preferred the beat tracking output of an expressive-parameterised system to the default parameterisation for highly expressive musical excerpts.

15h10 - 15h30

Drum Fills Detection and Generation. *Frédéric Tamagnan, Yi-Hsuan Yang*

Abstract. Drum fills are essential in the drummer's playing. They regularly restore energy and announce the transition to a new part of the song. This aspect of the drums has not been explored much in the field of MIR because of the lack of datasets with drum fills labels. In this paper, we propose two methods to detect drum fills along a song, to obtain drum fills context information. The first method is a logistic regression which uses velocity-related handcrafted data and features from the latent space of a variational autoencoder. We give an analysis of the classifier performance regarding each features group. The second method, rule-based, considers a bar as a fill when a sufficient difference of notes is detected with respect to the adjacent bars. We use these two methods to extract regular pattern/ drum fill couples in a big dataset and examine the extraction result with plots and statistical test. In a second part, we propose a RNN model for generating drum fills, conditioned by the previous bar. Then, we propose objective metrics to evaluate the quality of our generated drum fills, and the results of a user study we conducted. Please go to <https://frederictamagnan.github.io/drumfills/> for details and audio examples.

15h30 - 15h50

Discriminative Feature Enhancement by Supervised Learning for Cover Song Identification. *Yu Zhesong, Chen Xiaoou, Yang Deshun*

Abstract. Cover song identification is to identify, for a query audio track, other recordings of the same composition, which shows potential use in music management and license protection. Existing methods involve complex sequence matching algorithms and hand-crafted features, where a further breakthrough is hard to be achieved. In this paper, exploiting large-scale data, we explore several supervised learning methods to enhance hand-crafted features and extract discriminative features for cover song retrieval. Experimental results show that the enhanced feature highly improve the precision on several datasets with low time complexity.

Oral Session

“Auditory Perception and Cognition – Music and the Brain 2”

Chairman: J. Mc Dermott (MIT, USA)

16h30 - 16h50

Perception of the Object Attributes for Sound Synthesis

Purposes. *Antoine Bourachot, Khoubbeib Kanzari, Mitsuko Aramaki, Sølvi Ystad, Richard Kronland-Martinet*

Abstract. This paper presents a work in progress on the perception of the attributes of the shape of a resonant object. As part of the ecological approach to perception – assuming that a sound contains specific morphologies that convey perceptually relevant information responsible for its recognition, called invariants – the PRISM laboratory has developed an environmental sound synthesizer aiming to provide perceptual and intuitive controls for a non-expert user. Following a brief presentation of the different strategies for controlling the perceptual attributes of the object, we present an experiment conducted with calibrated sounds generated by a physically-informed synthesis model. This test focuses on the perception of the shape of the object, more particularly its width and thickness since these attributes, especially the thickness, have not been much studied in the literature from a perceptual point of view. The first results show that the perception of width is difficult for listeners, while the perception of thickness is much easier. This study allows us to validate the proposed control strategy. Further works are planned to better characterize the perceptual invariants relevant for shape perception.

16h50 - 17h10

A Proposal of Emotion Evocative Sound Compositions for Therapeutic Purposes.

Gabriela Salim Spagnol, Li Hui Ling, Il Min Li, Jônatas Manzolli

Abstract. Recognition and understanding of emotions is a path for self healing. We have worked with Mandalas of Emotions, derived from the Traditional Chinese Medicine (TCM), as a complementary therapy. In this paper, we present the conceptual framework related to the creation of sound collages for the five elements of TCM and assessment of these compositions by experienced holistic therapists. Results present quantitative data, according to scales for relaxation, arousal and valence, and qualitative data from transcription and analysis of the recorded responses of volunteers. In our study, the most common perceptions were warmth, irritation, peace and fear. The innovation of this proposal may stimulate further research on emotion-evoking sounds, and in sound composition.

17h10 - 17h30

The Influence of Non-Linear Phenomena on the Perception of the Strength of an Impact: Towards a Perceptually Consistent Control of Sound Synthesis Processes.

Samuel Poirot, Stefan Bilbao, Richard Kronland-Martinet

Abstract. In this paper, we propose to verify that non-linear behaviors due to large deformations have a significant influence on the perceived impact strength when listening to percussive sounds. The approach consists in generating a corpus of sounds from a physical model of non-linear vibrations of thin plates, then quantifying the effect of non-linear phenomena on the perceived strength through a listening test. This study is the first step towards the development of signal transformation models to improve the means of expression when using synthesis processes. Future work will focus on modelling sound morphologies corresponding to non-linear behaviors and propose a transparent control strategy.

Workshop

“Introduction to the Bach Library”

Organizer: Andrea Agostini

09h00 - 13h00, Campus Joseph Aiguier

The bach package for Max (<https://cycling74.com/>) is a freely-distributed library (www.bachproject.net) of more than 200 modules, aimed at easing work in the fields of musical representation, algorithmic and computer-aided composition, as well as generic data manipulation. bach features musical notation editors able to display both traditional and augmented scores, including directives for sound synthesis and DSP processes, completely controllable via a rich GUI or scriptable through Max messages; graphical interfaces for alternative musical representations, (such as clock diagrams and tonnetz); advanced tools for list manipulation; combinatorial and matrix-calculus tools; and, in the latest version, a full-fledged, textual programming language for easing the implementation of algorithms that would be too complex to comfortably program in plain Max.

bach has been under continuous development since 2010; it has won the 'Piccialli' prize of the AIMI and the 'Prix du Jeune Chercheur' of the AFIM (respectively, the Italian and francophone association for musical informatics); it is taught in various computer music schools around the world, including the IRCAM Coursus of composition and musical informatics; and it is considered as having at least 2000 users.

This hands-on workshop will provide an overview of some advanced programming techniques that can be used effectively with bach. Namely, these include inclusion of explicit functional and imperative traits in bach-based Max patches; textual coding, both as scripts for the bach.roll and bach.score musical notation editors and as actual Turing-complete, functional programs for the new bach.eval object; and, if time allows it, some hints at constraint programming.

