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Accademia Musicale
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Keynote Lectures

Harmonic Representation, Learning and Creativity

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Brief Bio

Emilios Cambouropoulos studied Physics (University of Athens), Music (Conservatory of Attiki and Glyfada) and Music Technology (MSc, University of York). He obtained his PhD in 1998 on Artificial Intelligence and Music at the University of Edinburgh (title of thesis: Towards a General Computational Theory of Musical Structure). He worked for one year (1998-1999) as a research associate at King's College London on the musical data-retrieval project 'Musical Similarity and Melodic Recognition'. From 1999-2001 he was employed at the Austrian Research Institute for Artificial Intelligence in Vienna working on the project 'Artificial Intelligence Models of Musical Expression'. Currently, he is a full-time assistant professor on Musical Informatics at the Department of Music Studies, Aristotle University of Thessaloniki. He has published numerous refereed papers in scientific journals, books and conference proceedings.

Abstract

Different musical styles/idioms establish independent harmonic spaces that involve a network of inter-related constituent concepts such as chord, root, scale hierarchy, tonality, harmonic rhythm, harmonic progression, voice-leading, implied harmony, reduction, prolongation and so on. Such harmonic spaces allow the invention of new concepts by 'exploring' previously unexplored regions of a given space ('exploratory creativity') or transforming/altering in novel ways established concepts ('transformational creativity') or by making associations between conceptual spaces that were previously not directly linked ('conceptual blending' - 'combinational creativity'); Boden (2009) maintains that the latter, i.e., combinational creativity, has proved to be the hardest to describe formally. Composers/musicians actively engage in one or more of these modes of creativity in producing novel music creations.

In this presentation we focus on issues of harmonic representation and analysis, giving special attention to the role of conceptual blending in melodic harmonisation. Firstly, a new idiom-independent representation of chord types, namely the General Chord Type representation, is described; this is appropriate for encoding tone simultaneities in diverse harmonic contexts (such as tonal, modal, jazz, octatonic, atonal, traditional harmonic idioms). Then, methods are presented for statistical learning from (harmonic reductions of) musical pieces drawn from diverse idioms; more specifically the application of a novel constrained hidden markov model and a prediction suffix tree methodology are explained. Finally, a computational account of concept invention that is based on the construction of harmonic ontologies is discussed; conceptual blending is materialised with the employment of harmonic ontology amalgams, yielding original blended ontologies that, in turn, can be combined with machine learning techniques to produce novel melodic harmonisations. Many musical examples will be presented that illustrated the proposed representations, and analytic/generative outcomes.

Multilayer Music Encoding And Interaction: Exploiting Music Cultural Heritage

Goffredo Haus
Università degli Studi di Milano
Italy

Brief Bio

Prof. Goffredo Haus is known for his research in computer science for music and multimedia.
Since 1985 he has established at the Computer Science Department of the State University of Milan and, since then, directed the Laboratorio di Informatica Musicale (LIM). He is currently the Dean of that Dept. He is full professor in the Computer Science area at the State University of Milan. He teaches Computer Science Applications in Music, Foundations of Computer Science, Multimedia Digital Archives. He has also directed computer music and multimedia projects of industrial interest, and carried out didactic and other cultural activities, both inside and outside academy. The most relevant are the projects concerning the rescuing of the Musical Archive at Teatro alla Scala in Milan and the Bolshoi Theatre in Moscow. Prof. Haus published about a hundred scientific papers, and also dozens of other kinds of publications, including a number of books and CD-ROMs concerning computer applications in music. In 1992, he has been the head of many scientific projects in the frame of the IEEE Computer Society & Standards Association.
CHRONICLE 2012-today head of Department of Computer Science at the University of Milan.
2010-2012 chair of the Didactics Coordination Council of Science and Technologies of the Cultural Heritage at the University of Milan.
2008-2011 chair of the IEEE Computer Society Technical Committee on Computer Generated Music.
2007-today member of Executive and Steering Committees of the Interdepartmental Centre for the Cultural Heritage at the University of Milan.
2006-2012 member of the Board of Directors of the University of Milan.
2006-2007 scientific director of digitization projects at the Ricordi Historical Archive.
2005-2007 scientific director of the "Network of Italian Music" project of the Italian Ministry of the Cultural Heritage.
2004-2010 head of Department of Informatics and Communication at the University of Milan.
2002-today coordinator of the bachelor degree in "Musical Informatics" (previously "Science and Technologies of Musical Communication") at the University of Milan.
2001-2008 official reporter del IEEE Standards Association Working Group on XML Musical Application.
2001-today full professor of Computer Science - INF/01 at the University of Milan.
1999-2000 scientific director of the Audio Archive digitization project at the Bolshoi Theatre in Moscow.
1996-2000 scientific director of the Audio Archive digitization project at the Scala Theatre in Milan.
1992-2008 vice-chair of the IEEE Computer Society Technical Committee on Computer Generated Music.
1992-2001 associate professor of Cybernetics - K05B at the University of Milan.
1985-today scientific director of L.I.M. – Laboratory of Musical Informatics at the University of Milan.
1984-1992 researcher at the University of Milan.
1981-1983 head of computer assisted instruction, electronic publishing and videotext projects at the Lombardy Interuniversity
Consortium for Automatic Computing (CILEA) in Segrate (MI).
1980-1983 grant professor of the Master Course in Physics at the University of Milan.

