CIM04

Conference on Interdisciplinary Musicology

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Abstracts

Hosted by the Department of Musicology, University of Graz
Presented by the European Society for the
Cognitive Sciences of Music

Graz/Austria, 15-18 April 2004

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Introduction

The first Conference on Interdisciplinary Musicology (Graz, Austria, 15-18 April 2004) is a forum for constructive interaction among musicologically relevant disciplines such as acoustics, computing, cultural studies, education, ethnology, history, linguistics, performance, physiology, psychology, sociology, and theory/analysis. CIM04 especially promotes collaborations between sciences and humanities, between theory and practice, and interdisciplinary combinations that are new, unusual, creative, or otherwise especially promising.

The deadline for abstract submission was 31 October 2003. 122 abstract submissions were anonymously peer-reviewed by 26 international experts. On the basis of their reviews, Anna Rita ADDESSI (Bologna), Christian G. ALLESCH (Salzburg), Ali ERGUR (Istanbul), Frauke JURGENSEN (Montreal) and Marc LEMAN (Ghent) were invited to give keynote lectures. 49 further submissions were accepted as talks, 54 accepted as posters, and 14 rejected. All authors were given access to the individual ratings and comments of their reviewers and asked to respond to the comments when preparing their abstracts, proceedings contributions and presentations.

Most papers at CIM04 have two authors with contrasting backgrounds. Authors are citizens of Australia, Austria, Belgium, Britain, Canada, Czech Republic, Estonia, Finland, France, Germany, Hungary, India, Israel, Italy, Japan, Lithuania, Netherlands, Poland, Philippines, Russia, Serbia and Montenegro, Slovakia, Slovenia, Spain, Sweden, Turkey, and the USA.

CIM04 is hosted by the European Society for the Cognitive Sciences of Music (ESCOM) and the Department of Musicology, University of Graz and endorsed by 24 participating societies. Graz is an ideal location for a conference on interdisciplinary musicology; its universities include departments of (historical and systematic) musicology; composition, music theory, music history and conducting; music education; ethnomusicology; aesthetics; early music and performance practice; jazz research; electronic music and acoustics; signal processing and speech communication; and broad-band communications.

This abstract booklet contains the (revised) abstracts of the invited talks and of all regular talks and posters for which at least one author had registered by the published deadline of 15 March, 2004. The abstracts are listed in alphabetical order of first author regardless of mode of presentation. This book also includes information on the conference's hosts, sponsors, committees, participating societies, aims, and review procedures. The index includes both the names of all authors of presented papers and the most important words in the paper titles. Inside the back cover is a pouch containing the proceedings CD.

CIM04 aims to bring together scholars with contrasting backgrounds to solve common problems emerging from the study of music and musical phenomena. It is about the collaborative collection of convergent evidence. It is about climbing walls and crossing bridges.

Welcome to Graz and to CIM04!

Richard Parncutt, conference director

Committees

International Review Committee

This committee comprises international experts in various sub- and sister disciplines of musicology. Their anonymous reviews of submitted abstracts are the conference's guarantee of a high academic standard. Depending on the topics addressed by submitted abstracts, reviewers may have been approached who are not included in this list.

Kofi Agawu, Professor of Music Theory, Princeton University, New Jersey.
Anders Askenfelt, Associate Professor of Music Acoustics, Royal Institute of Technology (KTH), Stockholm, Sweden.
Judith Becker, Professor of Ethnomusicology, University of Michigan, Ann Arbor.
Anna Maria Busse Berger, Professor of Medieval and Renaissance History and Theory, University of California, Davis.
William Caplin, Professor of Music Theory, McGill University, Montréal, Québec.
Michèle Castellengo, Laboratoire d'Acoustique Musicale, Université de Paris VI, France.
Eric Clarke, Professor of Music, University of Sheffield, England.
Nicholas Cook, Professor of Music, Royal Holloway, University of London.
Eugenia Costa-Giomi, Professor of Music Education, University of Texas at Dallas.
Anselm Gerhard, Professor of Musicology, Universität Bern, Switzerland.
Jill Halstead, Lecturer in Jazz and Popular Music, Goldsmiths College, University of London, England.
Antoine Hennion, directeur de recherches, Centre de sociologie de l'innovation, Ecole nationale supérieure des mines de Paris, France.
Ellie M. Hisama, Director, Institute for Studies in American Music, Associate Professor of Music, Brooklyn College & the Graduate Center, City University, New York.
Colin Lawson, Professor of Music, Dean of the London College of Music and Media, and Pro Vice-Chancellor of Thames Valley University, England.
Marc Leman, Professor of Systematic Musicology, University of Ghent, Belgium.
Daniel J. Levitin, Professor of Psychology, McGill University, Montréal, Québec.
Fiona McLaughlin, Associate Professor, African Languages and Linguistics, University of Florida, Gainesville.
Gary McPherson, Professor, Department of Creative Arts, Hong Kong Institute of Education, China.
Elizabeth W. Marvin, Professor of Music Theory, Eastman School of Music, Rochester, New York.
Isabelle Peretz, Professor of Neuropsychology, Université de Montréal, Québec.
Rüdiger Schumacher, Professor of Ethnomusicology, Universität zu Köln, Germany.
Eleanor Selfridge-Field, Consulting Professor, Center for Computer-Assisted Research in the Humanities, Stanford University, California.
Ruth Solie, Professor of Music, Smith College, Northampton, Massachusetts.
Barbara Tillmann, CNRS Researcher, Laboratoire Neurosciences & Systemes Sensoriels Equipe Audition, Université Claude Bernard Lyon I, France.
Menno M. van Zaanen, Postdoctoral Fellow in Computational Linguistics, Universiteit van Tilburg, Netherlands.
Robert Zatorre, Professor, Montreal Neurological Institute, Montreal, Quebec.

ESCOM Advisory Committee

This committee comprises members of ESCOM who were centrally involved in the organisation of previous ESCOM conferences:

Irène Deliège, Professor of Music Psychology, University of Liège, Belgium.
Alf Gabrielsson, Professor of Psychology, University of Uppsala, Sweden.
Reinhard Kopiez, Professor of Music Psychology, Musikhochschule Hannover, Germany.
John Sloboda, Professor of Psychology, Keele University, England.

Local Advisory Committee

This committee comprises staff of the Department of Musicology, University of Graz (UG), of the University of Music and Dramatic Arts in Graz, also known as the Art University of Graz (KUG), and of the Technical University of Graz (TUG):

Federico Celestini, Research Fellow in Historic Musicology, UG.
Andreas Dorschel, Professor of Music Criticism and Esthetics, KUG.
Johann Götschl, Professor of Philosophy, UG.
Gerd Grupe, Professor of Ethnomusicology, KUG.
Robert Höldrich, Professor of Electronic Music, KUG.
Gernot Kubin, Professor of Nonlinear Signal Processing, TUG.
Werner Jauk, Lecturer in Systematic Musicology, UG.
Franz Kerschbaumer, Professor of Jazz Research, KUG.
Kordula Knaus, Assistant in Historical Musicology, UG.
Leopold Mathelitsch, Professor of Theoretical Physics, UG.
Peter Revers, Professor of Music History, KUG.
Michael Walter, Professor of Musicology, UG.
Gerhard Wanker, Professor of Music Education, KUG.

Local Organizing Committee

This committee is responsible for all aspects of conference organization:

Richard Parncutt, Professor of Systematic Musicology, UG (conference director).
Annekatrin Kessler, Student Assistant (academic coordinator).
Fränk Zimmer, Student Assistant (technical coordinator).
Sieglinde Petzl, Departmental Secretary (administrative coordinator).

Support team

The support team consists mainly of local and international musicology students. Support team members will be available throughout the conference to answer questions, solve unexpected problems and generally make sure that things run smoothly. They are:

Werner Goebl (coordinator)
Nora Bammer, Marta Blazanovic, Angelika Dorfer, Michael Gerersdorfer, Sévérine Grassin, Ivana Hausknecht, Manuela Marin, Margit Painsi, Thomas Russold, Marina Stanic, Ludwig Wagner, Gundi Wilscher, Lukas Wohlgenannt.

Participating societies

The following societies accepted our invitation to participate in CIMo4 on the basis of their relevance to musicology and their international academic status. The following list includes academic contacts nominated by each society.

AMS: American Musicological Society
President: J. Peter Burkholder, Professor of Musicology, Indiana University, Bloomington, Indiana.

DGM: Deutsche Gesellschaft für Musikpsychologie
President: Reinhard Kopiez, Professor of Music Psychology, University of Music and Drama, Hanover, Germany.

EAA: European Acoustics Association (including all 29 national societies)
Secretary: Etienne Parizet, GIE Renault Recherche et Innovation, Rueil-Malmaison, France.

ESCOM: European Society for the Cognitive Sciences of Music
President: Mario Baroni, Professor, Department of Music and Theater, University of Bologa, Italy.

ESCOP: European Society for Cognitive Psychology
President: André Vandierendonck, Professor, Department of Experimental Psychology, University of Ghent, Belgium.

ESEM: European Seminar in Ethnomusicology
Secretary General: Giovanni Giuriati, Associate Professor, Department of Greek, Latin and Musical Studies, University of Palermo, Italy.

Gesellschaft für Musikforschung
President: Detlef Altenburg, Professor, Hochschule für Musik, ˆWeimar, Germany.

Gesellschaft für Musik & Ästhetik
President: Ludwig Holtmeier, Professor, Musikhochschule 'Carl Maria von Weber', Dresden, Germany.

GMTH: Deutsche Gesellschaft für Musiktheorie
Vice-President: Ludwig Holtmeier, Professor, Musikhochschule 'Carl Maria von Weber', Dresden, Germany.

IAEA: International Association of Empirical Aesthetics
Secretary-General: Holger Höge, Lecturer in Psychology, University of Oldenburg, Germany.

IASPM: International Association for the Study of Popular Music
Chair: Claire Levy, Associate Professor of Musicology, Institute of Art Studies at the Bulgarian Academy of Sciences, Sofia.

ICMA: International Computer Music Association
President : Mary Simoni, Professor and Chair, Department of Performing Arts and Technology, University of Michigan.

ICTM: International Council of Traditional Music
President: Krister Malm, Director, Swedish National Collections of Music, Stockholm.

IMS: International Musicological Society
President: David Fallows, Professor, Department of Music, University of Manchester, England.

ISA: International Sociological Association
President: Piotr Sztompka, Professor of Sociology, Jagiellonian University, Poland.

ISJR: International Society for Jazz Research
President: Franz Kerschbaumer, Professor of Jazz Research, Art University of Graz, Austria.

ISME: International Society for Music Education
President: Gary McPherson, Professor of Music Education, University of New South Wales, Australia.

ÖGM: Österreichische Gesellschaft für Musikwissenschaft
President: Peter Revers, Professor of Music History, Art University of Graz, Austria.

RMA: Royal Musical Association
President: Hugh Cobbe, OBE FSA, Head of Music, British Library.

SEM: Society for Ethnomusicology
President: Ellen Koskoff, Professor of Ethnomusicology, Eastman School of Music, Rochester New York.

SEMPRE: Society for Education, Music and Psychology Research
Conference secretary: Raymond MacDonald, Lecturer in Psychology, Glasgow Caledonian University, Scotland.

SMA: Society for Music Analysis
President: Amanda Bayley, Reader in Music, University of Wolverhampton, England.

SMPC: Society for Music Perception and Cognition
President: Richard D. Ashley, Associate Professor, School of Music, Northwestern University, Evanston, Illinois.

SMT: Society for Music Theory
President: Joel Lester, Dean of Mannes College of Music of New School University, New York.

Aims and ethos of CIMo4

The following account of aims and ethos (or spirit) of the conference has two functions. The first function was to explain the aims of the conference to potential participants before they submitted their abstracts. The second is to provide a foundation for the plenary discussion of problems and prospects of musicological interdisciplinarity that is scheduled for the last day of the conference. The text has been expanded considerably since the first call for papers – inspired by the content of submitted abstracts and by various suggestions received from committee members (especially from the abstract review committee). The text will be revised again after the conference in response to statements made during the final plenary session and other suggestions received during the conference. Responsibility for the content of this document lies entirely with the conference director, Richard Parncutt.

Definitions

Interdisciplinarity may be defined as an interaction between or among academic disciplines. The definition is problematic because neither "interaction"nor "discipline"is clearly defined. There are many different levels of interaction between disciplines, ranging from superficial reference to relevant work done by another discipline without incorporating its findings (weak or pseudo interdisciplinarity) to the far-reaching review of the fundamental assumptions and methods of one discipline on the basis of a thorough examination of the assumptions and methods of another (sometimes regarded as *transdisciplinarity*). Moreover, some disciplines, like for example physics and history, are old and well-established, while others, like cultural studies, are still so new that some scholars do not acknowledge their identity or their autonomy. A further problem is the fuzziness of the boundaries of disciplines. Is music analysis a separate discipline from music history – because if it is, research involving both is interdisciplinary! Does psychoacoustics belong to acoustics or to psychology, or is it independent of both? If it is independent, when did it become so, and is "truly"interdisciplinary research between it and its "mother" disciplines (acoustics or psychology) possible?

CIMo4 avoids trying to offer clear yes/no answers to such questions – although sometimes such decisions cannot be avoided, for example when drawing up a table of relevant disciplines (see below). Instead, CIMo4 regards interdisciplinarity as a continuously variable parameter. The interesting question is not *whether* a given research project is interdisciplinary or not, but the *extent* to which it is interdisciplinary. The answer to both questions is subjective and depends on a number of criteria, such as the extent to which the interaction crosses larger interdisciplinary borders such as those between sciences and humanities and between theory and practice (another possible meaning of the term transdisciplinarity), and the degree to which the interaction is new, unusual, creative, or otherwise especially promising. CIMo4's solution to this problem was to ask expert reviewers to rate the degree of interdisciplinarity of each abstract submission on the basis of a list of such criteria. This rating was an important part of the conference's review procedure and has prevented CIMo4 from falling into the trap of claiming interdisciplinarity when it is not warranted.

Musicology is musical scholarship. It is the academic study of any and all musical phenomena. It addresses the physical, psychological, aesthetic, social, cultural, political, and historical concomitants of music, musical creation, musical perception, and musical discourse. It incorporates a blend of sciences and humanities, and is grounded in musical practice

(performance, composition, improvisation, analysis, criticism, consumption, etc.). It involves a wide range of non-musical disciplines and corresponding research methods.

It follows from this widely accepted approach to defining or describing musicology that any academic who is qualified (e.g. with a doctorate degree) in any important area of musical research is a musicologist. Ethnomusicologists are, or should be, both musicologists and anthropologists or ethnologists. Music acousticians are, or should be, both musicologists and acousticians. Music psychologists (or psychomusicologists) are, or should be, both musicologists and psychologists. Music historians (or historical musicologists) are, or should be, both musicologists and historians. Music sociologists are, or should be, both musicologists and sociologists.

What, then, is a musicologist? These examples suggest that a musicologist is a scholar with a deep knowledge of one of the central areas of musicology, a broad acquaintance with other areas, and an awareness of the complex internal structure of the discipline.

History of musicological multi- and interdisciplinarity

Musicology has always been both multidisciplinary and interdisciplinary. For the ancient Greeks, music was not only an art but also a matter for scientific and philosophical investigation; it involved number theory and ratios, musical intervals and their consonance, tetrachords and scales, musical emotion and ethos, and music's supposedly cosmic foundation (harmony of the spheres). In spite of this early flowering of theoretical discourse around music, musicology was not recognized an independent field of knowledge and research until the mid 19th century (e.g., Chrysander, 1863).

Adler (1885) divided musicology into two subdisciplines: historical and systematic. In response to a growing interest in non-western musics, Haydon (1941) separated ethnomusicology from systematic musicology to create the well-known tripartite division of musicology: historical, ethnological and systematic. Developments of recent decades have tended to erode the tripartite model. Systematic musicology comprises several independent and essentially unrelated subdisciplines, including a USA-led music theory founded on, and now diverging from, pitch-class theory and Schenkerian analysis; music psychology, whose international revival in the 1970s and 1980s was triggered by the emergence of cognitive science in the 1960s; and music acoustics, which maintained a strong autonomous identity throughout the 20th century. At the same time, other fields of musical research such as music education have become as important as the traditional three, and a range of smaller interdisciplinary fields within and around musicology have asserted their independent identity, for example jazz research (which happens to be one of Graz's more famous specialities). Perhaps the straw that finally broke the tripartite-musicological camel's back was the 1990s emergence of "new musicology" with its focus on culture, gender, and subjectivity and strong links to all three "old" musicologies.

Today, there may be little point grouping together research in such diverse areas as theory/analysis, psychology, acoustics, psychoacoustics, sociology, aesthetics, philosophy, physiology, computer science, mathematics, statistics, linguistics, popular music, jazz, media, technology, and related areas and calling it all "systematic musicology", for the following reasons:

- The word "systematic" is misleading in this context, because these various

(sub-) disciplines are no more "systematic" (in the everyday sense) than music history or ethnomusicology - or they should not be, since a systematic approach is, or should be, a feature of any academic discipline.

- The long list suggests that "systematic musicology" has become a repository for anything that does not fit neatly into the traditional confines of historical and ethnological musicology.
- The walls of this unmanageably large container tend to isolate music historians and ethnomusicologists from other aspects of musical scholarship. One of the aims of CIMo4 is to remove artificial shields of this kind and to challenge all musically oriented scholars to engage with *all* disciplines that could be relevant to their research.
- The various subdisciplines of "systematic musicology" are more diverse and less clearly related to each other than the various subdisciplines of historical musicology and of ethnomusicology.
- There is considerable disagreement among musicologists, both "systematic" and otherwise, as to the exact definition of "systematic musicology". Which subdisciplines belong to it, and which do not? Where is the boundary of the discipline, that is, at which point does it stop being "musicology"? Such discussions tend to go around in circles and divert attention from the content. Instead of talking about the program, it is usually more productive to go ahead and implement it.