Workshop structure

- Presentation of the bach library, its philosophy, goals and overarching design principles. (30 min.)
- The twomain notation editors: basic graphical and message-based interactions. Implementation of some elementary processes of generation and transformation of musical material. (30 min.)
- The main bach data structure, called llll. Principles of operation and main related operators. Implementation of processes based upon manipulation of lllls. (1h)
- Controlling DSP processes through bach. Implementation of a simple control system for a synthesizer. (1h)
- Brief overview of real-life usage examples. (30 min.)
- Q&A (30 min.)

Workshop

“Advanced Programming with the Bach Library”

Organizer: Andrea Agostini

14:00 - 17:00, Campus Joseph Aiguier

Workshop structure

- Brief introduction to some essential concepts of the bach library, and demonstration of a few examples of problematic processes to be implemented in the typical non-functional data flow style of Max. (30 min.)
- Adoption of programming traits inspired by functional and imperative languages. (30 min.)
- Scripting bach's notation editors through textual methods. (30 min.)
- Introduction to bell, a new textual programming language included in the bach distribution and exposed through the bach.eval object. (1h)
- Introduction to constraint programming with bach. (1h)
- Q&A (30 min.)

Andrea Agostini (andreaagostini@conservatoriotorino.eu)

Andrea is a composer of both instrumental and electronic music, as well as a computer music researcher. He has studied mostly in Italy and France, and attended the two-year course in composition and musical informatics at IRCAM, Paris. His curiosity for the totality of musical languages brought him to work in the domains of rock and improvisation, and to study non-Western musical practices. His music integrates these influences into a coherent mesh, without renouncing the potential of organization and complexity and the technical achievements that are specific of contemporary music as a genre.

He is one of the developers of the software libraries for computer-aided composition bach: automated composer's helper and cage; he has worked with various artists and musicians as their assistant programmer; he has collaborated with IRCAM as a Composer in Research in 2011 and 2013, and as an artistic research fellow in 2017; he is professor of computer music at the Conservatory of Turin and the Scuola Civica 'Claudio Abbado' in Milan, and he regularly delivers workshops, presentations and masterclasses about his research and artistic work in the most important European and American institutions.

Session and Workshop

“Ubiquitous Music”

Organizer: Damián Keller, Amazon Center for Music Research (UFAC/IFAC) and Leandro Costalonga, Federal University of Espírito Santo (NESCO/UFES)

09h00 - 13h00 and 14:00 - 17:00

Campus Joseph Aiguier, Salle Pierre Desnuelles

Ubiquitous music (ubimus) is a new area of research grounded on recent developments in artistic practice, community-based educational approaches and convergent technological advances that target the expansion of the creative resources for non-musicians and for musicians in everyday contexts. Ubimus proposals encompass research based on ubiquitous and mobile computing, DIY electronics, participatory design, ecologically based creative practice and interaction aesthetics, highlighting emerging issues such as the artistic use of the Internet of Musical Things (IoMusT), the strategies for support of everyday musical creativity and the enhanced possibilities of lay-musician interaction.

We welcome demonstrations and position papers that target conceptual, technological or artistic explorations of current or future ubimus scenarios. This Ubiquitous Music Workshop will feature artistic, technical and theoretical discussions to encourage new collaborations among research groups based in Europe and Brazil. A key objective is to draft a research agenda that addresses issues such as sustainability, social acceptability and the expanded access to musical creative practices in both central and peripheral countries. This initial bridge between the CMMR and the ubimus communities promises to be fruitful and fun.

Topics and goals

- Participatory design
- DIY electronics
- Professional and everyday creativity
- Digital arts
- Information technology creative practices
- Community-oriented educational technologies
- Ubiquitous and mobile computing
- Embedded-embodied cognition
- Computer-supported collaboration
- Lay-musician interaction
- Music interaction design
- Interaction aesthetics
- Internet of musical things

Musicality Centred Interaction Design to Ubimus: A First Discussion. *Leandro Costalonga, Evandro Miletto, Marcelo S. Pimenta*

Abstract. All humans share a predisposition for music even those who consider themselves to be “unmusical”. Until recently, most scholars were wary of the notion that music cognition could have a biological basis, and this fact reflects on the limited support HCI offers to the design of ubimus technology. In this paper, we present a preliminary discussion on five main aspects of human nature that can be applied to ubimus interaction design including (i) materiality and physicality of musical instruments; (ii) consciousness achieved when skills and challenges are in equilibrium during musical learning; (iii) natural mappings of gestures and movements; (iv) ability to recognize and synchronize with auditory signals; and finally (v) usage of (true) imitation as an strategy to musical learning and communication. It is our intention to point some ideas, concepts and principles that could be used as initial set of interaction design guidelines for improving User eXperience (UX) when developing digital music instruments in ubimus context.

A Soundtrack for Atravessamentos: Expanding Ecologically Grounded Methods for Ubiquitous Music Collaborations. *Luzilei Aliel, Damián Keller, Valeska Alvim*

Abstract. We tackle the creative development of a soundtrack for a video-dance artwork entitled Atravessamentos. Our exposition follows two strands: 1) The processes of creative sharing - involving the production of a collaborative artistic work; 2) The development of a multimodal artistic proposal through the application of an ecologically grounded approach. An overview of ecologically grounded creative practices serves to set the context for a discussion of the artistic strategies employed in this project. The contributions include: an expanded notion of shifting, incorporating the concept of cognitively dissonant strategies and the introduction of acoustic-instrumental synthesis as an ecologically grounded technique. We discuss the implications of the application of these strategies within the context of current creative practices in ubiquitous music.

The Analogue Computer as a Voltage-Controlled Synthesiser. *Victor Lazzarini, Joseph Timoney*

Abstract. This paper re-appraises the role of analogue computers within electronic and computer music and provides some pointers to future areas of research. It begins by introducing the idea of analogue computing and placing in the context of sound and music applications. This is followed by a brief examination of the classic constituents of an analogue computer, contrasting these with the typical modular voltage-controlled synthesiser. Two examples are presented, leading to a discussion on some parallels between these two technologies. This is followed by an examination of the current state-of-the-art in analogue computation and its prospects for applications in computer and electronic music.