Abstract

Multilayer music encoding allows music interested people to deeply interact with integrated music contents. Both desktop and web applications like traditional viewers are already available for the wide audience of Internet users. Our approach aims at exploiting music cultural heritage by means of the synchronous integration of any kind of traditional music media i.e.
printed music sheets, manuscripts, audio and video recordings, images, lyrics, musicological texts, and so on, making all them interactive. The premise to reach these goals consists in the digitization

of all these heterogeneous materials in order to describe a single performance comprehensively, e.g. considering many different video and audio-takes from different perspectives and by different performers, together with a number of other related materials containing music and text symbols. The format we adopt to encode such information is based on the XML international standard known as IEEE 1599. At the end of 2012, the project EMIPIU made available a public web portal which includes a wide library of examples i.e. a hundred approx music pieces encoded by the multilayer approach to make them fully integrated and interactive.

Mathematical models of popular music concepts: algebra and geometry in the service of songs

Moreno Andreatta
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France

Brief Bio

Moreno Andreatta holds diplomas in mathematics from the University of Pavia, piano performance from the Novara Conservatory and computational musicology from the EHESS (thesis on algebraic methods in 20th century music and musicology). A founding member of the Journal of Mathematics and Music (Taylor & Francis), he is the Vice-President of the Society for Mathematics and Computation in Music as well as the co-director of the "Musique/Sciences" and "Computational Music Sciences" Series published respectively by IRCAM/DELATOUR France and Springer. Moreno Andreatta is currently the coordinator of ATIAM (Acoustics, Signal Processing and Computer Science applied to Music), an interdisciplinary Master program hosted by IRCAM and co-organized by the UPMC University, Telecom ParisTech and IRCAM. Outside of academic research, he is interested in music improvisation and song writing, which he approaches in the spirit of the OuMuPo (Ouvroir de Musique Potentielle), the musical counterpoint of the more popularized OuLiPo movement (Ouvroir de Littérature Potentielle).

Abstract

Which are the common points between a song by Paolo Conte, a progressive rock piece by Frank Zappa or a hit of the 1980 pop music group Depeche Mode? Although they are very distant from a stylistic point of view, one may find symmetries and algorithmic strategies in all of these musical examples, which suggests that together with intuition and inspiration, rules and formal concepts do play an important role in musical creativity. The presentation will focus on the interplay between algebraic formalization and geometric representations in the analysis of popular music repertoire. There is unquestionably a growing interest by the music-theoretical and computer-aided analytical community for the development of formal mathematical tools applied to popular music. From one side, this interest can be explained as a consequence of the flexibility of some symbolic approaches that have been developed in particular in the so-called transformational music-analytical tradition. In this presentation, which is addressed to a general public audience, we will first introduce some formal concepts belonging to the set-theoretical and neo-Riemannian paradigms and successively focus on some computational properties of the so-called Generalized Tonnetz musical structure, a geometric space which will be applied in the computational analysis of pop music repertoire. Generalized Tonnetze can be selected according to the compactness property of a given musical grammar with respect to a possible geometrical space in which the musical piece will be represented, which suggests that the musical style has an intrinsic spatial character. After providing several examples of computer-aided music analysis based on these new
music-theoretical concepts, we will discuss some recent attempts by the author at applying these formal tools in the field of song writing (Andreatta, 2013).

Detection of Historical Period in Symbolic Music Text

Michele Della Ventura
Accademia Musicale Studio Musica, Treviso
Italy

Brief Bio

Michele Della Ventura brilliantly graduated in pianoforte under the guidance of Francesco Bencivenga. Concurrently to the music studies he graduated in Technology Disciplines with the highest honors and distinction, obtaining a scholarship followed by a II level Master's Degree in e-Learning (e-Learning: methods, techniques and applications) at the University of Rome 'Tor Vergata'. He was valedictorian of his class with his master's thesis 'Learning and new technologies'.
His research interests are in:
- correlation between music and mathematics with a particular emphasis on artificial intelligence research in the field of computer-aided analysis of tonal music;
- use of web technologies for teaching.

He is the author of several articles published in international science magazines and high school textbooks (also featured at the International Book Salon of Turin in 2012). He proofreads articles and is a member of scientific committees in International Conferences. He was invited as a lecturer to International Conferences in Italy, Canada, China, France, Germany, Hong Kong, Japan, UK, Romania, Singapore, Spain, US (Baltimore, Bostoon-Harvard, Las Vegas, New York, Washington). He teaches Music Informatics in University courses and Musical Technologies in Music High Schools.

Abstract

Despite the various studies on computer-aided musical analysis, there have been relatively few attempts at trying to locate, by means of analysis, a given melody in a certain stylistic period (Baroque, Classical, Romantic or Contemporary). The main problem is that a compositional style of a certain historic period is difficult to formalize. This study presents a model of analysis based on the theories of Warren Weaver and Claude Elwood Shannon, able to progressively explore the symbolic level of a melody, identifying the historic period on the basis of the information that it carries. The concept of information has already been used for several years now in linguistic analysis and it has also been applied to musical language. This approach was dealt with on the melodic level, omitting concepts like tonality, modulation and moreover rhythm. The efficiency of the model was verified by analyzing a series of melodies by different authors and from different times (trying to range through the different compositional techniques by means of a unique analysis methodology) emphasizing both the strong points and the weak points of the approach.

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