For these reasons, CIMo4 attempts – as far as possible – to avoid the category "systematic musicology". It also attempts to avoid hierarchical concepts of "sub-", "sister", and "mother" disciplines of musicology and associated value judgments. While these terms and approaches can still be useful, it is important to be aware of their weaknesses.

The above examples and arguments suggest that musicology is *inherently* multi- and interdisciplinary. Nicholas Cook (FBA Research Professor of Music, University of Southampton) put it like this in an email to CIMo4: "... I've never seen musicology/music theory as a discipline. Departments of history consist of different sorts of historians, but departments of music consist of historians, anthropologists, popular culture theorists, aestheticians, and psychologists (as well as composers and performers, of course)—it's just that they all happen to work on music. In other words, a department of music doesn't represent a discipline, rather it is an interdisciplinary (or at least multidiciplinary) research centre—or to put it another way, musicology is inherently multidisciplinary!"

The internal structure of musicology is in a constant state of flux – at least as much as other academic disciplines:

- Interdisciplinarity may be best regarded as a temporary state. As soon as a new interdisciplinary combination becomes routine, it is time to speak of a new discipline and to stop regarding the research as interdisciplinary. For example, semiotics may be regarded as a combination of music theory and cultural studies. In its early days, semiotics was clearly interdisciplinary; now, it may better be regarded as an established subdiscipline of musicology. The establishment of a new discipline opens up new interdisciplinary opportunities between the new discipline and its older "sisters" (e.g. between semiotics and psychology). The transition from an interdisciplinary combination to a new discipline is always a gradual process; the exact point in time when it is

complete is a matter of opinion. CIMo4 does not, therefore, support specific interdisciplinary combinations. Instead, it supports the *process* of^ interdisciplinarity.

- A hundred years ago, historical musicology was the biggest branch of musicology, as reflected by the number of good research articles published in that area by comparison to other, "systematic" areas. In the past few decades, the tables have turned: although historical musicology is flourishing more than ever before, global research productivity may now be greater in "systematic musicology", if it is defined to include theory/analysis, psychology, acoustics, psychoacoustics, sociology, aesthetics, philosophy, physiology, computer science, mathematics, popular music, jazz, media, and technology – and especially if recent research in cultural and gender studies ("new musicology") is regarded as a new direction that is not easily subsumed under historical, ethnological or systematic musicology. While there is hardly any need to test such a claim, it would certainly be interesting to investigate the relative sizes of the various more-or-less clearly defined research areas in modern musicology. A possible approach might be to search a large database of abstracts from all areas of research for the word "music", and then to attempt to classify the abstracts into different areas of musicology. As an example of the growth of systematic musicology in recent decades, consider the case of music psychology. The main international scholarly journals in this area are considerably younger than corresponding journals in the area of historical musicology, and more often subject to a strict peer review procedure (which has well-known advantages and disadvantages). The growth of modern, international "systematic musicology" does not mean that it has become more "important" or "central" than historical musicology (whatever that might mean); rather, it reinforces the argument presented above that the tripartite model of musicology is not as valid, appropriate or useful as it used to be. Nor is it true that systematic musicology has "overtaken" historical musicology in all countries. It appears not to have happened in Germany, with good reason: history is more important for German culture than, for example, American culture. In addition, the predominance of historical musicology in Germany is maintained by a hierarchical structure within musicology in which historical musicologists tend to have more political power than ethnomusicologists and "systematic" musicologists. CIMo4 challenges such structures and traditions, and asks whether and to what extent they promote good scholarship. CIMo4 also calls for a closer look at power relationships within musicology, which are not always as clearcut as they may first appear: on another level, the science faculties have been more resilient to recent funding cuts than the faculties of humanities – favoring the scientists, and hence, directly or indirectly, "systematic" musicologists. A possible solution is to move (central European) musicology departments into faculties, academies or universities of music, art, or cultural studies, as is normal in many countries of the world. But this just exchanges one power relationship for another: musicology then becomes dependent on the requirements of other groups such as performers, which can again affect its internal structure. For example, a music academy may be more interested than a faculty of humanities in research on the psychology of music performance.

The constantly changing relationships between musicologically relevant disciplines (including international variations in these relationships) need to be monitored and adequately responded to. That is one of the aims of CIM04. Another aim is encourage discussion of difficult or (real or potential) taboo topics such as those mentioned in the previous paragraph. If such discussion is not actively promoted, it tends to be suppressed: no ambitious, creative scholar wants to acquire a reputation as a trouble-maker, that can all too easily lead to mysterious career setbacks such as the rejection of good articles and the failure of good job applications. While some musicologists may feel unjustly attacked by some of the observations and remarks of the previous paragraph, such reactions are unavoidable within a dynamic discipline whose scholars are constantly pushing back boundaries, exploring new terrain, and questioning old assumptions. It is in the best long-term interests of any discipline that difficult topics are openly discussed in an atmosphere of mutual respect. The first aim of such a discussion should be simply to establish the so-called facts, that is, to arrive at a description of the situation that acknowledges the different viewpoints of all involved and helps them to see the situation from different standpoints. Once a reasonably objective account has been achieved, the implications of that account can be explored and converted into concrete policies that are realistic enough to be implemented. The extent to which such policies address the problems they are intended to solve can then be monitored by ongoing observation and analysis. An interdisciplinary conference such as CIM04, that aims not only to span the entire discipline of musicology but also to promote communication between its subdisciplines, is an appropriate forum for global constructive self-criticism of this kind.

Musicological interdisciplinarity at CIM04

CIM04 attempts to bring together all disciplines that can be relevant to musical questions. Any serious, musically relevant academic discipline with its own international community, societies, conferences, and respected journals is, or can be, included in the conference.

The structure of the conference program is determined by the specific combinations of disciplines represented among the contributions of conference participants. This structure is clarified by tentatively identifying the most important musically relevant disciplines, andconsidering the various possible relationships between them and the larger disciplinary categories to which they belong.

The following table classifies musically relevant disciplines into sciences, humanities, mixtures, and practically oriented disciplines. This classification is as arbitrary as any other, and is driven primarily by the typical backgrounds and ways of thinking of the researchers in each disciplinary category.

Humanities

Discipline	Definition, explanation, or examples
Art history and theory	(visual) aesthetics, art criticism, iconography and iconology, structural analysis, form and symbol, art reception, media, visual culture, psychology and sociology of art
Cultural studies	subjectivity, mentality, ideology, gender, sexuality, "race", class, politics, economics, popular culture, postmodernism, poststructuralism, intermediality, intertextuality
History (of music)	the (western) musical repertory, its sources and analysis and its historical and social context, including the history of perception, reception, composition and performance
Literature and philology (of music)	literary critical methodology, composition and rhetoric, comparative literature, literary aesthetics, classicism, romanticism, modernism, postmodernism
Philosophy (of music)	meaning, definition, reality, purpose, underlying principles, ideas, "isms", aesthetics, beauty , taste, experience, questions not addressed in other (musical and musicological) disciplines, context and wider implications

Sciences

Discipline	Definition, explanation, or examples
Acoustics (of music)	physical acoustics of music, music instrument design, electroacoustics, physiological acoustics of hearing and singing
Computing, mathematics and statistics (in musicology)	mathematical and statistical theory, modelling and algorithms, statistical analysis of databases (of musical scores or sound files), data mining, pattern recognition, digital signal processing, ccomputer music, music information retrieval, electronic technology and media
Psychoacoustics and auditory (music) perception	empirical study of quantitative relationships between physical and perceptual properties of (musical) sounds; perceptual thresholds; pattern recognition; auditory scene analysis
Psychology (of music)	cognition, motor control, expression, development, motivation, a bility, skill acquisition, personality
Physiology and biology (of music)	neuroscience of music perception and performance, physiology, bioiology of motor control in music performance, biomusicology, genetics, evolution

Mixtures of humanities and sciences

Discipline	Definition, explanation, or examples
Ethnomusicology	the (historical and systematic) study of (non-western, folk, and multiethnic) musics in their social, cultural and anthropological context
Linguistics	the nature and structure of human languages; language as a cultural, social, and cognitive-psychological phenomenon; music as language
Prehistory and archeology (of music)	the study of prehistoric musical cultures by excavation and description of their remains; chronology; role and function of ancient music instruments
Sociology (of music)	the role of music in: the identity of individuals and groups; relationships and family; gender stereotypes; institutions, national states, politics, war and peace; the origin, development, organisation and functions of human society
Music theory, analysis and composition	approaches to the understanding of musical structure, including compositional theory and semiotics

Practically oriented disciplines

Discipline	Definition, explanation, or examples
(Music) Education	individual and classroom teaching and learning both within and outside schools: theory, approaches, and systematic investigations of their validity and effectiveness
(Music) Medicine and Therapy	performance injuries, physiology, music therapy, performance anxiety, stress
Music performance	history of performance practice; advanced performance techniques and pedagogy

While CIM avoids evaluating disciplines relative to each other, the table suggests that two of the listed disciplines do have a special status. Music theory/analysis/composition and music performance are the only disciplines in the list that have no "mother disciplines" outside music or musicology. In that sense, they may be regarded as core disciplines of musicology.

Another criterion that has been applied in an attempt to nail down the boundaries of musicology is the degree to which a (sub-) discipline directly addresses music or musical phenomena. The problem with that criterion is the lack of a widely accepted definition of music. If music is tentatively regarded as an acoustic signal that evokes recognizable pitch-time patterns, implies physical movement, influences (emotion or mood) states, is intended to evoke such patterns, movements and emotions, is socially acceptable and deeply embedded within a cultural tradition, and is an important feature of all known cultures, the disciplines relevant to this attempt at a definition – acoustics, psychology, sociology, cultural studies, history, anthropology – may all be regarded as central to musicology.

These considerations suggest the following alternative structure:

- core disciplines (theory/analysis/composition, performance – across cultures, periods and styles)
- central disciplines (ethnology/anthropology, history, psychology, sociology, cultural studies, acoustics)
- peripheral disciplines (computing, psychoacoustics, philosophy, physiology, prehistory – topics peripheral to the central disciplines)
- neighboring disciplines (art, literature, linguistics – disciplines addressing other forms of human communication and culture)
- practical disciplines (education, therapy, medicine – specific applications of the above disciplines

This classification is just as arbitrary as the one presented in the previous table. Neither of the two classifications is intended to find its way into the bureacratic structures of musicology, or to supplant the tripartite model - which could merely create new barriers to interdisciplinary research.

CIM04 is not primarily about the detailed internal structure of musicology. The main focus is on the openness of musically oriented scholars for constructive interdisciplinary engagement. A prerequisite for such engagement is the interdisciplinary recognition of and respect for each individual discipline, regardless of the category in which it may be placed or perceived. All the disciplines listed above - and presumably several others besides - can play an important role in interdisciplinary studies of musical phenomena. So all qualify for inclusion in the academic catchment area of "interdisciplinary musicology".

Submissions to CIM04 could involve ANY discipline that is relevant to music and musicology. All submissions were considered in the same way and against the same criteria, regardless of whether the disciplines addressed were included in the above table and regardless of the size of the corresponding international scholarly community.

Aims of CIM04

Against the above historical and conceptual background, CIM04 aims:

- to promote forms of musicological interdisciplinarity that might otherwise be suppressed by bureaucratic hurdles, inflexible research structures, or the force of habit (e.g. lack of communication between scholars in different subdisciplines, resulting in an inability of subdisciplines to evaluate each others' research contributions; imbalances between different subdisciplines in terms of numbers of academic positions or membership of selection committees).
- to counter irrational fears of other disciplines (based, for example, on the fear of being shown to be incompetent in another field, which can in turn be based on shaming childhood experiences at school or at home) simply by direct exposure to them (related to the concept of *systematic desensitization*).
- to help scholars from disciplines that usually operate independently of one another to pool their expertise, combine their methodologies, and to compare and contrast the relevant convergent evidence that can be obtained from different sources. All papers at CIM should have at least two authors with complementary backgrounds; that way, no-one is expected to be an expert in more than one major discipline.
- to generate solutions to problems arising from the study of music through interdisciplinary synergy – as opposed to a mere multidisciplinary accumulation of knowledge. In other words, the aim is not primarily to make researchers more aware of research in related disciplines (although of course this is an interesting side-effect), but to generate new knowledge through deep, detailed, thorough, creative interaction between and among the various disciplines that are relevant to a given question.
- to promote new and promising interdisciplinary interactions, especially interactions between the sciences and the humanities. For example, we will not promote semiotics as such – even though it evidently involves both cultural studies and theory/analysis – because this particular combination is not new (cf. the above discussion of the temporary nature of interdisciplinarity). But we will promote promising contributions in areas like semiotics and education, or semiotics and ethnomusicology, and we will especially promote interactions between semiotics and the scientific disciplines of psychology, acoustics, and computing.
- to discuss specific problems that arise from interdisciplinary interaction. For example, different disciplines have different vocabularies, and different definitions of important words and concepts. In such cases, which terms and definitions should one adopt, and why?
- to promote the unity of musicology as an academic discipline. Communication between the traditional subdisciplines of musicology (historical, ethnological, "systematic"...) is surprisingly weak. Specialization within each of these areas, and within the subareas of "systematic musicology", causes musicology to fragment. CIM04 aims to bring the diverse subdisciplines of musicology closer together. Caveat: while interdisciplinary work can bring about the gradual fusion of specific pairs of (sub-) disciplines, it can also cause new (sub-) disciplines to emerge. These new (sub-) disciplinary identities tend in turn to diversify or fragment the overall discipline. Paradoxically, then, the aim of unifying musicology can never be achieved, and cannot be separated from CIM04's aim of monitoring, recognizing and supporting musicological diversity and the dynamic evolution of its internal structure.

Why a conference on interdisciplinary musicology?

Musicology has always been interdisciplinary. But there has never been a conference devoted to "interdisciplinary musicology" as such. Smaller interdisciplinary conferences on musicology have tended to restrict their attention to a specific area within the humanities. The larger ones (e.g., International Musicological Society, Musical Intersections) presented an overwhelming amount and diversity of information, and were primarily multi- rather than interdisciplinary. Scholars from different disciplines became more aware of each other's existence, but – with some promising exceptions, such as the Joint Sessions at Musical Intersections – effective, creative communication across disciplines remained limited.

Interdisciplinarity is necessary...

- to answer research questions that involve more than one discipline. Of course, many musicological questions do not require an interdisciplinary approach; if a unidisciplinary approach yields an adequate answer to a question, there is no need to look further. But unidisciplinary approaches often neglect important aspects of a problem. For example, it may be of little use to a pianist to understand the physical workings of the piano if this knowledge is not integrated into other knowledge about piano performance, interpretation, literature, teaching, and so on. That is one reason why piano teachers find much research on the acoustics of the piano irrelevant for their purposes. An intensification of interdisciplinary collaboration between the fields of piano acoustics and piano pedagogy could contribute to a solution to this problem. Whilst it may be possible for a single author to achieve this kind of interdisciplinarity, an innovative and promising approach is more likely to emerge from a new collaboration between two or more different scholars or practitioners of complementary expertise. This is an example of an interdisciplinary interaction between theory and practice - a major focus of CIM04.
- due to the general expansion and specialization of scholarship over recent decades. As the volume of published research in each field (e.g., in each musicologically relevant discipline) increases, it becomes increasingly difficult for individuals to keep abreast of developments in more than one field. So individual scholars become increasingly specialized. The greater the degree of specialization, the greater the need for interdisciplinary collaboration – if questions that simultaneously touch different specializations are to be plausibly and usefully answered.

Background and precedents

CIM04 grew out papers and sessions at previous conferences:

- a session entitled Art Meets Science at Musical Intersections, Toronto, Canada, in 2000.
- a session entitled Art Meets Science at the International Conference on Music Perception and Cognition (ICMPC) held in Sydney, Australia in 2002.
- an invitation from the Gesellschaft für Musikforschung to Richard Parncutt to consider the current situation and future prospects of (German) (historical) musicology from the point of view of systematic musicology; his talk and proceedings paper emphasized the importance of interdisciplinary and international collaboration within musicology. An interview focussing on the situation in the German-speaking world of musicology was published by the Swiss online magazine Codex flores.

CIM04 was also inspired by the following book:

R. Parncutt, & G. E. McPherson (Eds., 2002). *The science and psychology of music performance: Creative strategies for teaching and learning.* New York: Oxford University Press.

This book is an example of the combination education, psychology, and acoustics. Each chapter is co-authored by a music scientist (usually a psychologist, sometimes an acoustician) and a music practitioner (usually an educator).

CIM04 and postmodernism

During the 20th century, the disciplines listed in the above tables developed largely independently of each other – reminiscent of the range of artistic styles that co-exist within modernism. Postmodern art (including music) may include more than one style in a single piece or sound event, thereby abandoning the unified subjectivity that was previously taken for granted. Similarly, a postmodern musicology may be regarded as a musicology that is multidisciplinary: a discipline made up of numerous, partially independent subdisciplines. CIM04 aims to transform (postmodern?) multidisciplinary musicology into (post-postmodern?) interdisciplinary musicology. Unlike postmodern art and music, in which different styles may be starkly juxtaposed but remain essentially independent of each other, the aim of interdisciplinary musicology is to interact and thereby to produce a new synthesis. This approach is no news to those artists who regularly experience creative synergy in their collaborations with other artists of different but still relevant (i.e. complementary) skills and backgrounds; famous musical examples include Mozart and da Ponte, Verdi and Boito, and Strauss and Hofmannsthal – interpersonal synergies that produced some of the most important milestones in operatic history. Interdisciplinary musicology works in much the same way – not as art itself, but as scholarship about art. New answers to interesting, relevant and applicable research questions emerge from a melting pot of related disciplines that creatively dialogue and engage with each other.