Sounding Spaces for Ubiquitous Music Creation.

Marcella Mandanici

Abstract. This paper discusses the use of large-scale responsive environments for ubiquitous music creation. A short analysis of how people listen to music in everyday life settings and of active listening practices and applications outlines the function of everyday music listening and the shift towards the concept of ubiquitous music creation. Three models for the creative use of space are presented based on music application examples: the bi-dimensional slider, the interactive landmarks and the grid. Large-scale interactive environments may be embedded in public and private spaces and allow music creative practices for many users, learners or people with disabilities.

Ubiquitous Music, Gelassenheit and the Metaphysics of Presence: Hijacking the Live Score Piece *Ntrallazzu 4*.

Marcello Messina, Luzilei Aliel

Abstract. Originally composed by Marcello Messina, *Ntrallazzu* is a cycle of pieces for live score and electronics built on Max, and involving various instrumental line-ups. In particular, *Ntrallazzu 4* was performed by Luzilei Aliel on the pifano and electric guitar in São João del Rei during the VIII UbiMus workshop. Aliel's particular setup also involved a further layer of processing: namely, the usage of Pure Data alongside Ableton Live in order to literally hijack the original piece and open a whole set of unforeseen possibilities that abundantly transcend the original intentions. In this paper, we signify our experience by means of the concept of comprovisation, while we situate *Ntrallazzu 4* within the domain of ubiquitous music. Furthermore, we make use of the Heideggerian concept of Gelassenheit and of the Derridean concept of Metaphysics of Presence (as reformulated by Joseph Pugliese) in order to make sense of the piece.

Live Patching and Remote Interaction: A Practice-Based, Intercontinental Approach to *Kiwi*. Marcello Messina, João Svidzinski, Deivid de Menezes Bezerra, David Ferreira da Costa

Abstract. This paper introduces, documents and reflects on an intercontinental live patching experience based on simultaneous remote interaction using the software *Kiwi*, and that can be subsumed under several features of Ubiquitous Music. The experience involved two academic groups based in three different universities between Brazil and France, namely, a research group from the two Brazilian Federal Universities of Acre and Paraíba, and a working group based at the University Paris 8 in France. The intercontinental simultaneous interaction may trigger reflections on the implications of the presence/absence of the human being, on the implicit patterns of territorialisation reproduced in the context of intercontinental live patching, and on the operative action of mnemonic processes within the practice.

Brief history of the Ubiquitous Music Group

The Ubiquitous Music Group (g-ubimus) is a network of researchers encompassing engineers and computer scientists, educators and musicians, with members and collaborators based in Brazil, Europe, North America and Oceania. The g-ubimus started its activities in 2007 and has received institutional support from various Brazilian and international funding agencies. Since 2010, the workshops on ubiquitous music bring together researchers from various fields to discuss concepts, methods and results of this emerging research area. Ubiquitous music (ubimus) explores the convergence of participatory artistic practices based on mobile and distributed technologies, while fostering the integration of recent advances in music making, cognitivism, education, computing.

Damián Keller (dkeller@ccrma.stanford.edu)

Dr. Damián Keller. Associate professor, Federal University of Acre, Brazil. Principal investigator of the Amazon Center for Music Research (UFAC/IFAC). Co-founder and member of the Ubiquitous Music Group. Has published over 150 articles on music, computing and creativity. Books include: Music Creation and Technologies (Anppom, 2010), Ubiquitous Music (Springer, 2014), Applications in Ubiquitous Music (Anppom, 2018).

Leandro Costalonga (leandro.costalonga@ufes.br)

Dr. Leandro Costalonga. Assistant professor, Federal University of Espírito Santo, Brazil. Head of the Computer Music Research Group of Espírito Santo (NESCoM), Member of the Ubiquitous Music Group. Has published over 50 articles on Computer Music related topics. Other research interests include Human-Computer Interaction, Programming Languages and Artificial Intelligence.

Workshop

“Sound Morphing and the Sonic Continuum”

Organizer: Marcelo Caetano and Charalampos Saitis

09h00 - 13h00 Campus Joseph Aiguier

Sound morphing is a sound transformation that gradually blurs the categorical distinction between the sounds being morphed by blending their sensory attributes. Sound-morphing techniques allow synthesizing sounds with intermediate timbral qualities by interpolating sounds from different musical instruments, for example. Sound morphing finds applications in music composition and performance due to the possibility of creating hybrid sounds that are intermediate between a source and a target sounds.

The Sound Morphing Toolbox (SMT) contains MATLAB implementations of sound modeling and transformation algorithms used to morph musical instrument sounds. The SMT is open-source and freely available on GitHub (<https://github.com/marcelo-caetano/sound-morphing>), making it highly flexible, controllable, and customizable by the user. This hands-on workshop is aimed mainly at less technically inclined participants such as composers or researchers without the technical background. During the workshop, participants will be guided on how to use the SMT step by step. Our aim is to provide an intuitive rather than technical understanding of the audio processing algorithms used. By the end of the workshop, the participants will be able to make informed decisions about audio processing algorithms and parameter values and use the SMT on their own. Additionally, the workshop will draft a research agenda for sound morphing that introduces technical aspects, aesthetic and perceptual issues. Finally, we will identify shortcomings of the currently available pieces of morphing software listed above and research opportunities.

The twentieth century witnessed a compositional paradigm shift from pitch and duration to timbre. The advent of the digital computer revolutionized the representation and manipulation of sounds, opening up new avenues of artistic and scientific exploration. The quest for “new timbres” led to the development of sound transformation techniques usually referred to as sound morphing. Uniquely situated at the crossroads of art and science, and thus highly relevant to the CMMR community, sound morphing allows to create hybrid timbres along the sonic continuum between two sounds, with great creative and research potential.

This workshop will feature short tutorials and a group-based activity to stimulate art-science cross-communal knowledge exchange on sound morphing applications in computer music creative practice and psychoacoustical research. This workshop has three main goals:

- To compile and openly share a list of available resources for sound morphing techniques and software;
- To offer a hands-on demonstration of musical instrument sound morphing using the freely available Sound Morphing Toolbox;
- To draft a research agenda for sound morphing that addresses issues such as interdisciplinary synergies and open access resources.

Much like the infamous Bush/Obama morph, this workshop promises to be thought-provoking and fun.

Marcelo Caetano (mcaetano@inesctec.pt)

Marcelo Caetano received the Ph.D. degree in signal processing from UPMC Paris 6 University in 2011 under the supervision of Prof. Xavier Rodet, then head of the Analysis/Synthesis group at IRCAM. In 2017, he received competitive funding from the Portuguese Foundation for Science and Technology to develop a three-year project on sound modeling and transformation in the SMC group at INESC-TEC. He has published over 40 peer-reviewed articles in international journals and conferences with more than 300 citations (h-index 11). His current research interests are computer-aided musical orchestration and audio processing such as musical instrument sound modeling and sinusoidal parameter estimation with applications in sound analysis, synthesis, and transformation.

Charalampos Saitis

*Charalampos Saitis holds a PhD in Music Technology from McGill University. He is currently Lecturer in Digital Music Processing in the Centre for Digital Music at Queen Mary University of London. He has published over 40 articles on the topics of auditory perception and cognition, musical acoustics, and musician-instrument interaction. His research aims to quantify how listeners process and conceptualize sound quality, focusing especially on crossmodal semantic processing and the link between perception, language and meaning. Edited books include *Timbre: Acoustics, Perception, and Cognition* (Springer, 2019) and *Musical Haptics* (Springer, 2018).*

Workshop

“MUSICNTWRK: Unleashing Data Tools in Music Theory, Analysis and Composition”

Organizer: Marco Buongiorno Nardelli

14h00 - 17h00 Campus Joseph Aiguier

Big data tools have become pervasive in virtually every aspects of culture and society. In music, application of such techniques in Music Information Retrieval applications are common and well documented. However, a full approach to musical analysis and composition is not yet available for the music community and there is a need for providing a more general education on the potential, and the limitations, of such approaches. From a more fundamental point of view, the abstraction of musical structures (notes, melodies, chords, harmonic or rhythmic progressions, timbre, etc.) as mathematical objects in a geometrical space is one of the great accomplishments of contemporary music theory. Building on this foundation, the organizer has generalized the concept of musical spaces as networks and derived functional principles of compositional design by the direct analysis of the network topology. This approach provides a novel framework for the analysis and quantification of similarity of musical objects and structures, and suggests a way to relate such measures to the human perception of different musical entities. Finally, the analysis of a single work or a corpus of compositions as complex networks provides alternative ways of interpreting the compositional process of a composer by quantifying emergent behaviors with well-established statistical mechanics techniques. Interpreting the latter as probabilistic randomness in the network, the organizer developed novel compositional design frameworks that are central to his own artistic research.

This workshop is intended to provide CMMR participant with a hands-on introduction to data tools as implemented in the MUSICNTWRK code developed by the organizer and freely available at www.musicntwrk.com. Combining lecture and tutorial sections, the participants will be able to explore the main features of the MUSICNTWRK combined with other popular data management and visualization tools (Pandas, TensorFlow, Gephi, etc.). The goal is to provide enough information that the participant will be able to integrate this framework within their own scientific or artistic practice.

This workshop is intended to introduce the CMMR community to the use of data science tools (network theory, machine learning etc.) in the field of music theory, analysis and composition, and the physical and perceptual characterization of sound. The format will be mixed, with lecture-style and hands-on sections. Participants will be introduced to the MUSICNTWRK package (www.musicntwrk.com), a python library comprised of four modules:

- pcsPy - pitch class set classification and manipulation; construction of generalized pitch class set networks using distances between common
- descriptors; the analysis of scores and the generation of compositional frameworks
- rhythmPy - rhythmic sequence classification and manipulation; and construction of rhythmic sequence networks using various definitions of rhythmic distance
- timbrePy - orchestration color networks; analysis and characterization of timbre from a (psycho-)acoustical point of view; and machine learning models for timbre recognition
- sonifiPy - a module for the sonification of arbitrary data structures, including automatic score (musicxml) and MIDI generation

Participants will learn how to work with standard data manipulation and visualization tools, like Pandas, TensorFlow, Gephi, etc. and how to integrate all of the above in a compositional or analytic framework. Previous knowledge of Python and familiarity with programming languages is recommended. Participants will need to have their own laptop to take full advantage of the hands-on sections. All exercises will be run using the Google Colaboratory cloud environment and jupyter notebooks, so there will be no restrictions on individual devices, operating systems or software installations.

Marco Buongiorno Nardelli (mbn@unt.edu)

Marco Buongiorno Nardelli is University Distinguished Research Professor at the University of North Texas: composer, media artist, flutist, computational materials physicist, and a member of CEMI, the Center for Experimental Music and Intermedia, and iARTA, the Initiative for Advanced Research in Technology and the Arts. He is a Fellow of the American Physical Society and of the Institute of Physics, and a Parma Recordings artist.

Artistic Programme

October 15th, 16th and 17th, 14h - 18h, at "La Friche"

Miniature Opera Project #2: "The Messengers" a CosmOpera.

Marco Buongiorno Nardelli, music and scenography

Claude Vallée, Cosmophone

"The Messengers" is built around the concept of the Cosmophone, which is an installation designed to detect cosmic rays, elementary particles originating from distant galactic phenomena. Using a grid of sensors, it materializes their trajectories and characteristics in space using sounds. Building on this platform, "The Messengers" begins from where my previous immersive, collaborative work FutureCoast (futurecoast.org) ended, the collection of voicemails that have arrived from the future. Each of the chosen voicemails is made public as a musical event that is guided by the response of the Cosmophone to the detection of a cosmic ray, the messenger. When operated as an installation, the choice of the particular voicemail is left to the visitors, who, before entering the installation, will choose a "chronofact" that will be decoded in turn. The musical gestures in this mode of fruition are prerecorded. When staged as a real-time performance, the singers will choose the chronofacts and the cosmophone will work both as a conductor (controlling the deployment of cues and of musical ideas to the performers) and as an independent instrument on stage (fixed media and electronics).