Will CIM become a series?

The following two observations suggest that the answer to this question may be "yes":

- The 122 submitted abstracts suggest that the ideas underlying CIM have long-term significance and resonance for the future development of musicology.
- During the months preceding the abstract submission deadline, we received several reports of scholars who were interested in CIM but who did not have time to develop a meaningful collaboration before the deadline.

A second CIM could be held in about three years. This would give potential participants time to develop new collaborations. It would also ensure that there is enough momentum left after the second CIM for further conferences, and avoid unnecessarily augmenting the already very large number of (musicological) conferences. There is a clear need to focus on quality rather than quantity. To promote the key elements of international and interdisciplinary balance, we further suggest that a second CIM be held on another continent (i.e., not in Europe) and be organized by representatives of another musically relevant discipline (i.e., not music psychology; see the disciplines listed under aims). We do not feel that CIM should found its own society, because the aim of CIM is to function as a link between societies together and to promote innovation – not to create a new establishment.

Readers who are considering the possibility of hosting a second CIM along these or similar lines are asked to contact the conference director.

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Review and evaluation procedures

An important feature of CIMo4 has been the development and application of appropriate, objective procedures to ensure and enhance the scholarly quality of conference contributions.

Each abstract submission to CIMo4 was independently reviewed by two international experts whose expertise corresponded to the disciplines addressed by the abstract. Their instructions were as follows:

Please evaluate each abstract against the following two criteria:

- academic quality, i.e. the normal criterion for evaluating research abstracts and articles
- interdisciplinarity, i.e. the suitability of the abstract for CIMo4 (rather than another conference)

Please regard these two criteria as completely independent. At one extreme, an abstract may be of excellent academic quality but unidisciplinary (or interdisciplinary in a well-established, non-innovative manner) and therefore entirely unsuitable for CIMo4. At the other extreme, an abstract may combine disciplines in a very promising, innovative, relevant and creative way but – for other reasons – you may consider it to have no academic value and therefore recommend its rejection.

1. Academic quality

(a) Please rate the abstract according to your own criteria for academic quality – just as you would for any other conference or journal – on the following scale:

1: very good (keynote / invite)
2: good (above average)
3: ok (below average)
4: inadequate (reject)

As far as possible,

- ignore the question of interdisciplinarity or suitability for this conference,
- ignore any linguistic imperfections and focus only on content, and
- use all four points of the rating scale.

As reviewers have been known to reverse the rating scale, please always write both the word and the number, e.g. "ok 3" or "1 invite".

(b) Please give the single main reason behind your rating. If, for example, you rate the abstract as "good" (2), please indicate in what way you consider it to be better than average. If you rate it "ok" (3), indicate in what respect is it worse than average.

(c) Type a few of lines of constructive criticism. Your comments will help the authors to improve the academic quality of their abstract and to prepare their talk or poster. Do not criticize or attempt to improve the language; focus on the content.

2. Interdisciplinarity

(a) Please evaluate the abstract's interdisciplinarity, taking into account the following:

- the degree to which the abstract realises the aims of CIM04
- the novelty, rarity, creativity and promise of the interdisciplinary combination
- the extent to which both sciences and humanities and/or both theory and practice are addressed in the paper
- the balance between the two main disciplines (i.e. the extent to which the second-most-important discipline contributes to the study, by comparison to the first)
- the correspondence between the main two disciplines and the background and expertise of the authors (on the basis of the provided bios), and
- the degree to which the described approach has the potential to go beyond mere *multidisciplinarity* (accumulation of knowledge from different disciplines) toward true *interdisciplinarity* (synergetic generation of new knowledge), i.e. to generate new insights that fundamentally depend on input from both disciplines.

Rate the abstract's interdisciplinarity on the same scale as before:

1: very good (keynote / invite)
2: good (above average)
3: ok (below average)
4: inadequate (reject)

Here, the rating "very good" does not in any way refer to the abstract's academic quality. It refers only to its interdisciplinarity, as defined and explained in the above list of points. As before, please don't hesitate to use all four points of the rating scale.

(b) Please give the single main *reason* behind this rating. If, for example, you rate the abstract's interdisciplinarity as "good" (2), please indicate in what way you consider it to be better than average. If you rate it "ok" (3), indicate in what respect is it worse than average.

(c) Suggest how the authors could revise the abstract to make it more suitable for CIM04 (as opposed to another conference). Your comments will help the authors to revise their abstract for resubmission and to prepare their talk or poster. Please indicate what you consider to be the two main disciplines addressed by the paper (since this may differ from the authors' concept). Then suggest how the paper could be revised to make is more interdisciplinary, e.g. by introducing a new discipline or by enhancing the role of the second-most-important discipline.

Since your comments in (b) and (c) will be read both by the Local Organizing Committee and by the authors of the corresponding abstract, we are counting on you to navigate an appropriate middle path between honesty (for the organizers) and tactfulness (for the authors). For the same reason (and to avoid identifying revewers), all reviews must be entirely in English.

Please provide the information in the following format:

Academic quality
(a) rating
(b) reasons for the ratings
(c) suggestions for improvement

Interdisciplinarity
(a) rating
(b) reasons for the ratings
(c) suggestions for improvement

If the mean ratings of the two reviewers differed considerably, the abstract was sent to a third reviewer. Abstract submissions were accepted as talks if the mean of all academic quality and interdisciplinarity ratings of all reviewers was less than or equal to 2.5, and as posters if less than or equal to 3.5. Keynote (invited) lectures were selected on the basis of the reviews, the range of relevant disciplines covered by the invited lectures, the interest and accessibility of the material for an interdisciplinary audience, and the representative participation of female and non-western participants.

Members of the International Review Committee were also invited to submit abstracts. These were reviewed anonymously by other members of the same committee or by other scholars contacted by the Local Organizing Committee. Any abstract submitted by a member of the Local Organising Committee was processed confidentially by another member of the committee.

Peer review by conference participants

Toward the end of the conference, each active participant will be asked to rate the presentation and content of the best (non-invited) papers and posters that they witnessed. A specially prepared form will be provided for this purpose. The results will help determine which papers are invited for post-conference publication. They will also determine which doctoral student(s) win the *student researcher award*.

Abstracts

Child/Computer interaction: Observation in a classroom setting

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Background in music education

The relationship between new technology and learning is gaining more relevance in the field of music education (Webster 2002). The present study deals with an area still understudied, that of interactive musical systems, in an attempt to understand in what way it can affect the learning and the musical creativity of children. In particular, we chose to study young children, 3/5 years old, because at this age the problem of the interaction between child and machine takes on a fundamental role in the learning process. Imberty (2002), in accordance with the psychologist Daniel Stern (1977), describes the musical development of young children as based on the vocal play between child and mother (lallation, baby-talk), characterised by the mechanism of repetition and variation. The point of interest is to verify what type of music development arises when this interaction takes place not between two human subjects, but rather between a child and a machine.

Background in artificial intelligence

At the Sony CSL, a system was elaborated able to produce music in the same style as the person playing the keyboard, the Continuator (Pachet 2002). This system is based on the notion of Interactive Reflective systems. The core concept of this approach is to teach powerful – but complex – musical processes indirectly by putting the user in a situation where these processes are performed not by the user, nor by the machine, but by the actual interaction between the user and the system. A preliminary experience has been conducted in Paris with eight children of 3 and 4 years, who were invited to play a keyboard and then the keyboard connected to the Continuator. The ability of the system to attract and hold the attention of children can be interpreted through the theory of Flow introduced by psychologist Csikszentmihalyi (1990).

Aims

A second experimental protocol has been established to observe systematically some interesting behaviours observed in the preliminary experience, and to analyse the music played by the children and the system, according to the age of the children (3-5), the exposure to the experience, and if they play alone or together with another child. From a pedagogical point of view, the general aim is to understand in what way the children relate to interactive musical systems, what kinds of musical and relational behaviours are developed, and how interactive systems can be used in the educational field to stimulate creativity and the pleasure of playing.

Method

The experiment was based on observation. It was carried out with 27 children of 3/5 years, in an Italian kindergarten (Bologna). Three sessions were held once a day for 3 consecutive days. In every session, the children were asked to play in 4 different ways: just with the

keyboard, with the keyboard and the Continuator, with another child, and both with another child and the Continuator. All the sessions were recorded on video. The attention span of the children was measured for each task. Two case-studies were observed and analysed. Successively, the most interesting conducts were selected to be tested also on the other children by means an observation grid.

Results

It was possible to observe a sort of life cycle of interaction, that move from surprise, to a different phases of excitement, analytical behaviour, invention, readjustment and relaunch. The two tasks involving the system gave rise to the longest attention spans and show how most children reach a stable level of attention characterized by a strong intrinsic motivation. The system therefore appears to motivate also children working in pairs, thus stimulating the socialization of the musical experience (join attention). The listening conducts were particularly varied: the child listen carefully to their own productions in order to identify repetitions and differences with the replies of the system. - Conclusion: The results suggest that the Continuator, or other similar interactive reflective systems, is able to develop interesting child/computer interaction and creative musical conducts in young children, thanks above all to its ability to replicate the musical style of the child that is playing.

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Understanding our experience of music: What kind of psychology do we need?

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Background in music psychology

Music psychology, in its historical development, followed the paradigmatic turns of psychology in general: In the 20th century, it adopted in particular the research methods and interest of cognitive psychology and, during the past decades, the new interdisciplinary connections to psychobiology and neurosciences. On the other hand, there are deficits regarding the cross-connections between music psychology and cultural psychology.

Background in historical musicology and cultural anthropology

From the point of view of historical musicology and cultural anthropology, experiencing and understanding music represents a process basically dependent from the cultural context. This leads to the question how cultural context influences the social and individual representations of music in the sense of a particular "style of aesthetic experience" typical for a historical period. Although this is a genuine psychological question, it cannot be answered by a psychology which is restricted to "ahistorical" explanations of information processing. Thus, from the viewpoint of cultural anthropology, there is a strong interest in any kind of "cultural psychology" which is able to conceptualise the dynamic interactions between culturally determined "social representations" of music and the individual mind.

Aims

We aim at arguing the necessity of a "cultural turn" in music psychology. Following the main lines of the development of psychology as a science, research concentrated in neuro-cognitive aspects during the past decades while cultural aspects have been underestimated in music psychology as well as in psychology in general. Furthermore, we claim for re-developing the concept of psychological aesthetics to cover the particular "psychologies" concerned with arts, like music psychology, psychology of arts.

Main contribution

We refer to Jerome Bruner (1990), who argued that the original intention of the "cognitive turn" in psychology aimed "to discover and to describe formally the meanings that human beings created out of their encounters with the world" and, furthermore, "to prompt psychology to join forces with its sister interpretative disciplines in the humanities and in the social sciences". However, stimulated by the "information revolution" the interest of psychology "shifted away from mind and meaning to computers and information" (Bruner).
Bruner therefore pleas for revitalising the original intentions of the "cognitive turn" and argues that psychology, when it concerns centrally with meaning, must "inevitably become a *cultural* psychology". We want to show that the same argumentation can be referred to music psychology, respectively. Cognitive music psychology has elaborated an amazing plenty of knowledge about the functioning of mental processes connected with experiencing and understanding musical structures. However, there is a lack of interpretative research aiming

at interpreting the role of music in those processes which Bruner called "the nature and cultural shaping" of meaning-making, and the central place it plays in human action.

Implications

An important task for an interdisciplinary framework including cultural sciences and psychology should be to review recent theories of cultural psychology in order to elaborate implications for a psychological theory of musical experience. As an example, we will point to the Symbolic Action Theory developed by Ernst E. Boesch (1991) which explicitly refers to the role of aesthetic experience in cultural context.

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Scales in traditional solo singing: Models and results

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Background in psychoacoustics

Description of pitch scaling in solo singing without accompaniment is problematic because of slightly floating tonality and zonal intonation. It is well known that zonal intonation results from categorical perception. Usage of the zone depends on aspects of performance (e.g. Sundberg 1999) as well as on melodic context (Ambrazevièius 2001). Slightly floating tonality and zonal intonation are especially inherent for archaic traditional solo singing (e.g. Alexeyev 1986); by 'archaic' we mean 'unbound to the Western musical thinking'.

Background in ethnomusicology

It is widely known that archaic traditional solo singing features pre-diatonic scales different in interval structure from the contemporary pitch scales. These scales are mostly based on contrast of voice registers and timbre or made of approximately equidistant steps (á- or ã-types, by Alexeyev 1986). Perception of pitch scale of a distant musical culture results in distortion of the original structure (e.g. Chenoweth 1972). It is a manifestation of also widely known collision of two phonemic systems (e.g. Nettl 1964) that bears inadequacy in transcription (Reid 1977).

Aims

- To develop mathematical model aiming for recognition of an insider's phonemic scaling, i.e. for its reconstruction from acoustical pitch measurements (elimination of masking factors of slightly floating tonality and zonal intonation).
- Also, for comparison, to develop the model for an outsider's (here, researcher's with Western background) perception of a traditional scale. This model is based on the perceptual seek for the best fit of sounding material to the template of equal temperament.
- To study, by means of the models, the regularities of scaling in one idiolect and its perception.

Method

The mathematical models described above were developed. Pitches of songs belonging to one idiolect of Lithuanian traditional male solo singing were measured (computer software of acoustical analysis 'Speech Analyser' was used). The results of acoustical measurements were reconsidered by means of the modelling.

Results and conclusions

Reconstructed scales show different interval structures characteristic of the ancient pre-diatonic and modern diatonic (or even 'equally tempered') musical thinkings. It means that there are different historical layers of musical thinkings manifested in the idiolect.

It is also demonstrated how 'aural ghosts' conditioned by diatonic templates work in perception of traditional scaling by a contemporary outsider and, consequently, how they mislead to false systematisation of traditional scales. Resemblances to interval structures in Lithuanian vocal *Schwebungsdiaphonie* are discussed.

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Contextual influence on the intelligibility of high-pitched sung vowels

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Background in music psychology

Most of the time, while listening to high-pitched singing, there is a poor understanding of the sung speech. It seems that there are some properties in production and perception responsible for this. Previous research has shown that perceptual difficulties of the sung speech increases with raising pitch (see e.g. Hollien et al. (2000); Sundberg (1999)). Most of the experiments conducted, however, have been focused on steady state vowels. It has been noted that many listeners identify vowels in consonantal contexts more accurately than in isolation, but the combinatorial effects of vowel quality and different consonantal elements are still rather unclear.

Background in music acoustics

The most important facts for vowel recognition are formant frequencies, which converge with increasing pitch, especially for /e/ and /i/. Closer formant frequencies make vowel recognition more difficult.

Aims

The main interest of this investigation was to map the perceptual aspects of speech intelligibility in high-pitched singing onto the acoustical signal. In particular, the influence of context was of great importance.

Method

In reaction time experiments, 24 non-musicians between the ages of 22 to 32 heard 216 monosyllabic pseudowords with a CVC-structure. The consonant positions were filled by plosives, and the vowel position was filled by the tense vowels /a, e, i/. Each item was presented with three levels of steady-state pitch as well as rising and falling contour tones, and each listener heard the items in a different random order. The subjects had to concentrate on the vowel, and a response box with 3 keys was labeled with /a/, /e/ or /i/. After hearing each item, listeners were requiered to press the right key as fast as they cancould. The recorded responses were the number of correct and false vowel identification, and as well as the reaction time.

Results

An effect was found for vowel quality and the pitch/contour-conditions. Most of the correct /a/ and /i/ vowel identifications were found at a low pitch level and for the contour conditions. In contrast to /a/ and /i/, the /e/-case showed the fewest errors at high pitch levels. The reaction time was pitch-dependent for all vowels, and faster reaction times were found at low pitch levels. The overall perception was onset –dependent. Best results have been achieved with /k/, poor results have been found for /d/.

Conclusion

It was found that a change in pitch level had a profound effect on vowel perception. In general, perceptual difficulty in vowel recognition increases as the pitch level is raised. But looking at each vowel generates a more heterogenious outcome. In fact, some vowels achieve a better rate of correct identification with the most high-pitched tone. The results indicate that the identification of sung vowels is influenced by vowel quality, pitch and contour. The results also suggest consonant-dependent vowel identification.

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Algebraic methods in Twentieth-Century music theory and musicology: Some computational aspects

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Background in algebraic methods applied to music

The historical development of the concept of algebraic structure in the Twentieth Century accompanied almost contemporaneously the constitution of modern music theory, as well in the American set-theoretical tradition (Babbitt, 1965/1972) as in European (Xenakis 1965) and East European formalizations of musical structures (Vieru 1968). Algebraic methods offer a unitary perspective on these three historical approaches and raise the question of the perceptual and cognitive relevance of the abstraction process in the representation of musical structures (Andreatta, 2003).

Background in computational musicology

The evolution of computer-aided music-theoretical, analytical and compositional environments naturally increases the computational character of the systematic approach in musicology. Recently, the conception and realization of graphical programming languages, like the Ircam OpenMusic environment (Agon, 1998), enables the construction of models of music-theoretical and compositional processes and radically changes the musicological relevance of some traditional music-theoretical constructions.

Aims

We aim to clarify the relevance of algebraic methods in the foundation of a computational approach to music theory, analysis and composition.

Main contribution

Algebraic methods lead to a new way of understanding some classical Twentieth-Century analytical approaches (in particular American Set Theory) and give some answers to new music-theoretical questions about the formalization of musical structures in the pitch as well as in the rhythmic domain. Three different compositional orientations, such as Milton Babbitt's total serialism, Iannis Xenakis' symbolic music and Anatol Vieru's modal theory, can be shown to belong to the same theoretical paradigm which is provided by an algebraic representation of musical structures. At the same time, once implemented in a computer-aided environment for music analysis and composition, such as OpenMusic, these approaches become a general framework for a structural computational orientation in musicology.