October 14th to 19th (on demand) at Campus Joseph Aiguier

Massilia, Carnet de bord - Binaural version for headphones and sound walk.

Cécile Le Prado

Charles Bascou, sound space setup

Massilia, Carnet de bord is part of the Escales project, sound creations specially designed for the fitting rooms of the Galeries Lafayette Marseille Prado department store and commissioned by GMEM.

"The stopover in Marseille began on December 15, 2018. I started recording anything around the place where I live, at the end of the wharf. I enlarged my concentric circles from St Laurent to pass in front of the pilot boat, around Fort St Jean to the Major. This part of the port is the boundary between cruise ships, shuttles to Corsica or Algeria and then the smaller trips to Frioul, Estaque or Pointe Rouge. On December 26th, departure of the J4 to follow Terminal 1, cross the Joliette market and return to the Panier area. The sound landscape gradually slips from an open space to an intimate area where voices bounce off the walls. In the following days, I leave my systematic paths to look for specific sounds and ambiances. I extend my map towards the end of the harbor and then to the south. Of all these sound recordings, I keep in mind, when I listen to them again, the impressions of the place. Some sounds evoke movement, space, others bring elements of dramaturgy. Finally, some fragments extracted from their context reveal more abstract, more musical particularities. I propose to the listener, during the conference, a binaural version of the musical composition "[Cécile Le Prado]

Concert

"La Friche", Grand Plateau

19:15 - 19:45

Turenas (1972). *John Chowning*

"This was the first widely presented composition to make exclusive use of frequency modulation synthesis, discovered by Chowning in 1967. It is also makes use of a technique for creating the illusion of sounds in motion through a quadraphonic sound space. Leland Smith's program Score was used to create the input data for the spatial and synthesis algorithms. In 1978 Turenas was regenerated on a real-time digital synthesizer designed by Peter Samson (the Samson Box), and in 2009 Bill Schottstaedt (CCRMA) created a software emulation of the Samson Box that allowed Turenas to be recomputed to meet current audio standards.

Present at the premiere at the premiere of Turenas in Dinkelspiel Auditorium, Stanford University on April 28, 1972, were Martin Bresnick, Andrew Imbrie, Gyorgy Ligeti, Loren Rush, and Ivan Tcherepnine, who wrote the following notes in 1973 for a concert at Harvard University." (John Chowning)

"This computer-generated tape composition makes extensive use of two major developments in computer music pioneered and developed by John Chowning, working at Stanford's Artificial Intelligence Lab. The first involves the synthesis of moving sound sources in a 360-degree sound space, which takes into account the effects of the Doppler shift. The second was a breakthrough in the synthesis of "natural" (as well as almost "supernatural") timbres in a simple but elegant way, using accurately controlled frequency modulation. This is the technical background, but the piece is not about that background.

The title "Turenas" is an anagram of "Natures", evoking the way sounds "tour" through the space, transparent and pure, produced by the most technologically sophisticated means yet tending to sound perfectly natural, as if a dream could come true." [Ivan Tcherepnine, 1943-1998]

Duet for one pianist - eight sketches for MIDI piano and computer (1989), for piano Disklavier and computer.

Jean-Claude Risset

Hélène Pereira, piano

This is probably the first duet for a single pianist: in addition to the pianist's part, a second part is played on the same piano - an acoustic piano, with keys, strings and hammers - by a computer which follows the pianist's performance. This requires a special piano - here a Yamaha Disklavier - equipped with MIDI inputs and outputs. On this piano, each note can be played on the keyboard, but it can also be activated by electrical signals: these signals trigger motors which actually depress or release the keys.

Mutations (1969)

Commissioned by the Groupe de Recherches Musicales, Mutations (1969) was entirely synthesized by computer at Bell Laboratories.

This piece attempts to exploit, especially in harmonic order, some of the possibilities offered by the computer to compose the sound itself. Thus, at the very beginning, the same motif appears first in melodic form, then harmonic - as a chord, finally in the form of a timbre, as a simulacrum of a gong which is like the shadow of the previous chord - the harmony is extended into the timbre.

The title refers to the gradual transformations that take place during the piece, including the transition from a discontinuous pitch scale to continuous frequency variations. This passage is made through developments in mutations - in the sense of the organ's mutation (or mixture) : the gradual addition of higher and higher harmonics gives rise to a network of increasingly narrow intervals. Continuous sounds slide towards higher pitches following an ascending "spiral" that can continue indefinitely - a paradox or an acoustic illusion. Then a bridge that - for the first time in a musical work - calls upon John Chowning's frequency modulation technique, a recapitulation of continuous and discontinuous pitch scales is heard, up to an end point that releases the high and low frequency components from the initial harmonic structures.

Mutations was awarded at the International Electronic Music Competition, Dartmouth 1970.

Voilement (1987), saxophone and electronics

Joël Versavaud, saxophone

Charles Bascou, electronics

Voilements, for tenor saxophone and magnetic tape, was written in 1987 at the request of Daniel Kientzy. The piece is dedicated to Kientzy, a pioneer of contemporary saxophone and explorer of new playing modes.

The title alludes to the role of the tape: at first double, echo of the soloist, the sound coming from the loudspeakers multiplies his playing, but at the same time alters it, warps it, veils it, like a cloth in the wind or a wheel that no longer turns. Strange transformations take place: the scale of heights gradually loses their musical temperament, the melodic scrolls close on themselves, like a scratched disc. Then the perspective changes, we're switching to a wide angle telephoto lens. The tape becomes more multiple and distant. Synthesis sounds foreign to the world of the saxophone burst in. And until the end, a more peaceful and distant relationship is established between the tape and the soloist's various performance techniques.

The tape was made in Marseille (Faculty of Luminy Sciences and CNRS Laboratory of Mechanics and Acoustics). The sounds recorded by Daniel Kientzy were transformed using the SYTER digital audio processor designed at the INA-GRM by Jean-François Allouis and industrialized by Digilog. The author thanks Pierre Dutilleux for his work on SYTER. The synthesized sounds were produced on an IBM-PC compatible computer using the version of the MUSIC V program extended by Daniel Arfib; they were specified by instrumental gestures on a MIDI keyboard, then transcribed into MUSIC V code. This transcoding, carried out by Frédéric Boyer, makes it possible to combine the resources of synthesis and real-time commands.

Each key also sends out information as to when and how loud it is played. The information to and from the piano is in the MIDI format used for synthesizers. A computer receives this information and sends back the appropriate signals to trigger the piano playing. The programming determines in what way the computer part depends upon what the pianist plays. In these Eight Sketches, I have tried to explore and demonstrate different kinds of live interactions between the pianist and the computer.

1. Double
2. Mirrors
3. Extensions
4. Fractals
5. Enlargements
6. Metronomes
7. Up-down
8. Resonances

I made a duet for a pianist in 1989, while I was composer in residence at the M.I.T. ("Music and Cognition" Group, Media Laboratory), thanks to a grant from the Massachusetts Council of the Arts. It was implemented with the real-time program Max, a powerful graphical real-time programming environment written by Miller Puckette at Ircam and M.I.T. I acknowledge the most dedicated and competent help from Scott Van Duyne. [Jean-Claude Risset]

20:00 - 21:00

Cocktail Dinner (hosted by the PRISM Lab)

21:00 - 22h30

Concert: Tribute to J.C. Risset

Jean-Claude Risset was born in 1938 in France. After studying science and music (Ecole Normale Supérieure, piano, composition with André Jolivet), he worked at Bell Labs with Max Mathews in the 1960s to develop the musical resources of computer sound synthesis (trumpet simulation; pitch paradoxes; synthesis of new timbres; sound development processes; sound catalogue of synthesized sounds, 1969). He became head of the IT department of IRCAM between 1975 and 1979. In the MITs. Media Labs, Jean-Claude Risset developed the first "Duo for a Pianist" in 1989, whereby the pianist triggers an accompaniment on the same piano that depends on what he or she plays and how he or she plays. Researcher at the CNRS Laboratory of Mechanics and Acoustics in Marseille, he was awarded the 1999 CNRS Gold Medal. For his pioneering work in the field of computer music, he received the first Nica d'Or (Prix Ars Electronica, 1987), the Prix Giga-Hertz-Grand 2009, and the highest French distinctions in music (Grand Prix National de la Musique, 1990).

Luraï (1992), celtic harp and electronics

Alice Belugon, celtic harp

Charles Bascou, electronics

Commissioned by Radio-France, Luraï (1992) is dedicated to Denise Mégevand, who contributed so much to developing the resources of the Celtic harp for contemporary instrument, and who incited me to compose the piece. Luraï includes a cadenza composed by Denise Mégevand in the spirit of the piece, and where she presents some of her own new performance techniques on the Celtic harp.

The Greek term Luraï means "Lyres": the title refers to the antique family of instruments from which the Celtic harp originates. Like the Greek lyre, the Celtic harp has no pedals to modify the tuning. The piece is a journey through different harmonic regions: it uses a non-octaviating mode, in which intervals and harmonies vary throughout the tessitura. Motives are often confined within a tetracord. The computer intervenes to decline and multiply the motifs stated by the harp, and also to make filters heard, tuned according to the mode, which resonate somewhat like a eolian harp. Digital sound transformations occasionally allow escape the scale and the equal temperament.

The title also evokes the memory of the insatiable singing of a lyrebird (Ménure) once heard in the Australian forest. The melodic proliferation brought by digital processing is still far from it the bird's extraordinary singing. The magnetic tape was made at the Laboratoire de Mécanique et d'Acoustique of CNRS in Marseille, mainly on the SYTER digital audio processor. The author thanks Pierre Dutilleux who implemented the resonating filters that can be heard, for example, at the entrance of computer sound.

Saxatile (1992), saxophone and electronics

Yui Sakagoshi, saxophone

Charles Bascou, electronics

Jean-Claude Risset dedicated Saxatile (1992) is to Iannis Xenakis for his seventieth birthday. The band was achieved at the UPIC workshops in 1992, using exclusively the sounds produced by the UPIC. This piece does not use the writing techniques that are so personal to Xenakis: however, as a tribute to this great creator, the band has some graphic allusions to Metastasis.

The title Saxatile refers to the saxophone: but the adjective saxatile means "who lives among the rocks". An image of the relationship between saxophone and sounds of the band as a biological and mineral meeting. At first, the drawn sounds turn around a height, then they undergo slips, drifts, finally they are dispersed in grains. In spite of this diversity of morphologies, they belong to the same reign, as strata, rocks, pebbles and sand all belong to the mineral kingdom. The lines of saxophone play this context with a flexibility specific to the biological.

Attracteurs étranges - excerpt of 2 mvt and 5th mvt (1988), clarinet and electronics.

Ivan Solano, clarinet

Charles Bascou, electronics

"Strange Attractors (1988) is a computer-made piece for clarinet and tape. The piece was commissioned by ARCAM at the request of Michel Portal, for his "carte blanche" at the 1988 Hyères Biennale. [...] As the title indicates, the piece is metaphorically inspired by the idea of attractors, which geometrically describe dynamic systems: point attractors correspond to equilibrium positions; strange attractors, with fractal structure, represent systems with chaotic behaviour, unpredictable, extremely sensitive to initial conditions. The clarinet also uses turbulence and multiphonics, which are examples of chaos. The composition features polar heights, cycles or quasi-cycles and bifurcations." [Jean-Claude Risset]

"JC Risset's *Attracteurs étranges* for clarinet and tape, has been left unplayed for about 30 years. I had the chance to perform two of the 4 written movements in November 2018 at the International Conference "Pour un monde sonore virtuel: Hommage à Jean-Claude Risset" held in Paris at CDMC (23-24 November 2018). This concert proposal will allow me to perform the integrality of the piece that is actually made of 5 movements. The researches on the piece brought me to discover the existence of a 5th movement for tape and improvised clarinet on the written material of the rest of the piece. With the help of Nicolas Verin, I managed to find and get a copy of that 5th movement tape." [Ivan Solano]

Naka (1971) – Music for Little Boy by Pierre Halet,

soprano, flute, clarinet, piano, percussion

Raphaële Kennedy, soprano

Hélène Pereira, piano

Damien Louis, percussion

"The theme of the play *Little Boy* by Pierre Halet (Ed. du Seuil, Paris, 1968) is the revival of the Hiroshima bombing in the form of nightmare of Eatherly, the pilot of a reconnaissance plane who later developed guilds jeopardizing his mental health. In the play, some elements are historical realistic, while occasionally certain cues in the performance or in the music indicate that the action is fantasmatic, imagined in a man's mind. [...]