Implications

A discussion of the relevance of algebraic methods in Twentieth Century music theory and musicology requires a mathematical as well as a music-theoretical and musicological expertise. Moreover, the emphasis on the computational aspect of this systematic approach to musicology requires an expertise in computer science and, in particular, in the conception and elaboration of user-friendly programming languages. This has a strong implication in the way to teach music theory, analysis and composition and raises, at the same time, the question of the perceptual and cognitive relevance of algebraic methods applied to music.

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Linguistic semantics as a vehicle for a semantics of music

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Background in linguistic semantics

Meaning has been the most difficult issue to tackle in linguistics. Approaches have been many, success minimal. Modern semantic theories are largely mind-oriented, in that they postulate specific mental representations responsible for meaning generation. The most promising approaches to semantics include cognitive semantics, which predominantly studies the conceptual building of metaphors, and generative semantics, which deals with truth-conditional acceptability of linguistic utterances. An interesting, more socially-oriented, approach to semantics, is also that of memetics, which proposes that meaning propagates through social groups by imitation.

Background in music theory

The approach to music theory based on a linguistic epistemological framework has been present in cognitive science for at least twenty years. However, the study of musical meaning backed by the findings of modern linguistic semantics has been scarce in the literature. Reasons are obvious, since the research in music cognition has still not resolved the issue of whether there is such a thing as musical meaning at all. Most discussion still seems to cluster around the ancient cleft between formal and contentual aesthetics of music. Even when the latter position is accepted, its psychological research usually sticks to emotion-related phenomena, such as the notorious 'happiness' of majors or 'sadness' of minors, and therefore provides little grounds for a broader theory to describe the extramusical impact of music.

Aims

We take a moderately contentual view of musical meaning in order to point to some approaches of modern linguistic semantics which might prove valuable to the research of musical content. These include: (1) a revised attempt of approaching musical denotations and connotations, along the lines of memetics and social propagation theory; (2) a revised approach to the study of musical metaphor, in accordance with the findings of cognitive semantics; (3) an attempt to draw parallels between generative semantic theories and possible studies of suitability of music in particular non-musical contexts.

Main contribution

(1) Within the framework of memetics we propose that musical phrases spreading in society can function as memes, bits of information causally influencing the behaviour of individuals. This is where musical denotations, if at all, should be sought. (2) In the cognitive domain, we propose a distinction between *intrinsic* and *extrinsic* musical metaphors, the former to be studied in music theory only, and the latter to be the subject of a grand metaphor theory based on cognitive linguistics. (3) As for more formal issues, we propose parallels between generative semantics and the study of musical content. Although music certainly has no truth-conditions, we believe 'native listeners' (parsers) do have intuitions about the acceptability of music in certain extramusical contexts.

Implications

Even though the two systems vastly differ, linguistic semantic methodology can give insights into the study of music experience. We postulate a possible identical coverage of linguistic and musical denotations and connotations, a neo-Fodorian 'module' for metaphor, irrespective of the symbolical form of its realization, and a substantive role of intuition in musical meaning generation, comparable to some aspects of native speaker's intuition. We believe these connections are a good starting point for a grand semantic theory to cover at least these two cognitive abilities.

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Teenagers, internet and Black Metal

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Background in cultural studies

Black Metal is a musical subgenre of Heavy Metal that appeared in England back in the 80's. It combines radical political ideologies and left hand path religious beliefs with nihilism, misanthropy and a dark aesthetic. This subculture spread in Norway in the early 90's and got infamous due to violent episodes of murdering and church-arson (Moynihan, 1998).

Background in sociology

Young people of western countries are growing up in a Judeo-Christian influenced culture. One mean of rebellion is to reject the biblical and become adept of everything that is described as evil in it. In this case, they search for a social group based on their insurgent beliefs and consequently adhere to Black Metal which is unanimous in its destructive impulses toward Christianity and its parent religion, Judaism from the Middle East (Prozak, 2002).

Aims

This paper aims to clarify the influence of the Internet, especially in the context of anonymous communication in a music focused online community, on the behavior and the socialization of young people member of a very extreme, highly political and religious influenced musical subculture.

Methods

An Internet discussion forum dedicated to Black Metal has been examined. The official and also the most frequently used language is English but there are also some Norwegians and French threads. There have been 25 653 postings so far, with an average of 85 new postings every day. There are currently 9696 registered users, with an average of 43 new users per day.

Results

The data collected so far showed deviances to the existing Black Metal codex. Basic fundaments of the Black Metal subculture like "white pride" or the non admission of electronic music were often rejected. The reasons which could be identified were the censorship of the forum moderators, the globalization of communication, which is inherent to the Internet, and the influence of older forums members, which act as mentors. Especially the threads dealing with personal feelings and experiences had a socialization effect on the users. The users also seemed to develop deeper musical and artistic knowledge over time due to their interest in the music and the cover artwork of their favorite Black Metal band. The qualitative data which has been collected shows that the main forum themes are music centered and focus on the musical production (sound, technology, instruments), how to play particular songs (request for tabs), discussion about the lyrics, reviews of concerts and albums, personal discussions about feelings and experiences, presentation of own musical and artistic work for peer review.

Conclusion

A virtual ethnography of a Black Metal online community has shown that the sub cultural aspects of Black Metal are not as preponderant as the music itself. The Internet, as a global means of communication, seems to help the teenagers in gaining mutual understanding. This increased sociability and tolerance is probably the key element which leads to the rejection of the radical beliefs in Black Metal and put the focus on the music. These empirical results however where gathered by considering only a small extent of the data available on the Web. There is a need for a computerized approach in order to get qualitative data out of huge amount of information available online.

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Nationalizing harmony? – A system of harmony proposed by Turkish composer Kemal Ilerici

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Background in musicology

Kemal Ilerici (1910-86), Turkish music theorist and composer, asserts in 1940's that based on chords of thirds western harmony does not suit to the harmonization of traditional Turkish modes, as European and Turkish musical spheres are of totally different nature. He examines both styles through a common perspective and states that harmony is principally a product of voice leading, although some other aspects like over- and undertone series play a certain but not central role. Voice leading is but governed by some basic yet oppositional characteristics inherent to each scale step of a mode. In the major scale, the arrangement of steps according to their antipodal qualities results in an intervallic array of thirds that forms also the essence of chord-building in western harmony, while in traditional Turkish modes such an arrangement ends up with an ordering in fourths as an expression of its idiosyncratic nature. Consequently, a proper harmonization of indigenous modes necessitates not a tertian but a quartal scheme of chord-building.

Background in sociology

Nationalism is principally a cultural phenomenon which is though not a passive identification of folk character but a deliberate making of the *national*. Particularly in non-western experiences, national thought displays a paradoxical quality. On the one hand, it appreciates native cultural elements and exalts the national identity. On the other hand, comparing the local level of development with a higher standard, it exhibits a feeling of disadvantage vis-à-vis developed western nations and accentuates the necessity to progress. Ilerici's view comprises both of these peculiarities and aims at devising a modernized yet unique form of musical expression, engaging in his system of harmony characteristic elements of the native music styles.

Aims

With a symptomatic reading of the quartal system of harmony, which becomes prominent in the *New Turkish Music* during the postwar era, and its structuring within nationalist discourses, our aim is to investigate the fusion of western and eastern musical styles as envisioned by theorist-composer Ilerici.

Main contribution

Ilerici's enabling of polyphony within traditional Turkish music, a kind of 'search for the other in itself', is thought of being a crystallized instant of Turkish nationalism. His way of handling the native music culture should not be considered only as a matter of taste, as it is deeply backed up by nationalist ideology. However, Ilerici's attempt is self-contradictory regarding both musical and ideological levels. First: On the one hand he acknowledges qualities of western music as universal norm, which are though supposed to be immanent to the west per se. On the other hand he discovers comparable elements of harmony from inside the unique and intrinsic qualities of a non-western musical discourse. Second: Non-

western nationalist discourse utilizes the premises of the enlightenment philosophy to accomplish the distinctive national identity and the modernization. However, it is on the same philosophical basis that the non-western had been acknowledged as unprogressive, passive, a fall from the universal –western– norms, *essentially*, as the antipode of what the West represents. We investigate Ilerici-system through, firstly, a sociological analysis of national thought; secondly, a musicological investigation of his theory and example works; lastly, a more elaborate and abstract third level in which previous analyses are considered. Thus, our main theoretical premise is neither a comparative musicological study, nor a sociological analysis of nationalism, nor a juxtaposition of the both through a transfer of analytical results from one discipline to another.

Implications

How Turkish composers enabled western thought and music in their Weltanschauung and, moreover, how they resisted to the western simultaneously, should be thought of following a much more complicated pattern than it is exhibited until now in the literature. For such an intercultural survey, staying at the border of the West and the East, we propose an interdisciplinary standpoint considering the meaningful specificities which could not be revealed through a single perspective at all.

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An ecological approach to multimodal subjective music similarity perception

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Background in music information retrieval (MIR)

The perception and cognition of musically similar songs is a well-known research topic in the MIR community. There has been a lot of work in the auditive area (e.g. Logan, Aucouturier, 2002). More recent approaches investigate the influence of cultural factors on similarity through the use of metadata (Whitman 2002). Possible bi-modal combinations of audio and cultural facets have been explored recently and (Baumann 2003) intended to include also the lyrical facet to compute tri-modal subjective music similarity.

Background in experimental psychology, cognitive science

We are interested in an 'ecological' approach to perception of musical similarity. This approach takes us out of the lab and into the actual worlds of music users. Being able to observe users' interactions with music free of experimental manipulation or direction could help us start to build accounts of musical similarity based on cognition 'in the wild' (Hutchins, 1995).

Aims

We aim to evaluate the relations between similarity facets, namely sound, lyrics, cultural issues and whether a situated rather than lab-based approach can lead us to new insights concerning music similarity perception and cognition in general, and these relations in particular.

Main contribution

In order to allow the setup of real-world experiments that allow us to study situated cognition we have built a mobile application, 'musicAssistant', a portable device which accesses a music database over WiFi in mobile usage scenarios. It allows users to directly interact with a recommendation engine. A virtual joystick controls the weights of 3 facets (sound, cultural and lyrics) each contributing to a combined music similarity measure. Our studies involve equipping music users with the musicAssistant and shadowing them using video feeds to track the similarity decisions they spontaneously make in a variety of locations and social settings, at different times. (The only instruction to users is to find new music that is similar to what they are currently listening to.) Our research is beginning to show how perception of musical similarity is impacted by social, temporal and geographic contexts in ways not predicted by literature based on lab-based studies. An ecological approach can give us new insights into the cognition of musical similarity and help us to understand the relation between the different facets involved.

Implications

The work of the MIR research community is shifting slowly towards user-oriented basic research and applied systems as most recent contributions in core MIR conferences (ISMIR2003, DAFX2003) show. Cross-disciplinary work on different input data (raw audio, MIDI, metadata) and real-world user evaluation may provide means of addressing the open research areas in innovative ways.

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Singing as a stepping stone for speaking: Melodic intonation therapy

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Background in neuropsychology

Left-hemisphere lesions often cause language impairments. Patients with acquired nonfluent aphasia have severe problems with spontaneous speech. However, they are able to sing the lyrics of familiar songs fluently (Béhir, 1836). Yamadori et al. (1977) showed that a vast majority of nonfluent aphasics can sing with words. That musical abilities are still working is not surprising as they are thought to be located in the right hemisphere (Zatorre et al., 2002). However, the ability to produce language fluently in singing but not in speaking is astonishing and suggests hemispheric interactions not yet investigated.

Background in musicolinguistics

Singing and speaking have common roots in ontogenetic and phylogenetic development (Deutsch et al., 2003). The differentiation of the two abilities in the course of life, their commonalities and differences are the topics of musicolinguistics (as named by Anoop Chandola). Musical features of speech and the role of language in singing show how singing and speaking intersect. As singing is a valuable resource of nonfluent aphasics, the described intersection should be dealt with in speech therapy.

Aims

The technique of Melodic Intonation Therapy (MIT, Sparks et al., 1974) is used to explore possible explanations of hemispheric interactions. Commonalities of singing and speaking are described. Implications of the use of these interactions and commonalities in language rehabilitation are clarified.

Main contribution

MIT mixes speaking and singing. The prosodic features of language are transformed into musical elements of melody and rhythm in an intensive training programme for chronic "therapy resistant" nonfluent aphasics. The musical frame enables the initiation of propositional speech (Bonakdarpour et al., 2003). For the efficacy of MIT there are two competing explanations. Sparks et al. hypothesize a contribution of right-hemispheric regions to recovery, focusing on the reorganisation of language functions and consistent with results of recent brain imaging studies (Thulborn et al., 1999). Belin et al. (1996) argue that right-hemispheric activation in language functions is abnormal and thus poses an obstacle to complete recovery; MIT reactivates the damaged left-hemispheric regions rather than stimulating reorganisational processes in the right hemisphere.

Implications

Why does MIT work? Research combining neuropsychological and musicolinguistic approaches is needed to test the hypotheses of Sparks and Belin. Mechanisms of recovery can be studied by examining neural growth in damaged and homotopic areas (using brain imaging techniques) after MIT treatment. Regardless of the outcome of this research, MIT is a powerful device for patients to regain speech via singing.

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Composing and performing contemporary music with pupils

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Background in music composition

Contemporary music seems difficult to be listened because of rhythmic-metric and textural irregularity (Erickson 1982; Deliège 1989; Baroni 2003). Composing new pieces in classroom context is problematic because pupils don't know this music. However, contemporary compositions seem to be easier accepted by people not usually listening to classical pieces (Delfrati 1998).

Background in music education

Contemporary music and musical education are link together through the exploitation of sound objects and the invention of new forms (Delalande 1984). Recent pedagogical studies suggest the increase of listening skills in pupils in order to rework what they listened to and to compose (Paynter 1982; Addessi 2000). This is easier if carried out in tutored groups with discussions beyond composition and performances of the created pieces (Swanwick 1994), developing particular competencies on musical form.

Aims

It could be interesting to check whether the difficulties described above can be overcome through specific didactic projects. These were the aims of a concrete teaching experience (not an experimental test), carried out in Italy (school year 1997-98) at a secondary school in the province of Turin.

Methods

35 pupils (12-13 years, not music-learned) were involved in analysis-composition workshop during one month (two hours a week). Pupils begun by listening to some fragments of contemporary pieces (Ligeti's *Atmosphères*, Stockhausen's *Kreuzspiel*, Xenakis' *Metastasis*) to recognize music textures (sound strips, punctual events, massive glissandi) and to decide after discussion how to represent it graphically (intuitive 'ear score'). Then groups of 4-5 pupils explored sounds of electronic keyboards at disposal, choose timbres, invent adequate musical textures (models: pieces heard before), draw intuitive graphic score, perform it and record the outcome on tape. Finally they listened all together to the fragments composed by each group, decided how to order them in sequence according to their textural characteristics, and recorded them on a new tape to build a complete piece.

Results

Project allowed pupils through the listening to develop analytical (Delalande 1993) and creative abilities (recognizing textures, describing them verbally and represent them graphically). Composing as 'group game' connected cognitive dimensions (analysis-synthesis) and creativity. This increased the consciousness of relationships between ideation and sound evidence of

musical outcome. Final discussion allowed pupils to build a complete piece, defining its form as depending from composing and performing.

Conclusions

Thruogh experience of composing and performing, contemporary pieces could be appreciated by not music-learned people. It led pupils to enjoy not only their own pieces, but also masterworks of important composers, thus contributing to enlarge their musical horizons.

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Monophonic polymeter

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Background in music psychology

Phenomenal accents suggesting nonconcurrent groupings can generate competing metric interpretations of a musical surface. Sometimes these conflicts continue for a relatively prolonged period. We use the term *polymeter* to describe such cases. This paper discusses perceived polymeter created by conflicting cues within a single melodic line, a situation we term *monophonic polymeter*. Contributing factors and the perceptual effects of monophonic polymeter are described. In particular, we consider the cognitive implications of music that commences with monophonic polymeter. We propose that the modus operandi of processing incipiently ambiguous music is, by nature, quite different than that of music that commences with unambiguous metrical structure. Metric induction has been one of the most widely studied and controversial areas of music cognition. Models of metric induction (Desain and Honing (1996), Longuet-Higgins and C. S. Lee (1992), Berger and Gang (1998), etc) focus primarily on integrating cues to produce an emergent metric grid. The task is generally, albeit implicitly, regarded as one of optimization. Perceptual polymetric music intentionally delays unambiguously clarifying the meter of a piece, sometimes retaining multiple metric interpretations throughout the entire work. In this paper we will discuss the aesthetic and cognitive implications of monophonic polymeter with particular emphasis on its occurrence prior to metrical inference.

Background in music theory

Incipient metric ambiguity is a characteristic of a good deal of western music of the 18th and 19th centuries. In these works, metric induction is delayed due to ambiguity often caused by misalignment of contributory melodic, tonal, and rhythmic metric cues. The listener is faced with the task of processing conflicting metrical cues. A particularly interesting case involves perceived polymeter arising from a single melodic line. While monophonic polymeter is evident in a broad category of works, the music of Bach provides a rich body of examples of this phenomenon.

Aims

Our broad purpose is to propose perceived incipient polymeter as belonging to a category of music that must necessarily be regarded in contrast to the rhetorical model of music that predominates during the late eghteenth and early nineteenth centuries. Simply put, music that begins ambiguously, and maintains that ambiguity for an extended period of time demands an entirely different type of cognitive listening strategies than music in which the meter is clear and unambiguous soon after it starts.

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Sync or swarm: Group dynamics in musical free improvisation

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Background in music improvisation

Improvisation has received some scholarly attention, although its emphasis on in-performance creativity and interaction often defies the standard musicological tools of the trade and accepted methods for evaluating competency and aesthetic value [5]. Our existing analytical tools, derived in great part from the study of European notated music, are inadequate for a better understanding of the freer forms of group improvisation that have developed since the 1960s. These approaches tend to avoid pre-established harmonies, melodies, rhythms, forms–and often any strong idiomatic components–in favor of the dynamic and self-organizing qualities of ensemble interaction and exploration [1].

Background in nonlinear dynamical systems

In any system that involves cooperation or competition and in which the whole is greater than the sum of its parts the governing equations must be nonlinear. Several recent scientific approaches aim to model these nonlinear problems of communication and control including: catastrophe, chaos, complexity, criticality, and network theories. While the full complexities of musical performance are still beyond the scope of these approaches, their emphasis on nonlinearity and dynamics offers insight into the complexities of musical production, interaction, and reception.

Aims

By applying insight and vocabulary from nonlinear dynamical systems theory–including attractors, bifurcations, and phase transitions–to the analysis of group free improvisation, we aim to discover patterns of ensemble interaction and to develop more appropriate and precise ways to discuss the dynamics of improvised performance.

Main contribution

In order to apply these ideas with some rigor, we are developing an algorithm to compute minimum complexity descriptions of temporal sequences that can assign an "entropy" to each subsystem of a complex system and, in turn, give rise to a "complexity profile" for an entire piece [4]. And we look to seminal recordings of free improvisation [6] and first-hand ethnographic interviews with improvisers (in this case the celebrated saxophonist Sam Rivers) to identify common types of interactions and transitions within group performance [2 and 3]. By treating the temporal trajectory of improvised music as a multi-dimensional "phase space" and defining an energy function based on a structural information measure, we hope to model and discuss the ways in which coherence and incoherence, synchrony and disruption emerge in performance in both intended and unintended ways to shape a collective order.

Implications

We are only in the early stages of investigating the nonlinear dynamics of complex systems involving social interaction and human cognition and creativity. But these interdisciplinary approaches are already encouraging in their ability to offer alternate perspectives, vocabularies, and analytical strategies. While the allure of musical improvisation may continue to be its inherent unpredictability, a better understanding of the dynamics of ensemble performance will only highlight the subtleties of its form.

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The paradox of musical acoustics: Objectivizing the essentially subjective

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Background in acoustics

The study of music acoustics may be considered the quintessential interdisciplinary musical science, requiring expertise in a number of areas, including but not limited to musical performance, psychoacoustics, and physics. Acoustics is the science that deals with the production, control, transmission, reception, and effects of sound. Sub disciplines include speech processing, room acoustics, environmental noise, vibration in vehicles, ground vibration, marine mammal communication, bioacoustics and musical acoustics. Sub disciplines of musical acoustics include music perception, physical modeling, music performance, and instrumental acoustics. One of the goals of instrumental acoustics is to define quality parameters enabling objective judgments of musical instruments. These quality parameters are largely dependent on subjective factors, however, and remain elusive.

Background in music performance

Musical instruments evolved by trial-and-error, fulfilling developing needs of contemporary musicians. Instruments and musicians' playing techniques developed a high level of sophistication long before they came under scientific scrutiny in the last century. Skilled musicians may be able to say immediately if they like an instrument without any idea of its physical function based on his or her traditions, habits, taste, and expressive vision. The complex and ethereal judgement factors of musicians make it therefore difficult to obtain unified quality judgements to correlate with objectively measurable acoustical data.

Aims

The authors submitted this paper to ensure the presence of musical acoustics at this conference. It is of great importance to share knowledge among researchers in perception, performance, and other types of musicology to enable further advances in all of our fields.

Main contribution

The main point of this talk is to introduce the interdisciplinary field of musical acoustics, characterize difficulties of scientifically objectivizing the essentially subjective and mysterious entity of music, and to present some approaches that have been used to define quality parameters of musical instruments. While great advances in the understanding of physical aspects of musical instruments have been made, science will be perpetually dependent on the judgments of musicians and listeners to give their findings relevance in a musical context. The writings of some of the "parents" of modern musical acoustics will be taken into account in the discussion of how science and music performance can be combined.

Implications

One possible reason for the difficulty of quality judgement is that music acousticians are confronted by a great paradox: in isolating the musical instrument from the musician, the room environment, and the listeners, the scientist removes the subjective factors involved.

These subjective factors are, however, precisely those intimately connected with the main purpose of musical activity: expression.

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Perceived consonance of harmonic intervals in 19-tone equal temperament

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Background in microtonal research

Regardless of the method of evaluation used, the 19-tone equal temperament (19-tet) has frequently emerged as one of the most plausible candidates for an alternative equally tempered tuning system (e.g. Krantz & Douthett, 1994). Speculations on consonance within the 19-tet have been presented by Yasser (1975/1932) and Mandelbaum (1961).

Background in psychoacoustics

According to Plomp and Levelt (1965), sensory consonance for harmonic complex tones reaches its local maxima at simple-integer frequency ratios (which represent the consonant intervals). These ratios are well approximated in e.g. 12-tet and 19-tet. Quite similar influence of coinciding and nearly coinciding partials can also be found for inharmonic tones (cf. e.g. Geary, 1980). Terhardt (1984/1976) suggested that sensory consonance is insufficient to describe the phenomenon of musical consonance, which also depends on culturally conditioned aspects of music.

Aims

The present study had two aims. First, we wanted to get a comprehensive overview of the relative amounts of consonance and dissonance perceived among the harmonic intervals of 19-tone equal temperament. Second, we aimed at producing general information about the strategies that are used for making judgments concerning musical consonance (e.g. the influence of fundamental frequency ratios vs. the matching of partials). This involved evaluating how well current models of sensory (or tonal) consonance would predict the experimentally obtained values of this study.

Method

Two experiments were conducted in order to study listeners' tendencies to attribute patterns of relative consonance and dissonance to adjacent harmonic intervals of the 19-tet. The stimuli in Experiment 1 consisted of ordered pairs of harmonic intervals. The subjects indicated whether the perceived consonance increased or decreased from the first to the second interval. Experiment 2 was designed firstly to replicate the previous findings in an a-temporal setting: now the subjects had to choose the most consonant interval from three alternatives that they were free to explore using three push-buttons. In half of the trials, Experiment 2 also incorporated inharmonic spectra, designed to yield maximum sensory consonance for intervals that would otherwise be heard as dissonant.

Results

The results suggest that (1) intervals, which approximate the familiar diatonic intervals, were perceived as most consonant. (2) The subjects used various strategies in their judgment on consonance of harmonic intervals: sensory consonance, fundamental-frequency relations and avoidance of slow beating were all significant factors. Sensory consonance seemed to be the dominating factor when subjects judged dyads incorporating an inharmonic spectrum.

These findings do not support the previously proposed hypothetical consonance/dissonance rankings for 19-tet (by e.g. Yasser).

Conclusions

Although unsatisfactory in itself to describe musical consonance in 19-tet, the results obtained in this study will provide a psychoacoustic foundation for such a concept. As Huron (1994) has noted, there exists a connection between sensory aspects of consonance and most common musical scales and chords. Thus, our results will form a basis for practical suggestions concerning the use of the 19-tet.

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The science of singing and seeing

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Background in singing pedagogy

Singing teaching is commonly based on a master-apprentice model, relying on good modelling and feedback. Visual feedback technology (VFT) has been investigated as a tool in singing teaching by a number of researchers and its benefits for skills learning long advocated. However, its uptake in the singing teaching community has been slow, partly because of the cost, which has been very high until recently, but also because of real and perceived shortcomings of the technology and the lack of pedagogical guidelines incorporating VFT.

Background in vocal acoustics

Perceptual characteristics of the singing voice include the pitch, loudness, and vocal timbre—with corresponding acoustic correlates fundamental frequency (Fo), sound pressure level, and spectral characteristics. For the purposes of singing training, acoustic quantities must be presented in musically relevant terms.

Aims

In order to develop new VFT for use in singing teaching, the aims of this research were to:
1. develop new acoustic algorithms to better meet the needs of singers
2. design on-screen displays to present the feedback in musical terms
3. evaluate the usefulness of the VFT in the singing studio.

Method

New acoustic algorithms were developed to optimise pitch accuracy for the singing voice and used in a computer software package SING & SEE with musically-oriented visual feedback. Four singing teachers used the VFT in lessons with a number of their regular students (21 students in all). Prior to implementing the protocol, the teachers were given a brief training session on use of the VFT, and collaborated with the researchers in setting appropriate singing tasks for each student. The learning effectiveness of the VFT was assessed by means of a single case study design, comprising 4 weeks baseline, 6 weeks intervention, and 4 weeks follow-up. Both teachers and students were interviewed about how the technology was used in the pedagogical process and perceived strengths, weaknesses, and possible improvements or developments of the technology.

Results

Analysis of the interview data showed positive reactions from both teachers and students. Students were enthusiastic about the immediacy of the feedback and its precision. Many felt that they made quicker progress. Teachers used the VFT for onset, pitch accuracy, vibrato,

and vowel quality. Both students and teachers had suggestions for improvements to the VFT and for how it could be incorporated into the learning process.

Conclusion

The results suggest that VFT can provide a useful tool for singing teachers in providing immediate and precise feedback about particular aspects of the voice that are otherwise difficult to explain to the student.

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Language as music: The case of Leo Janácek

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Background in music history

Composer Leo Janácek is known for the distinctive speech-like style of many of his vocal lines (Stìdroò 1999). The intonational and prosodic contours of speech fascinated Janácek, and he daily collected snippets of spoken language in notebooks. Janácek's approach to transcription was informed by his ethnographic experience in notating folksong, as well as his readings of contemporary psychology and acoustic science.

Background in linguistics and cognitive science

The importance of proper melody and rhythm in speech has been clear at least since the Homerian epic (Danek and Hagel 1995). Aristotle, Cicero, and Quintilian discuss the importance of proper prosody in speaking; Rousseau and Spencer considered music an outgrowth of speech. Certain musical indicators seem to have supported language syntax in ancient chant traditions (Treitler 1992). A single mechanism is involved in initial processing of both music and language (Patel, et al. 1998). Earlier studies regarding auditory processing, in particular using a dichotic listening paradigm, often assume a priori the uniqueness of linguistic inputs (Milner 1962, Kimura 1967). Nevertheless, it is likely that the human voice contributes a particular element to sound, regardless of its linguistic or musical function (Belin, et al. 2000).

Aims

We aim to elucidate some connections between language and music through examining the process of melodic transcription.

Main contribution

We will present some of Leo Janácek's transcriptions and discuss his working methods, as well as what is involved in transcription generally. Applying prosodic and intonational analysis to the transcriptions, we will discuss their significance in relation to mental processes involved in transcribing spoken language.

Implications

The question of how and to what extent we perceive language as music and the concomitant cognitive issues are of immediate interest to composers and listeners, but also have broader implications for how our brains process these different inputs. This research can be extended to include other 20th-century composers who worked with speech melody, e.g., Bartók, Reich, and Oliveros.

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"There's no theatre like Noh theatre..." Cultural montage in Britten's Curlew River

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Background in literary theory

In The Anxiety of Influence and A Map of Misreading, Harold Bloom outlines a system that attempts to account for the nature of artistic influence. Any artistic endeavour is, he argues, grounded in a tradition and is therefore reactionary, rather than an original and autonomous creative impulse. But, as with Hegelian dialectics, which outline a cyclic pattern of thesis and anti-thesis prior to synthesis, Bloom's conception of influence does not suggest an adoption or continuation of the aesthetic of a precursor. Rather, the mimetic view of influence is replaced by Bloom by the idea of antithetical completion, in which influence is regarded as the dis-continuous relation between past and present texts, a kind of poetic misprision in which its elements become encoded anew so that it retains the same terms, whilst 'meaning' them in another sense.

Background in music theory

A consideration of Britten's compositional style in terms of Bloomian principles can be revealing, since whilst it is possible to trace the influence that is evident in his music, in doing so there emerges, too, a clear and distinct compositional strategy. In Britten's work there can be discerned an intentional process of the juxtaposition of diverse intertextual references and forms in order to subvert and disrupt their original meanings. Furthermore, I hope to show that this juxtaposition resembles a cinematic montage, which in turn generates a narrative bred of the dialogic relation between the elements.

Aims

The aim of this paper is to demonstrate how the bringing together of diverse theoretical models, taken in turn from musicology, literary theory and film studies can provide a richer understanding of the dialogic nature of Britten's music.

Main contribution

Britten's Church Parables were inspired, not only by modernist theories of theatrical performance, but also by more unfamiliar models, including Japanese Noh and medieval Christian drama. The use of masks, symbolic gestures, and stylised and extended vocal techniques came to distinguish these highly intertextual works. Curlew River, for example, is based on the Japanese Noh play Sumidagawa, which Britten saw performed in Japan. The Japanese text is translated almost word for word, but the action is transposed to medieval England and Britten structures the work as a liturgical drama.

Implications

The 'bi-focal' view of eastern and western aesthetics generated by this approach can be equated to the principles of cinematic montage, and a consideration of the nature of montage provides a revealing perspective in a consideration of the music-language-game that Britten plays in this piece. The implication here is that by embracing a global aesthetic, the cultural montage of Curlew River generates a principle of narrative, a means of communicating

concepts through the collision of two or more frames that are seemingly independent of one another.

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Cognitive confusion as compositional subject matter: Viewpoints from music theory and modern psychology

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Background in music history

Music-theoretical systems seldom concern themselves with *hindrances* that stand in the way of cognitive structuring. Such systems emphasize structures that are established after the fact, rather than the listener's *search* for structure. There appear however in the theoretical literature of the 18. /19. centuries many references to the deliberate setting up of perceptual conflicts as a musical goal. Taking such writings as a starting point a contrary method of approach is assumed that places hindrances to perceptual structuring in the foreground of analysis.

Background in music psychology

Modern theories of music perception offer descriptions of

- border areas between perceived pattern and 'no pattern state' (Bregman, 1990)
- interplay of conflicting structural scenarios (Agawu 1994)
- conditions for the generation of musical orderings in real time (Fricke 1993)
- the setting up and the discarding of 'impossible' structural models
- situations of cognitive crisis which prompt alternative structural possibilities to be tested by the listener (Wegner 1994).

The musical relevance of these descriptions can be traced

- through analogous descriptions in historic theory
- as a primary analytical paradigm in the examination of individual tonal and a-tonal compositions.

Aims

- To correlate the many descriptions of cognitive conflicts in the historic literature with modern theories of pitch and melody perception;
- To produce analytical models that concern themselves with the gulf between after the fact structural picture and the attempts at structuring that make up the listening process (Fricke 1993).

Main contribution

- A re-evaluation of the role of disorder and cognitive confusion as harmonic criterion;
- development of an analytical approach towards tonal and a-tonal music capable of taking on board failed structuring processes and unstructurable sound situations.

Implications

The theorists' job description as a definer of intrinsic structure is problematical. The institutional *teacher* of music theory is even more bound to this codex that bears an uncomfortable relation both to the listening experience and to historic theory. A re-evaluation of the above-mentioned categories, as well as their grounding in psychological theory can help to re-evaluate this ageing job-description.

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Histories in sound: Disseminating medieval music

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Background in study of recordings

The History of Music in Sound (*HMS*), produced by His Master's Voice (HMV), was an attempt to create a recorded historical anthology in the 1950s. From the 1930s, similar projects had been undertaken. They provided a platform for musicologists and pioneering performers keen to educate the public.

Background in historiography

Although modern editions of medieval polyphony became available in the early twentieth century, musicologists struggled to make medieval music accessible. Published music histories had limited success in making this repertoire more familiar, but recordings presented new opportunities to bring its sound to life.

Background in manuscript studies and performance practice

Very little fourteenth-century polyphony appeared in the recorded anthologies, despite the availability of at least some scholarly editions; evidently this repertoire presented a challenge to performers as well as listeners.

Aims

- To assess the reception of *HMS* in the context of other recorded music histories
- To explore the place of study of recordings within historiography
- To examine aspects of performance and reception of fourteenth-century polyphony

Main contribution

Musicologists were closely linked with *HMS*, which originated in a BBC radio series. They saw themselves as informing public taste; choosing works to represent vast and largely unknown areas of musical history on record gave them a powerful voice. On the principle that "music must be heard to be fully appreciated" (Hughes & Abraham 1960, vii), *HMS* was intended to accompany the *New Oxford History of* Music.Unlike most of its predecessors, *HMS* included examples of 14th-century polyphony. Performance standards varied considerably; whilst these anthologies could introduce the medieval repertoire to the general listener, they did not always keep pace with developments in performance practice. *HMS* attracted mixed reviews, both for its sometimes variable artistic and recording standards, and its comparatively narrow selection of works, which by the 1950s appeared dated.

Implications
Whilst *HMS* could change tastes, for example by introducing the general listener to fourteenth-century polyphony, its recordings also reflect changes in the performance of early music in the 1950s and 60s. Finally, *HMS* also forms part of the history of recording technologies.

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Singing as a way to recover speech

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Background in neuropsychology

Only humans are able to use their voice in a twofold function: as sounds for expressing thoughts and as tones for forming melodies (Ploog, 1994). Vocal tract as well as sense of hearing are employed for both activities – speaking and singing. Still, there are cases of dissociation between the two, as encountered in amusia or aphasia. Research using correlates of neural activity shows a predominantly left-hemispheric representation of language functions (Zatorre et al., 2002). Music processing, on the other hand, is based on highly individual and widely spread neural networks (Koelsch et al., 2002). How can these facts be used to explain that Broca-aphasics are better in reproducing a song´s lyrics in singing than in speaking?

Background in musicolinguistics

Spoken language always has musical ingredients. Conversely, singing in its elementary form is entwined with words. The connection between language and music is constituted by prosody. Prosody is the resource an aphasic patient may still have access to although his language functions are impaired by left-hemispheric brain damage. Might singing be the tool which reactivates certain language functions by means of prosody?