Noka assembles some episodes of the music centered around the character of a Japanese actress who died in the explosion of the atomic bomb. In the play, the pilot Eatherly is haunted by the memory of Naka – he imagines her performance of a Noh drama where she narrates the origin of the world and recalls Amaterasu, goddess of the sun. Naka evokes this performance, revived through the ears of a Westerner.

The soprano sings in French fragments of the text by Pierre Halet – in the play, a fuller version of the text is spoken in counterpoint to the singing. The singer is accompanied by four performers, playing flute, clarinet, piano and percussion instruments. The sung sections alternate with flute and/or percussion episodes. The sequence presented lasts about 9mn"

[Jean-Claude Risset]

Videomusique

Campus Joseph Aiguier

14:00 - 14:30

Constellations. *Julian Scordato*

This audiovisual work begins from the exploration of an imaginary celestial space which is translated into sound space. How does each celestial sphere“ starting from its manifestation as a unit “ interact with the cosmos where it belongs? How does it react to its law? How does it transform itself integrating with the system, until the loss of identity? In contrast with that process, the constellations act underlining the bodies in their uniqueness by means of creation of symbolic links: beyond their meaning, they stand as a classification and articulation device of the individual within the system.

Un été. *Claude Moreau & Jean-Pierre Moreau*

Video-musical art is an art of time created by the unified sensory expression of the different media - image, music and sometimes text. It will be a question here of this moment¹, starting from its sensations, an "I" gradually becomes aware of an "I am". A few more moments will lead him to perceive "who" or "what" is who "I am". The moment then fills up with the multiple presents where memories and visions of possible futures are mixed.

Concert

"La Friche", GMEM

19:00 - 20:00

Cosmophone concert.

The Cosmophone is an immersive device which detects ambient cosmic rays and instantaneously materializes their trajectories through sound.

Intraçables No 1. *Jean-Marc Montera*
Plus loin que l'infini. *Lucie Prod'Homme*
Metamuons. *Francis Dhomont*

20:00 - 21:00, Le Foyer

Sensorium. *Rafal Zapala*

SENSORIUM ... the installation is interdisciplinary. The spirit of holistic, integral perception of human emotions, intellect and physiology pervades the work. It combines, in equivalent proportions, the artistic, scientific, technological and psychological aspects... The term sensorium indicates your connection to the actor-network with the others: humans, animals, tools, ideas, and other non-humans. The borderline where you end and something different begins is blurred. So, it describes subjectivity dispersed in reality. The installation is an intimate, anti-mass, one-person experience (20min). It essentially consists transposition of dynamics of visitor's emotional reactions (by means of biofeedback technology in the tradition of Alvin Lucier's artworks) upon musical structures in a direct live experience. The composition is structured rhizomatically, i.e. it takes into account the possibility of musical parameters' multi-directional change and mutual influence.

Sensorium at CCRMA, Stanford University, chamber version :
<https://vimeo.com/334956091>

Sensorium at CK ZAMEK, Poznan, Poland, full version :
<https://vimeo.com/108643954>

<http://zapala.com.pl/soundart/s-e-n-s-o-r-i-u-m/>

21:00, Le Module

“Augmented, Virtual and Mixed Reality”

“Augmented, virtual and mixed reality: whatever the categories, the body in motion remains the obligatory passage of recognition. The body plays, it learns. The dance at the origin would be that: the body that plays in its simplest expression.” [Norbert Corsino]

Delearn. *Atau Tanaka*

Delearn is a performance for electromyogram muscle sensing, machine learning, and corpus-based concatenative synthesis. Gestures of the performer are detected by EMG sensors on the forearms, and analysed, producing movement features. The sound being performed is based on an old track of electronic music, that is segmented and analysed for audio descriptors. A neural network is trained on associations between arm postures and sound grains. This produces a regression model associating gesture and synthesized sound. An iterative cycle of training-by-example becomes the compositional structure of the performance by which an interactive machine learning process is exposed.

Trois Machins de la Grâce Aimante. *Rob Hamilton*

Trois Machins de la Grâce Aimante is a composition intended to explore Twenty-First century technological and musical paradigms. At its heart *Trois Machins* is a string quartet fundamentally descended from a tradition that spans back to the 18th century. As such, the work primarily explores timbral material based around the sound of a bowed string, in this case realized using a set of physically modeled bowed strings controlled by Coretet, a virtual reality string instrument and networked performance environment. The composition - for four performers, preferably from an existing string quartet ensemble - takes the form of three distinct movements, each exploring different capabilities of the instrument itself and requiring different forms of communication and collaboration between the four performers. Performers in *Trois Machins* perform the piece entirely in networked virtual space playing virtual stringed instruments. Each performer wears an Oculus Rift head mounted display and holds two Oculus Touch controllers. A laptop in front of each performer drives a game-client connected to the server via ethernet and a gigabit switch. Two Oculus Touch tracking towers sit with each computer to track player hand motions. The server projects a virtual camera view of the performance into the concert hall so the audience can watch each client avatar and instrument interact and perform the piece.

Self Patterns. *n + n Corsino*

SELF PATTERNS by n+n Corsino is the first choreographic navigation in augmented reality. This application for Apple Store and Google Play offers about ten short choreographic sequences: game, fantasy and humour are proposed.

"Imagine two dancing figures (a woman, a man) whose clothes evoke the adventurer Corto Maltese, you have them with you in your pocket. By the sea, in front of the Acropolis, the Empire State Building, the Eiffel Tower or the Buckingham Palace, you launch your application. You have chosen the place, the point of view, now it's up to you: follow the two characters in ten unique adventures.

Your dancing partner has his own environment and his own choreographic suite that will be superimposed on yours and will fit into the setting where you have chosen to take them. The journey is reciprocal, n+n Corsino's imagination will increase from yours for a fabulous journey through appearances. You will travel with giraffe, rhino, in the middle of gleaming planes like toys, cross a rain of foliage, fly higher than the Eiffel Tower, but yes, it is possible! Walk turn and run if you want, but don't forget that you are still a passenger of reality, don't cross the street without looking and don't do a backward salto without training!" (Claudine Galea)

In SELF PATTERNS, exteriors are increased and transported with oneself thanks to mobile communication objects. The user enters the choreographic sequences in relation to architectural, historical or landscape signs. There is scenography of movement within the frame and the frame itself begins a narrative as geographies of the moment and places: this fictional corpus is presented in installation.

Tuesday 15 October

Concert

"La Friche", Grand Plateau

21:00

'Research Project - Contemporary Music'

At and across, Genesis software and bells sheep
(electroacoustics). *Juraj Kojs*

At and Across is composed for a single performer, a set of tuned physical bells, and live electronics, mirroring and accentuating the spectral relationships between the partials of J.C. Risset's additive synthesis bells.

Take your time... hurry up!, flute and electronics
Vincze Davor Branimir

Bass flute is an instrument that has substantial constraints due to its very large size and a considerable amount of air the performer needs to make the instrument resonate. Almost like in a scientific research, each miniature focuses on one flute playing technique and tries to expand the playfulness of the instrument via live electronics. Bass flute is thus no more an instrument confined to smoky, deep range sounds, but it becomes a vessel of spoken word, granular sounds and chirpy noise.

ægo. *Scurto Hugo, Axel Chemla, Romeu-Santos*

ægo intends to show and share an encounter between a learning machine and a human being to the audience. The learning machine possesses a latent synthesis space, as well as a distinctive musical behaviour, that are both originally unknown to the human being. Through improvisation, the human and the machine will simultaneously learn to interact with each other on an embodied level for the human, and on a computational level for the machine.

This mutual exploration is designed to be heard, seen, and experienced by the audience. The piece divides in six successive scenes, corresponding to different latent spaces and sonic dimensions learned by the machine. The performer will expressively negotiate control of the synthesis with the machine, by communicating positive or negative feedback using motion sensors placed on both hands. The slowly-evolving spectromorphologies, synthesized and projected in real-time on stage, intends to open a sensitive reflection on what is actually learned on a musical level, both by the human and its artificial alter ego-the machine.

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Mit Allen Augen, web score with Marseille Labo Band (Jean Marc Montera), *Jonathan Bell*

This music submission proposes to perform ONE piece among the following, according to the musicians available at CMMR. These pieces do not require a human conductor since they are performed with the help of the SmartVox system. The scores can be read via any browser-capable device (preferably smartphones). Displaying the score on head-mounted displays or Smart Glasses (e.g. Vufine) would help the performers move more freely, leaving room for experimentation with augmented reality.

Cinema / Game Concert

"La Friche", Grand Plateau

19:00 - 20:30

Interactive Music, Christophe Héral

Cinema/Game-Concert, original creation for CMMR 2019.
Christophe Héral

The music for the image class of the Cinema and Audiovisual Master Programme (Aix-Marseille University), directed by Christophe Héral (UBISOFT) with Antoine Gonot and Konstantinos Alevizos (AMU) will perform their compositions facing the a projected animated film (Péripheria, directed by David Coquard-Dassault) and different musical video games with various levels of difficulty (Rhythm Game, Musical Platformer, etc).

Christophe Héral is a French composer and sound designer for cinema, television and video games. Renowned for his numerous compositions, he has, among others, received the Best original music award at the Festival du cinéma d'animation français de Bruz in 2011 for La douce. The short film La queue de la souris, for which he composed the music, is nominated for a César in 2012 and after working on Jean François Laguionie's feature film L'Île de Black Mór, he receives the Jury's special mention at the Festival d'Annecy (2010) for Kérité, la maison des contes. In parallel, he collaborates with Michel Ancel on the music of video games including Beyond Good and Evil, which won many prizes, Rayman Origins, Tintin et le secret de la Licorne, and Rayman Legends (Ubisoft) for which he won the Best original music for a video game award at the Game Paris Awards (2013). He is currently working on two AAA games Beyond Good and Evil 2 (Ubisoft) and Wild (Sony), Laguionie's next feature Le voyage du prince and four short films. Apart from all these awards, Christophe Héral is curious and passionate by all cultures and types of music, and he enjoys collecting musical instruments.

GMEM

Founded in 1972 in Marseille by composer Georges Bœuf, the GMEM has been labelled the Centre National de Création Musicale since 1997. Its missions are defined by the Ministry of Culture and Communication and focus on the production of musical creation, dissemination, transmission and research. Creative music covers a surprisingly wide field: vocal, electroacoustics or mixed (combining acoustic, electronic and/or computer-based instruments). They explore new languages and experiment with new processes. Music is intrinsically linked to multidisciplinary (theatre, dance, visual arts, cinema...) which adds new elements to its richness. The diversity of the devices and venues (concert halls, museums, gardens and parks, etc.) also contributes to their originality.

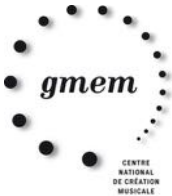
n+n Corsino

n + n Corsino, choreographers and researchers, lead SCENE44, a European stage for choreographic creation and digital innovation, located at the Pôle Média at la Belle-de-Mai in Marseille. SCENE44's orientations are structured around three axes: a creative centre that receives artists and researchers in residence, a cultural cluster that promotes the relationship between artistic creation, research and digital innovation, a laboratory for shared experiments. Its actions, oriented towards a relationship with living organisms and close to the notion of applied research, measure the viability and potential of a technology through its artistic treatment. SCENE44 enters into privileged partnerships with the PRISM laboratory and Aix-Marseille University.

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