Aims

Following Yamadori et al. (1977), we test the hypothesis that aphasia patients' linguistic performance is better in singing than in speaking. Furthermore, we compare the relative effort of initiating singing, reciting and humming the first two lines of a well-known song.

Method

Subjects were 14 stroke patients with global and Broca's aphasia in the experimental group and six neurologic patients without aphasia as controls. Eleven German folk songs were presented to the subjects. The order of the songs and of the conditions of reproduction were randomized. If singing, speaking or humming was not initiated spontaneously, progressive cueing was offered.

Results

All patients were able to sing with melodic intonation. All patients but one sang with words. The aphasic group achieved significantly higher linguistic performance scores for correctness in singing than in speaking. In the control group, no significant difference could be found. To test the degree of difficulty in the three conditions, we counted the number of cues a patient needed to initiate a speaking, singing or humming reproduction of a required song. Humming required significantly more cues than singing or speaking, but speaking did not require significantly more cues than singing.

Conclusion

Singing seems to facilitate language production of aphasic patients. Because neural substrates of singing and speaking still remain unclear, explanations on the basis of hemispheric lateralization are rather speculative. Nevertheless, singing is a resource of aphasics which cannot be underestimated in regard to its emotional and motivational aspects. Therapeutic use of singing seems to lead to positive results even with severely impaired patients (Bonakdarpour et al., 2003; Brotons & Koger, 2000) and should therefore be promoted.

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How music moves: Musical parameters and listeners' images of motion

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Background in music theory

Music theorists and aestheticians have long suggested that musical gestures are isomorphic with expressive human motion (e.g., Scruton 1997). This assumption has led to attempts to map changes in diverse musical parameters onto curves representing spatial motion (Shove & Repp, 1995) or to analyze musical configurations and processes as sonic embodiments of "image schemas" (e.g., Zbikowski, 2002). Analogies of musical and bodily gestures were also suggested as the "iconic" component in semiotic theories of music (e.g., Hatten 2002).

Background in music psychology

Various empirical and theoretical studies suggest that the relationship between music and motion is fundamental to music processing. For instance, Sundberg and Verillo (1980) showed that performers' tempo fluctuations, such as the final retard, match the velocity profiles of natural human locomotion. In the realm of perception, Gabrielson (1973) reported that similarity ratings of rhythmic figures are affected by the motion qualities listeners ascribe to these figures. One mechanism assumed to mediate between music and motion is motor images evoked by matching spatiotemporal auditory stimuli (e.g., Todd, 1999). These studies notwithstanding, little attention has been given to the effect musical parameters other than rhythm have on the motional implications of music, and little has been done by way of mapping musical gestures onto listeners' visuo-motor images.

Aims

We explore how different musical parameters affect listeners' mental images of bodily motion by examining the effect of intensifications and abatements (in pitch, loudness, or IOI) on listeners' associated motion parameters.

Method

- Subjects: 77 college students, 37 of whom were musically trained.
- Task: Subjects visualized an animated human character of their choice. They were then presented with brief melodic figures, for each of which they were asked to specify their character's imagined motion, including motion type (e.g., walking, jumping), vertical direction, change of distance from spectator, direction on the horizontal axis, change of pace, energy level, and presence of external force .
- Experimental materials: Brief melodic figures were derived from pairs of stimuli, each pair including an increase versus a decrease in a specific musical parameter, (e.g., crescendo vs. diminuendo), with other parameters held constant. Manipulated parameters were: dynamics, pitch direction, pitch intervals, attack rate (IOI), motivic pace, and articulation.

Results

- All musical parameters affected motion imagery in several dimensions. For instance, pitch contour affected imagined motion along all three spatial axes (not only up-down), as well as velocity and energy.
- Many musical-spatial analogies are asymmetrical: a musical change in one direction often evokes a significantly stronger spatial analogy than its opposite. For instance, crescendi are strongly associated with increasing velocity. In contrast, diminuendi are not related to decreasing velocity but rather to spatial descent.
- In general, musical abatements are associated with spatial descents, while intensifications are associated with increasing velocity, rather then ascent.

Conclusions

- Musical parameters affect motion imagery in demonstrable, consistent ways.
- Listeners' music-induced imagery suggests that musical "space" is much more complex than assumed hitherto:
  - Correspondence of intensity profiles generates one-to-many musical-motional associations.
  - Listeners may utilize diverse, conflicting strategies when mapping sound onto bodily motion.
  - Opposite directions in musical parameters are not experienced as polar opposites. Rather, each stresses different kinetic and spatial associations.

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Patterns of modernization in Turkish music as indicators of a changing society

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Background in sociology

The Turkish modernization presents an unsimilar example of cultural change, due to its singularity vis-à-vis both the western Enlightenment and modernity as it is conceived in decolonized world. Turkish society, experiences a profound transformation since the late eighteenth century, that stimulates an extensive social change in which traditional modes of cultural expression are restructured, throughout capitalistic standardizations. This simplification is also observable in the structural transformation of traditional Turkish music. In fact, musical rationalization encodes the logic of an entire phase of modernization.

Background in ethnomusicology

The sound system of traditional Turkish music, on whose scale degrees Turkish musicologists have not reached a consensus yet, differs substantially from the western one which became universally valid. Based on micro-tonal varieties, traditional Turkish music theory necessitates a sufficiently refined and non-western musical perception. However, during the last two centuries this perceptual affinity is being abolished through the standardizing process of modernity, which realizes in effect a hidden temperament within the traditional sound system, while systematically eliminating modal, rhythmic and compositional elements of the traditional Turkish music, through the adoption of the western system.

Aims

We aim to analyze, the main features of rationalization in Turkish music, through the change of its expressive specificities, as representation of a sociological transformation.

Main contribution

Music is one of the most symbolic domains, in which symptoms of a rationalization process can be observed. Our study, based on a survey of modal and rythmic preferences of some composers, who can be considered as the pillars of both the tradition and modernization, and an analysis on different musical elements (performance, instruments, market, etc.), tries to demonstrate the progressive proliferation of a process of rationalization, together with the consequences on contemporary popular music, scarcely linked to the global market conditions. Traditional and westernized (it can be read today as globalized) sound systems and performances have always been conceptualized as deeply separated spheres, even as antagonistically polarized hermetical spheres which possess their specific audience, expressive instruments, discourse, etc. Conversely, we also deduce that the actual phase of musical rationalization in Turkey has attained such a degree that the artificially fragmented nature of musical genres are being melted in a technical and stylistic fusion.

Implications

In nearly all of the sociological studies on Turkish music, the ontological specificities of music are underestimated, while developing deductions from music itself. In the case of ethnomusicological researches on the same subject, with a quite contrasting tendency, musical phenomena are usually isolated from their sociological context. Opposing to such prevailing considerations both in sociology and ethnomusicology, the present study may help to inaugurate, in a totally unexplored domain, an alternate path through which the artificially divided musical spheres of Turkish cultural context can be reevaluated as different aspects of an identical comprehensive modernization process.

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Performed and perceived dotting are different: Implications for performance practice and pedagogy

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Background in performance

In the literature on baroque performance practice there is a controversy regarding the "appropriate" delivery of dotted (long-short) rhythms. The debate focuses on the question of whether or not the dotting ratio should be mechanical (0.75:0.25) or doubledotted (0.875:0.125). A further matter that is discussed at some length is related to articulation: whether or not a rest should be inserted between the long and the short note. In the course of the various arguments both these issues are discussed in the context of affect (or musical character) created. A previous study (Fabian & Schubert 2003-4) showed that the judgement of musical character (using clusters which grouped together distinct aesthetic meanings) depended largely on perceived articulation and tempo whilst perceived dotting did not play a significant role. But is perceived and performed dotting the same?

Background in psychology

Neither the historical treatises nor the modern literature distinguish whether they are discussing perceived or performed dotting. In our other study (Schubert & Fabian 2001), which used synthesized stimuli, we demonstrated experimentally the existence of an illusion: listeners perceive identical dotting ratios as being more dotted when the articulation is short (staccato) or the tempo is increased. This indicates that perceived and performed dotting might be different and that perceived dotting is likely to be a function of articulation and tempo as well as dotting.

Aim

The aims of the study are (1) to find out if there is a difference between perceived and performed dotting using commercial sound recordings, and (2) to compare the relative contribution to musical character of performed (i.e. measured) as opposed to perceived dotting, articulation and tempo.

Method

The previous two studies used versions of Variation 7 from Bach's *Goldberg Variations*. Therefore we selected the same 34 commercial recordings as in Fabian & Schubert 2003-2004 and prepared acoustic measurements of tempo, dotting, articulation and loudness using sound analysis software. We then compared the results of this measurement with the subjective ratings of 98 undergraduate music students reported in the earlier study.

Results

Each measured parameter was significantly correlated with its perceived counterpart at $p = 0.01$, except dotting. A regression analysis explained 55.6% of the variation in perceived dotting, with each of the performance variables, except loudness, making a roughly similar, significant (at $p = 0.01$) contribution. Each of the performance features contributed to making a distinction between the musical character clusters. Measured articulation distinguished clusters C (delicate, serene) and I (agitated, tense), the latter being more staccato. Cluster I

was consistently less dotted than the other clusters. Cluster I performances were played the fastest, and clusters C and G (majestic, serious) were performed most slowly. Clusters A (bright, joyous), G and I were louder than B (playful, lyrical) and C. Measured loudness and tempo distinguished essentially the same clusters as perceived tempo and loudness, however there was a discrepancy in the contribution of perceived articulation and rhythm versus measured articulation and rhythm.

Conclusions

The results indicate that instead of focusing on the dotting ratio it seems more fruitful to realise that tempo, loudness and articulation all contribute to creating a distinct musical character. The perception of dotting is a higher order construct that incorporates tempo and articulation. Instrumental teachers might consider advising their pupils to search for the right tempo and how to devise phrasing or articulation that enhance the projection of the desired musical character.

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Computer aided harmonic analysis from Midi input

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Background in music analysis

The style analysis is one of the main fields of music analysis, where those structural signs and features are relevant, which are of the most frequent occurrence and the way to find them is possible to automatize by using computer. Music structure is possible to analyse with computer from many points of view (Hewlett – Selfridge-Field, 1991-1996). Software tools offer uncomparable faster and more objective way to detect style signs of a large number of compositions of one style, than empirical one.

Background in computing

Automation is not the first option to reach the qualitative new results, but is a very perspective tool in reaching number of quantitative ones. Our software is a new version of existing package (Ferkova 1999), for Windows and automatized midi input, made in Delphi.

Aims

A trial to build a computer programme to get information about occurrence of triads and seventh chords, harmonic functions, cadences, and also a way, how to automatized detection of tonal key.

Main contribution

Harmonic structures: is possible to find them in both vertical and horizontal directions. Software identifies three kinds of them:

- chords: The software is looking for triads and seventhchords (also as broken chord in a horizontal direction)
- tonal key: This is found according to key signature and local accidentals. The main problem is with MIDI input, which does not allow in most cases to find the original key signature, because of numerically coded pitches . The paper discovers discussion about possibility, how to detect a tonal key and it´s changes from Midi.
- chordal weight, is a new experimental way to find a tonal key or the best candidate for it according to metro-rythmical value.
- tonal functions of chords in a distinguished tonal center area allows to automatically find cadences. The segmentation of music composition according to cadences is one of the possible and legal way

Implications

The poster will show the block diagrams of algorithms (author Eva Ferkova) and the ideas, how to use the results for educational and scientific purposes – evaluation of style, segmentation of music composition, evaluation of dynamics of harmonic structures (Ferkova 2001).

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Music education as perceived by fourth and fifth-grade students

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Background in music education

Previous research in music education suggests wide differences in students' attitudes toward classroom music learning (CML) as opposed to the same students' appreciation of music out of school. There is wide agreement that there exist two distinct forms of musical socialization, one at school and one out of school. It seems that a range of factors contribute to these socialization processes. One important implication is that individual responses to CML do only partially reflect the potential interest in musical learning. It is likely that music experiences at home, including private instrumental lessons, participation in choirs, and musical ensembles of many kinds, exert a major influence on the perception of CML. For example, children who receive private music lessons are more likely to express positive attitudes towards CML than children who do not receive private music instruction. Music education thus needs to account for students' attitudes toward CML in order to develop strategies to integrate those different individual levels of musical experience.

Background in music psychology and sociology

According to Gagné, music learning appears to be moderated by the complex interactions of both genetic and environmental factors. Therefore, the success of classroom music learning (CML) may be influenced not only by individual degrees of motivation or 'talent' but also, for example, by private music lessons and other musical influences out of school. It seems important to understand the sociological and psychological processes associated with children's attitudes toward CML, in general, and the effects of musical experiences outside school, in particular. Again, students' attitudes toward CML need to be accounted for with respect to widely differing individual levels of music experiences.

Aims

To address some of the issues, and as part of a larger-scale project, the age group in the final class of primary school (fourth grade) and at the beginning of secondary school education (fifth grade) was chosen as the target group for this investigation. As a first step, a methodology needed to be developed to identify key elements of individual attitudes towards CML by means of qualitative data sampling techniques. The strategy is two-fold: First, qualitative data should reveal the particular constellation of influences which contribute to the perception of CML in each individual case. Second, by extracting typical categories to classify children's perception of CML, we sought to develop a quantitative questionnaire, which is to be submitted to a larger sample of students.

Method

Semi-structured interviews with an unselected group of subjects (N = 60) were performed and each interview submitted to various qualitative data analysis techniques, e.g. content analysis. The first part of the interviews addressed the children's personal background. The

second part focused on music experiences and leaning in and out of school. Finally, the children were asked about their relationship with the teacher and their schoolmates. To classify the answers a system of relevant categories will be presented to give a survey of children's perception of music and of characteristical influences.

Results and conclusions

Data analyses are still under way. To highlight methodological issues, samples from the original interviews will be presented. The data should reflect upon the essential question "what really goes on in classroom", thus providing realistic information about sources of motivation and demotivation for CML from the students' perspectives.

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An fMRI study of the neural basis of song perception

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Background in music performance

"A singer should assume his voice is gorgeous beyond compare, then forget about it; thus he can concentrate wholly on the text... When I construct a song from a poem, I think only of the words" (Rorem, 1992). This emphasis on the importance of the text in art song performance expressed by Ned Rorem may reflect the current trend in vocal performance; vocal pedagogy in particular accentuates the language and music dichotomy in singing. As voice teachers use phonetics and phonology as didactic tools, this framework may also provide a fertile ground for a bidirectional exchange of information between research on singing cognition and pedagogy.

Background in cognitive neuroscience

Recent neuroimaging studies (Jeffries et al, 2003), (Riecker et al, 2000) indicate that different brain networks are employed in singing and speech production tasks. However, many of the activations found were related to differences in motor control, rather than perceptual processing of words and melody. To our knowledge, no experiment has ever been conducted to examine the brain regions that are involved in song perception.

Aim

The present study is the first experiment of a long-term project with two interrelated, interdisciplinary aims: first, the exploration of the neural basis of song perception, and second: the exploitation of this information to develop innovative techniques for vocal pedagogy. Since this is the first study of its kind, we have envisioned a functional mapping of the cerebral structures that are involved in perception of singing and speech. The purpose of this initial experiment is to use functional Magnetic Resonance Imaging (fMRI) to determine whether sung words employ bilateral processing to simultaneous treat the linguistic and musical dimensions of singing, or if singing is processed in its own specific region.

Method

10 participants (non-musicians) were scanned while listening to stimuli from each of the following conditions: 1) pairs of tri-syllabic words, spoken; 2) pairs of tri-syllabic words, sung on 3-note melodies; 3) same melodies from condition #2, sung as a non-word vocalise. In all conditions, participants performed a same-different task, in which they respond as quickly and accurately as possible as to whether the two stimuli in the pair are the same or different. Moreover, to eliminate the effects of brain activity related to the "same-different" decision,

motor response and low level auditory processing, we used a control condition employing the same task with low-level auditory stimuli (different noises). Images were acquired on a 3T Bruker scanner; reaction time and error rate were also recorded.

Conclusions

Although at this moment our results are too preliminary to be described, we are looking forward to presenting them at the conference. Along more general lines, by exploring the cerebral functions that manifest themselves in the universal appeal of vocal music, research on singing cognition may also be able to shed light on how the brain is organized in general.

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Aesthetic Realism: A new foundation for interdisciplinary musicology

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Background in musicology

The fundamental texts of musicology from Grosseteste to the Prakempa to Schopenhauer to Zuckerkandl imply that there is a philosophic basis to music. It was Eli Siegel in the 20th century who explained what that basis is: "All beauty is a making one of opposites," he showed, "and the making one of opposites is what we are going after in ourselves" (1949). Opposites which are in every reality—a leaf, a person, physics itself—such as oneness and manyness, motion and rest are in the music of every region. The opposites make for beauty—for isn't every good song, for example a unity with rich diversity? Exciting and also composing? We show in our presentation how the Siegel Theory of Opposites meets the hope of musicology for a method at once general enough and particular enough to provide new insight into every instance of music.

Background in anthropology

Also in this presentation we use findings of anthropology to illustrate the aesthetic structure in each culture—a structure which is based on the same opposites that are made one in music. In her Patterns of Culture Ruth Benedict gives evidence for this, as did every accurate observer including Boas and Malinowski. For example, looking at cultures of Native North America, the opposites we discuss include superiority and inferiority, self-assertion and self-abnegation—opposites every human being knows are in him- or herself. Our musical examples illustrate the poignant rising and falling, leaps and cascades so redolent of Native American melodies. We ask, when these melodies are powerful, beautiful, is it because they make sense of the opposites in self that are so confusing in life? Do they put together opposites in a way that shows, for example, the painful rising and falling of self—the conflict between one's arrogance and guilt—can be resolved? Our answer is, emphatically, Yes.

Main contribution

The opposites provide the means musicology has hoped for to see the common basis of its three main branches: 1) the aesthetic state of mind from which music arises; 2) the music itself—what makes it beautiful or not; and 3) the reception of music—what good music appeals to in the human self.

Implications

Aesthetic Realism, in showing that there is an aesthetic motive in people of every culture, which can be universally respected, has enabled music more than ever to oppose prejudice and bring out good will among peoples.

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The eye and the ear: Interaction of oculo-motor and musical tasks

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Background in music education

Learning is based on mental activities and causes functional and structural changes in the brain. Therefore, one can suppose that brain activities correspond with cognitive achievement. Since several parameters of oculo-motor tasks indicate a strong correlation with intelligence (mental speed, g factor) the eye and its interactions with the ear have become a promising source for investigations even in music education where brain activities involved in eye control and musical abilities are observed.

Background in neuropsychology

In late 19th century the French ophthalmologist Emilio Javal reported that eyes do not move continuously along a line of text, but make short rapid movements (saccades) intermingled with short stops (fixations). Since then, data analysis of oculo-motor tasks has been used as a diagnostic tool in neurology. The ability to suppress reflexive responses in favour of voluntary motor acts is crucial in everyday life. It relieves the organism from a stimulus driven behaviour in favour of internal goals. These abilities are particularly used in reading. Researchers from Optometric and Blicklabor at the university Freiburg developed a new tool (Express Eye) to measure dynamic vision and eye movement control by fixation stability, reflexive gaze control, voluntary eye control, and reaction time in standard visual pro/anti gap/overlap tasks. Absolute auditory threshold, frequency resolution, and temporal resolution develop with age. It is still under debate whether low level auditory performance - especially if influenced by delayed maturation of central auditory processing - is of clinical significance. Recently, five non-verbal auditory differentiation tasks (intensity, pitch, gap detection, time order and side order) were implemented to study the development of low level auditory discrimination.

Aims

The measurement of oculo-motor tasks can be applied to identify perception deficits which might appear in eye control, fixation duration and stability, spontaneous reaction time, and voluntary control. These attitudes are also crucial in musical performance (e.g. sight reading, intonation control, spontaneous motor reaction, fixation of a stable meter and pulse). Therefore, there are many overlapping domains either in visual or in auditory performance which have already been investigated (sight reading; mental speed in musicians and non musicians). We will survey relevant studies and their results, address the particular opportunities of the ear-eye-interaction research, and outline projects of interdisciplinary collaboration.

Main contribution

Connecting neurobiological and neuropsychological approaches to research areas in music learning will open new tracks of research and provide insights into a better understanding of the procedures involved in music learning. Mainly the critical issue of music and intelligence and the problematic assumption of cognitive transfer-effects caused by music can be addressed on a neurological base, and processes involved in reading music versus text can be clarified.

Implications

Using the oculo-motor approach for investigating musical performances and music learning limits research projects to those aspects where an ear-eye-interaction is engaged. However, this limitation, on the other hand, enables us to look at musical processes from a distant perspective, and introduces objective measures to speculative observations. This type of collaboration between humanities and sciences, therefore, may introduce an exemplary model of interdisciplinary research in music education.

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Pitch perception in lamellophones and the development of a computer based tool for interactive experiments on tunings and tonal systems

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Background in psychoacoustics

Because of their complex and partly inharmonious spectra it has been questioned that idiophones permit a consistent and unambiguous pitch perception (Schneider/Beurmann 1994).

Background in ethnomusicology

In the case of *mbira* lamellophones of the Shona (Zimbabwe), however, explicit statements by indigenous makers of these instruments indicate that they aim at a "clear sound" with definite pitches.

Aims

- Test the hypothesis that the metal lamellae mainly produce spectral pitches (Terhardt/ Seewann 1984).
- If applicable, examine the phenomenon of pitch shift.
- Comparable to the mechanical treatment of lamellae by local mbira makers, adjust the pertinent parameters of a virtual lamella in real time.
- Determine the margin of tolerance for the intonation of individual tonal degrees of the Shona tonal system, whose nature is still under debate (Berliner 1981, Brenner 1997, Grupe 1998).

Method

At first, Western test persons will determine the pitch equivalent frequency of the lamellae and test the handling of the user interface for adjusting sound parameters of the virtual lamellae. Later, Shona musicians will take their place.
The computer based sound synthesizer relies on the additive synthesis paradigm. To extract the required sound parameters (time-varying frequencies and amplitudes) from prerecorded lamellae, multi-resolution time-frequency analysis methods like spectrogram, Wigner distribution, and wavelets are exploited.

Results

[work in progress]

Conclusion

Employing a computer based system for interactive experiments (Arom 1991, Kippen 1992, Wegner 1993, Fernando-Marandola 2002) can yield insights into emic concepts of sound aesthetics which are usually not verbalized.

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Plane isometries in the music of M.K. Ciurlionis

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Background in music history

Although revered in his native Lithuania, the music of Mikalojus Konstantinas Ciurlionis (1875-1911) is little known outside his homeland. Initially trained as a composer, Ciurlionis began formal painting instruction in late 1902, studying at the Warsaw School of Fine Arts from 1904 through 1906.

Ciurlionis's music changed as his involvement in painting deepened. Linear textures and chromatic lines began to dominate his works; functional harmony was replaced by sonorities resulting from intersecting lines. Between 1907 and 1909, Ciurlionis aimed at a synthesis of the arts. His paintings were often conceived as visual analogies for musical forms (for example, the four-painting Sonata of the Sun cycle, and the diptych Prelude and Fugue); his last musical works are among his most abstract, bordering on atonality and serialism.

Background in music theory

The analysis of musical symmetry has a growing literature, including Riemann's (1896) theory of harmonic dualism, Lendvai's axis system (1993), and neo-Riemannian theory. Interesting parallels are found in Washburn and Crowe's (1988) survey of symmetrical patterns in decorative arts across cultures and historical epochs. Each of the four plane isometries—rotational symmetry, mirror reflection, translation, and glide reflection—has its musical counterpart, including transpositional invariance, real inversion and retrograde, sequence, and ostinato.

Aims

Ciurlionis's art has long been studied for alleged instances of musical metaphor. But Ciurlionis's music after 1904 also suggests an increasingly literal translation from visual principles to musical notation. Our paper will show how Ciurlionis's compositional process was shaped by awareness of symmetrical and other visual principles.

Main contribution

Ciurlionis's posthumous musical fame was overshadowed by his art until publication of his music began in 1957. Since then, several Lithuanian scholars have analyzed his music (Ciurlionyte 1959, Landsbergis 1965, 1992, Kucinskas 2002, 2003a, 2003b); outside Lithuania, however, most scholars have focused on his paintings. Furthermore, the extent to which Ciurlionis's newly discovered "visual thought" of 1904-1906 permeated his music during those years and thereafter has barely been explored.

Implications

As Kucinskas has noted, the "structural similarity of…different artistic media" allows us to "uncover in-depth links between different modes of … [Ciurlionis's] artistic self expressions" through the unity of his thematic-structural material (2003a, 4). We believe that this study of some of the distinctive tendencies of Ciurlionis's art manifested in his music will yield a deeper understanding of his distinctive creative process.

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Method development for qualitative research on interpretation-finding

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Background in music education

Musicians' interpretations are related to their familiarity with traditions represented by the work they play, and influenced by their individual ways of conceptualising music (Hultberg, 2000).
Musicians on a high level develop complex strategies while preparing a performance (Nielsen, 1998) and structure their work according to the musical form (Chaffin, 2002).
Since interpretation-finding related to performance practice has been little explored methods for studying entire works in natural settings need to be developed (Juslin, 2002).

Background in artistic research

The use of notation presumes a common understanding of performance practice of composers and interpreters, as has been demonstrated in historical manuals (Quantz, 1752)
Today many composers relate to various ethnic traditions. Yet, manuals for contemporary music mainly concern technical advice (Dick, 1996). Hence, there is a need for exploring functions and limitations of notation as a communicator between composer and interpreter.

Aims

In this joint project, part of both studies, we aimed at developing methods for exploring interpretation-finding through traditional notation of works from different periods. Therefore we carried through a cooperative study on Stefan's preparation of works by J. S. Bach and P. Nørgård.

Main contribution

The cooperation between a researching performing artist and a researcher with experiences as a performer allowed us to reveal aspects that each of us would not have realised on his/her own.

Many-sided data were required: Video/Audio documentation of

- working sessions: Stefan working on his own, and with Per Nørgård
- comments on sessions
- explorative interviews about musical background
- concert performances

The documentation brought about a high efficacy in interpretation-finding.
Thus, the documentation influenced the results. The researcher's explorative questions may have influenced the interpreter's decisions, too.

Implications

Similar cooperation between scholars with different approaches and a thorough mutual understanding may be applied to other areas. Parallel studies in which researchers cooperate with performing musicians/teachers and their students may contribute to a better understanding of individual learning strategies, and development of instrumental teaching with focus on meaningful expression in performance. The higher efficacy in the preparation of a performance indicates that musicians benefit from participating in such studies. The method, as described above, is time-consuming. In a smaller scale, though, such studies could be carried through as teamwork of pairs of students, changing between the roles of being researcher and interpreter. Such studies could be integrated in course-work of higher music studies.

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The Monasterio de Santa Clara Cantorales: Reclaiming the voices of women in the music of 19th century Manila

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Background in music history

The paper is a result of the rediscovery and re-emergence of an anthology of Hispanic religious music used by the nuns of the Monasterio of Santa Clara in 19th century Intramuros, Manila, the capital of the Philippines during the Spanish colonial period (i.e., 1571-1898). This five-volume collection entitled, Manual-Cantoral para el uso de las religiosas de Santa Clara de la Cuidad de Manila, contains a wide array of musical compositions covering a variety of western-derived musical genres such as masses, gozos, villancicos, motetes, Salve Regina, Miserere et al. Notable in this corpus of music is that some of the compositions are encoded in an obsolete form of mensural notation utilizing square and diamond note heads. The paper, therefore, traces the beginnings of this particular style of music tradition which is generally referred to as canto llano (plainsong), canto llano figurado (measured or figured plainsong) and canto de organo (polyphony) to a musical style that was cultivated in European centers and their colonies where the Roman Catholic chant tradition thrived. This tradition of liturgical music is viewed as constitutive of a musical syntax that was brought about by the reforms advocated by the Council of the Trent in the Counter-reformation period. Through social and cultural contacts, the style and syntax were disseminated and transmitted to countries that were strongly influenced by the religious music-culture of the Iberian Peninsula.

Background in Literature (anthropology/mythology)

Contemporary research in anthropology and mythology shows a distinct convergence of female spirituality and orality within numerous pre-historical societies. Indeed, women, in the context of indigenous Philippine pre-colonial culture, were repositories of communal spirituality and the tradition of orality. These, women, catalones and/or babaylanes presided over religious rituals as mediator between the spiritual and temporal worlds through chant and song which celebrated and narrated the evolving lore and experiences of communal life. Today, remnants of these subsumed practices prevail in the margins of Philippine society where women continue to chant epics in the state of trance asserting the tenacity and resilience of indigenous lifeways endlessly interrogated by colonizing hegemonic cultures. During the 19th century, this convergence of female spirituality and orality manifests itself in the ritual practices of the cloistered women religious of the Monasterio de Santa Clara recorded in the five-volume collection entitled Manual-Cantoral para el uso de las religiosas de Santa Clara de la Ciudad Manila.

Aims

It aims to provide perspectives into the transmission and development of western-derived music into an Asian colonial culture, in particular the transplantation of this Baroque music tradition of the Roman Catholic Church in the Philippines. It also hopes to identify links and congruences of this musical tradition in the worldwide study of Hispanic colonial music. Moreover, the paper hopes to provide insights in the discussion of women, in the Philippines

context, as repositories of spirituality and traditions of orality through the prism of music in various religious rituals.

Main contribution

It hopes to contribute to the discussion of Roman Catholic musical traditions beginning in the 17th century until the last decade of the 19th century as well as the transmission and cultivation of this musical culture to a particular Asian society. It also hopes to search discourses concerning women's role in religious practices and how songs/verses and chants are representations of spirituality and traditions of orality.

Implications

A formalist-positivistic approach (e.g. music history, theory and analysis, music notation) in the study of this anthology of music is needed to establish information concerning the origin and development this particular musical tradition and how it is linked in the worldwide musical phenomenon of Hispanic colonial music tradition. The study chronicles the emergence of a construct that Filipino women epitomize the convergence of spirituality and orality since the pre-colonial period: the babaylanes and/or catalones, the women religious during the Spanish period and the contemporary epic singers of cultural minority groups.

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Music in transition: Perception of popular musical arrangements

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Background in music psychology

It follows quite evidently that the individual differences both on the "superordinate" level of music perception, covering the axiological and motivational spheres of personality, and on the "subordinate" level of schemata and mechanisms of information processing are rooted in the musical experience of the individual. These differences, to be sure, correspond to the division of contemporary music for two basic spheres (see below within the second background) with differ semantics. In our investigation an operational method for registration of changes evoked by the translation of original work to another semantic system is offered. We also tried to reconstructed the semantic space of perceived musical work. The investigations of such spaces were conducted by M.Imberty (1979), G.Gotlieb& V.Konecni (1985). A.Halpern (1984) and J.-E. Gromko (1993) found the criteria of similarities of popular songs and instrumental music works. But till now the perception of original musical work and its arrangements has not been compared using the semanthic differential (SD) and the 8-colour methods.

Background in art education

Musical perception is a main part of education by music. The differences between an applied, popular music (endoxal, if we will use the R.Barthes's model of Aristotle concept of doxa (Barthes, 1984) and an autonomous, serious music (para-doxal) become in this case the principal problem in art education via music. The play perception is the base for teacher-student relations.

Aims

In a realistic music listening situation, we are testing the structure of characteristics of musical work and its arrangements in the listener's consciousness. The features of such sonsciousness and mentality one can use in art education and communication.

Method and sample

39 subjects in the first experiment and 40 subjects in the second one, students of the technical university, with mixed musical experience (from profane to professional), gender and ages (18 - 22 years), heard the "Serenade" composed by Schubert or the "Poem" composed by Fibich and then their arrangements in pop-music style. Listeners who heard the "Serenade" then heard the arrangement of the "Poem" and v.v. After each musical work, listeners rated the music's characteristics of it by the scales of the semantic differential (SD) and estimated of it by the 8-colour test. Then we have compared the evaluations of the "original" musical work and of its pop arrangement.

Results

The results allow to conclude that almost all the scales contributing to the E (evaluation) factor are of little value in the case of serious music because all the estimates tend to the positive pole of the scales. At the same time the original works and their arrangements can be fairly well differentiated by the values of P (power) and A (activity) factors. The arrangements seems to be perceived as more tentative, more clear, more energetic ones. The colors associated with the original works are "grey" and less often "green", and the arrangements are seems to perceive as "red", "yellow" in more than 50% cases. Thus, the transition of musical works belonging to serious music into popular music discourse make them for audience more powerful and active ones.

Conclusion

Our results suggest that in the listeners consciousness the original work and its arrangement are quite differ, especially by factors "Power" and "Activity". But what really happens with the musical work when it's arranged, it's the open question. Although the discrepancy between expectations and their realization in the text exists even in homogeneous texts, arrangements provide a promising opportunity for "measuring" the tension arising in the course of interaction of different "musical languages" in contemporary culture.

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Creating a joint technology/arts course in the technology of music for distance education

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Background in music education

Conventional undergraduate courses in music often discuss musical theory and processes in isolation from non-musical developments: for instance, the development of harmony or instrumental technique are often discussed in a purely musical context. Such approaches, although valuable, tend to ignore the relationship of musical evolution to technological change. For instance, developments in printing technology, metal working, mass production, etc. have had subtle but real influences on the history of music, as have the possibilities for mechanical creation and reproduction of music. Coming to more recent times, to give just two examples, electronic and computerised technology have allowed performance practices to be analysed more precisely than hitherto, and scores, parts and entire works can now be produced as desktop operations.

Background in technology education

The technological approach to music in education has tended to concentrate on acoustics (often more to do with sound than with music) and on modern computerised ways of creating music. The latter approach, particularly, fosters the misapprehension that the technology of music is synonymous with so-called 'music technology' (with its undue emphasis on synthesisers, MIDI and studio technology). The interaction of technology and music stretches much further back into musical history. Technology is nearly always present when a creative idea needs to be given representation or translated into an artefact. The use of modern digital technologies in music should be seen as part of a long tradition of technological, scientific and craft contributions to music and its realisation.

Aims

We have been part of a mixed-skills, mixed-media team of music academics, technology academics, software designers and other practitioners creating a course in the technology of music for the UK's Open University. The course, entitled 'The Technology of Music', uses distance teaching methods and is designed to appeal to students from both an arts background and a technology background. The course makes minimal assumptions about prior musical or technological/mathematical knowledge, but through the use of software, audio, video and print aims to render comprehensible ideas about (among other topics) sound, sound propagation, the harmonic series and temperament, Fourier's theorem, auditory perception, musical expressiveness, the design and operation of instruments (traditional and electronic), how music has been represented or coded through history to the present, and how digital technology has transformed the creation, recording, transmission, processing and reproduction of music. The course aims not just to enhance students awareness of the close relationship of technology and music, but to help them acquire skills in the use of standard software tools.

Novel features

In addition to taking an interdisciplinary approach, the course has many specially created computer-based teaching aids, relating to sound, the working of the ear and psychoacoustics. In addition, the course is notable for its inclusion of two pieces of high-level proprietary software: Adobe Audition (formerly Cool Edit Pro) and Cubasis 4. Students use this software to make their own recordings, edit and analyse sound, and to create a stereo mix of a multi-channel vocal recording.

Course presentation and talk

The course 'The Technology of Music' will have its first presentation in 2004, starting in February and running through to October. It will therefore be 'live' at the time of the CIM2004 conference. The success (or otherwise) of the course will be evaluated towards the end of 2004 through student and tutor feedback. The CIM talk will discuss the philosophy of the course and show how these have influenced the teaching material and its assessment.

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A comparison of automated methods for the analysis of style in fifteenth-century song intabulations

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Background in historical musicology

A repertory of several thousand secular songs survives from the fifteenth century. Much of it is not attributed to any particular author, and frequently, even the approximate place origin is uncertain. For us, the origin of a piece is a concern, so that we can better chart the development of musical style. Researchers have tried many approaches to attribution, or to style-classification in a broader sense: manuscript studies of all descriptions, studies of structural elements such as cadence degrees, ornamental style, elements of melodic behaviour such as contour, favoured intervals, and prevalence of leaps; dissonance treatment, and others. However, a comprehensive analysis of all these elements in a sufficiently large body of pieces is too time-consuming for one person to do by hand.

Background in music information retrieval

Computer technology has made it possible to analyze large amounts of information in a reduced timespan, as compared to traditional methods. While this capability has been available for some time, the analysis of multiple musical works by computer is still relatively unexplored by music theorists. Modern classification techniques require the extraction of features from sets of data, which are then resolved using higher-level constructions.

Aims

To detail a proposed set of features to be used for classification and show some initial results, and to suggest further avenues for musicological exploration of the Buxheim Organ Book and related repertoire.

Main contribution

A body of several hundred intabulations of secular songs from the Buxheim Organ Book (ca. 1450-1470) have been encoded in a format compatible with the Humdrum Toolkit developed by David Huron et al. The Humdrum tools as well as specialised software tools created specifically for the task were used to analyse each piece to produce individual sets of approximately fifty features. Some of these were general statistical features and others were features commonly examined in style studies of the mid-fifteenth-century secular song repertoire. These features can be used for classification purposes, for example to suggest authorship of anonymous pieces based on existing attributions. This paper focuses on overall properties of the entire set and their relationship to previous music-theoretical work on the subject.

Implications

While some researchers have developed useful automated tools for musical analysis, these have only rarely been combined with detailed musicological study of earlier repertories. Many historical musicologists are not aware of these developments, and are not in a position to evaluate their relative effectiveness. Applying multiple automated tests to a single body of music gives an opportunity to compare their effectiveness and usefulness for specific tasks, and provides a guideline to help musicologists choose the best methods for their problems. Solutions specific to the analysis of the chosen repertory have been proposed, and the results of such analyses on a larger scale will let us re-evaluate existing musicological ideas about these pieces.

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Painted musical representation and mnemonics

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Background in art history and theory

Specialist subject- painting. Della Francesca (15thc) used musical ratios as a compositional device in his paintings (Bouleau, 1963). Colour in Poussin's paintings (17thc) convey moods analogous to the modes representing the keys in early music, and Delacroix's use of colour (19thc is associated with mood and a 'musical quality' (Lockspeiser, 1973). An exhibition in 2003 of paintings in Madrid at the Museo Thyssen - Bornemisza gallery titled 'Musical Analogies, Kandinsky and his Contemporaries', testifies both to the diversity of interpretations of artists working within the parameters of this subject within the first few decades of the 20th century in Europe and to the present interest in this subject.

Background in music psychology

Meyer (1956) speaks of the absolutist point of view where "Musical meaning lies exclusively within the context of the work itself, in the perception of the relationships set forth within the musical work of art*". (p.1) Rod Paton (2001) mentioned that* "Jan Kapr . . . maintained that the visual beauty of a notated score was an important factor and a very real part of the experience of the sound . . . the patterns can be perceived visually and the formal logic is revealed even to those who might not be able to read music in order to re-create it as sound".

Aim

To investigate the relationship between the language of music and that of painting; to develop a visual interpretation of a specific piece of music which, when 'seen and read', presents a new way of understanding the structure and communicative powers of music and enhances the appreciation and recall of the music.

Method

A reduced score of the middle movement, 'Largo ma non tanto' from J.S.Bach's 'Concerto for Two Violins in D Minor' (BWV1043) was rewritten into proportionate notation and used as a template for the underlying structure of the painting. The over-painting was carried out while listening to a fully orchestrated performance. Therefore the methodology is a combination of the mechanics of the musical score and a subjective emotional response to the music.

Results

A painted frieze comprising 50 panels (each panel corresponds to one bar of music) which visually brings out the relationship of the instruments in terms of, for instance, pitch and time, and accentuates the structure of the composition in terms of, for instance, themes and motifs. A sequence of symbols is developed from the painting as an aid in memorising the piece. Accompanying illustrations provide a comparison between the relevant musical notation and the painted version.

Conclusion

The approach may provide a fresh way to introduce music to a wider audience, for example children or amateur musicians, or to act as a stimulus to performers to develop an individualised visual means as an aid in the memorising music.

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Subjectivity, meaning and emotion in music perception

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Background in music psychology

Emotion and meaning in music can in general be studied in two different ways. On the one hand, empirical aesthetics (e.g. Berlyne 1971) tries to explain responses to music such as pleasure, preference, or physiological responses (e.g. arousal) by analysing informational properties of the music (complexity, structure, tempo, mode etc.). On the other hand, researchers investigate the function of music and its emotional qualities in everyday life (e.g. Sloboda 2001). Both quantitative and qualitative methods in music psychology try to generate meaning and emotion in music at the expense of actual, individual experience. Some approaches (e.g. M. Imberty 1979, 1981), however, try to link musical structures, musical expressivity and psychoanalytical concepts.

Background in music philosophy

Phenomenology and postmodern philosophy criticise traditional psychology's construction of a subject as a closed entity. This concept was deconstructed by e.g. Nietzsche, Heidegger and J. Derrida, who showed that the separation of any phenomenon from the observer as rational/conscious entity (Kant, Descartes) is a metaphysic construction. Eco's concept of openness of art and a postmodern concept of subjectivity give rise to a new way of describing music perception in which semiosis (motion of meaning) plays a major role (cf. Monelle 1992).

Aims

Criticising psychological methods from a philosophical/postmodern point of view, we aim to explore the implications of a description of meaning and emotion in music as subjective/contingent qualities. Eco's concept of openness of art (in particular the differences between his 1st and 2nd categories) will be tested empirically by combining psychoanalytic, semiotic and traditional music-psychological methods.

Method

10 postgraduate students of musicology each filled in two questionnaires and attended two interviews. They were asked to listen to and later discuss the Confutatis of the Requiem by W. A. Mozart (Eco's 1st category of openness; questionnaire 1 and interview 1) and Four by John Cage (Eco's 2nd category of openness; questionnaire 2 and interview 2). Questionnaires 1 and 2 investigated similarities and differences between participants concerning the perception of meaning and emotion within the two pieces. Interviews 1 and 2 were unstructured and based on the participants' former (written) statements. Here, participants reflected their own statements and related their musical experiences to their personal history.

Results

The participants' statements were consistent with a concept of music perception as inextricably connected to the conscious and unconscious experiences of the present and the past (contingencies) of each person. Musical experience can be regarded as an interaction among cultural meaning, subject position/identity, and subjective contingencies. Further results will be presented at the conference.

Conclusion

Meaning and emotion in music can only be described objectively by ignoring the subjective contingencies (cf. Rorty 1989) that enable musical experience. The subjective experience corresponding to Eco's idea of openness in art can be investigated using methods derived from psychoanalysis and postmodern analysis. An empirical method that allows participants to explore personal associations and respects individual differences is necessary if music as a cultural phenomenon is to be investigated empirically.

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Stellar acoustics as input for music composition

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Background in acoustics and computing

Some of the stars show light variations due to internal acoustics waves. There are strong physical mathematical parallels between stellar behavior and musical instruments (Buchler, Yecko & Kollath 1997): the basic principles giving the "overtone" frequencies in stars and in acoustic musical instruments are identical. A virtual orchestra can be created based on stellar physics. The "stellar instruments" have lots of characteristics, which make their sounds different from ordinary musical instruments.

Background in theory/composition

Composers' activity is a means of cognizance. Many composers have been endeavouring to become familiar with sounds of inharmonic spectra since the beginning of the 20th century. In our time, the technical improvement of the computer technology and electro-acoustic instruments facilitates controlling inharmonic sounding processes and dealing with theoretical implications, regarding this kind of music. Drawing stellar acoustics into the orbit of music fits in well with this trend of the compositional practice.

Aims

Our main aim is to demonstrate that sounds designed according to stellar physics and the nature of the processes inside stars can be used as a new background of music composition, theoretical thinking and aesthetic evaluation.

Main contribution

Both cosmic and music actions are determined by the order of events, states and processes. The possible states of celestial objects are determined by their physical acoustic. Models of variable star provide the unusual patterns of "overtones" and the variations of these patterns as the star evolves. Due to the enormous size of stars, their frequencies are orders of magnitudes lower than the audible limit; therefore we should transpose those oscillations to human scales. However the range of time scales is also different in stellar and musical occurrences indicating the need for nesting points. A given star shows observable oscillations only on a limited period of its lifetime, giving a limited tonal range. These questions provide an interesting starting point for theory.
We developed a computer programme, which transforms stellar instruments based scores to C-sound instruments and scores, to make the compositional experiments affordable.

Implications

For musical composition we have to select a few "instruments" from the unlimited number of co-sounding stars. Besides the evident spatial selection one can use e.g. constellations as models for sounding sculptures, and stellar sounds can be used for the musical expression of cosmic experience. The stellar spectra based sounds can be laced together by the principle

of joint frequencies, but sound procession can also be designed by contrapuntal use of the intensity of partials. Different types of stars provide different frequency sets – the combinations of those sets furnish another base of composition.
Our experiments will be demonstrated by a piece of music and its analysis.

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Musical style recognition - A quantitative approach

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Background in history of music

In music history it is often considered important to have a reliable overview of the oeuvre of a certain composer. When critical editions are made, this is even a necessity. But also to understand the importance of a certain composer, we need to have a good overview over his work. Unfortunately many pieces exist of which the composer cannot be determined with great certainty. Not rarely this leads to authorship-discussions. Various kinds of evidence are used to defend an attribution. These can be categorized into external and internal evidence (Love, 2002). Stylistic evidence is a subcategory of the latter.

Background in computing, mathematics and statistics

In the subdiscipline of machine learning, many algorithms are developed to extract knowledge from measurements in order to make automatic recognition of classes of objects possible. For an overview see e.g. Webb 2002.

Aims

The aim of this experiment is to explore the possibilities of machine learning for composer attribution. Since no such research is done before, it is desirable to get an indication of the suitability of these methods, before relying on them for solving authorship problems. The focus is on low-level characteristics of counterpoint. So, only polyphonic compositions are taken into account.

Method

A dataset is made with compositions of five well known composers: J.S. Bach, Telemann, Handel, Haydn and Mozart. Of all these compositions the composer is known, so they can be used to evaluate the performance of the machine learning tools. Of each composition 20 style markers (features) are measured. No widely used and accepted method exists for finding appropriate style markers, so we have to evaluate some. Most of the chosen style markers are low-level counterpoint characteristics, such as the amount of parallel thirds or the amount of certain intervals between the voices as fraction of the total number of intervals. The pattern recognition algorithms are used to obtain knowledge from this data about the uniqueness of each style compared to the others. Also some classifiers are built. The algorithms used are: k-means clustering, k-nearest neighbor classifier, and a decisiontree (C4.5). The fisher-transformation is used to reduce the dimensionality. In the transformed space, also a nearest neighbor classifier is trained. As estimation of the true error rates of these classifiers, the leave-one-out errors are computed.

Results

The clustering shows that the compositions of the each composer do form a cluster in the featurespace (typical error between 10% and 20%).
The decisiontree is used to learn which style markers are important for separating the styles. These will appear in the top-nodes. We can learn, for example, that the style of Bach is isolated from the other composers by taking those compositions with low amount of parallel thirds, a steady rhythm and a high fraction of dissonant sonorities. About styles of the other composers, similar observations can be made. The nearest neighbor classifier performs very well in the transformed feature space, with a typical error rate between 4% and 10% for the styles of most composers. After removing some outliers, even lower error-rates can be obtained.

Conclusions

These results indicate clearly that it is possible to recognize musical style automatically. So, this kind of research can be a valuable addition to more traditional methods of musical style analysis. It offers a quantitative evaluation of the styles rather than the traditional qualitative descriptions.

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Music in the moment? Revisiting the effect of large scale structures

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Background in music psychology

According to a strict concatenationist approach (Levinson, 1997), music is perceived moment by moment. Empirical research on the perception of large-scale structures suggested that architectonic structures express the structures intended by composers more than the structures perceived by listeners. Several studies have investigated the perception of global form by systematically manipulating the global organization of musical pieces (Gotlieb & Konecni, 1985; Tillmann & Bigand, 1996). All confirmed the weak sensitivity to global form. However, other studies (Deliège, 1989; Clarke & Krumhansl, 1990) showed sensitivity to large-scale structure in contemporary music.

Background in music theory

The concatenationist view conflicts with the traditional concepts of form as developped by music theorists (Schenker, 1935; Riemann, 1882). Organicist and architectonic concepts describe large-scale structures as hierarchical structures in which the relationship between the elements facilitate the coherence. Other musicologists, such as Stoïanova (1978) or Kramer (1988) defend the idea that the perception of large-scale structures is an interaction between static and dynamic aspects of time.

Aims

The aim is to explore the sensitivity of participant to large-scale structure, the perception of musical coherence and the effect of temporal context.

Method

Six musical pieces, half from contemporary music, half from popular music were segmented in 29 chunks of 6 seconds on average. Participants listened to both original and scrambled versions of the pieces. They were told that two sound ingineers had been asked to organize the chunks in a musical coherent way. One of the ingineers was an expert but not the other one. Two main tasks were required of our participants. First they were required to indicated "on line" when they perceived an incoherent link. At the end of the piece, they indicated which of the two sound ingineers they thought had worked on the piece. A control experiment consisted in presenting chunks two by two without the whole musical context. Participants were required to perform a task similar as the first task.

Results

The finding demonstrates a moderate sensitivity to large scale structures which was found for both popular and contemporary musical styles. Numerous errors were detected in the scrambled version. Musicians and nonmusicians found, in majority, that the scrambled pieces were due to the "novice engineer".

In the control experiment, the increase in the number of false detections was surprisingly more massive in coherent than in incoherent versions.

Conclusion

This experiment shows the importance of the temporal context for the capacity to evaluate rhetorical coherence in music. The subjects seemed to need a temporal context much longer than 6 seconds especially in coherent versions.

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Motivic design and physical gesture in *L'après-midi d'un faune*

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Background in music theory, analysis and composition

The two foundational subdisciplines of American music theory, Schenkerian theory and pitch-class set theory, have historically been viewed as mutually exclusive and largely incompatible. Nonetheless, they share a common interest in motives at various levels of musical structure (Forte, 1988). In recent decades, an interest has developed in applying the results yielded by both approaches to performance (Berry, 1989).

Background in dance theory

The Hungarian choreographer and dance theorist Rudolf von Laban developed a comprehensive system of dance notation called "kinetography," the study of drawing movement (Laban, 1928). Later dubbed "Labanotation" (Knust, 1979), Laban's system became the gold standard of dance notation systems, enabling choreographers to preserve precisely documented "scores" of their works that could be reconstructed by later generations of dancers without having to rely on the inconsistent memory of individual dancers (Maletic, 1987).

Aims

Using an analysis of both Nijinsky's reconstructed dance score (Guest and Jeschke, 1991) and Debussy's music for *Prélude à 'L'après-midi d'un faune'* as an example, we aim to provide a synthesis of dance and linear analysis whose results differ significantly from those produced by a purely musical analysis (Brown, 1993). In our examination of Nijinsky as "choreographer-analyst," we aim to reverse the directional arrow between analysis and performance, establishing the performance as a potential starting point for interpretation.

Main contribution

Our paper will present "linear-gestural" analysis, a synthesis of the insights provided by traditional linear analysis and the analysis of the dance score, as an alternative to traditional forms of musical analysis. Rather than attempting to artificially separate the two analytical processes and simply compare the results side by side, the new analytical method will allow the insights gained from each analysis to interpenetrate and influence the results of the other. In the case of our analysis of Debussy and Nijinsky's *Faune*, this leads to a different interpretation of the work than that offered most recently by music theorist Matthew Brown (1993), one that takes the visual and aural aspects of the ballet equally into account.

Implications

By providing a new method for examining choreographed works, we will provide musicologists with the means to create interpretations that are more relevant to the performers that interact with those works on a daily basis. Likewise, our use of performance as a starting point for interpretation will enable musicologists to create new and innovative studies of important works. Both outcomes will positively affect the relationship between musicology and performance.

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Song duels as Turnierkampf: An ethological approach

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Background in ethnomusicology

Competitive musical performance (song duels, contests, Preissingen etc.) is found in many cultures all over the world. The competitions serve different purposes. Some take place on the occasion of celebrations, some are held in order to achieve honour and reward or win a prize; others are a device to settle legal conflicts between individuals (Rasmussen 1922, Emsheimer 1956, Böck 1957, Hoebel 1967, Bohannan 1967, Erdener 1995 et al.). Almost all song duels and contests follow strict formal rules.

Background in human ethology

The non-damaging combat between individuals of the same species and the same sex (mostly males) for territory or access to the opposite sex has been described as Kommentkampf or Turnierkampf (Lorenz 1943). The ritualized combat serves the function of controlling aggression and avoiding violence also in human societies (Eibl-Eibesfeldt 1984). The "weapons" and tactics used in and evolved through intrasexual rivalry are influenced by patterns of selective mate choice (Buss 1992). According to Darwin's (1871) and Miller's (2000) hypotheses, sexual selection played an important part in the evolution of human music. We hypothesize basic functional and evolutionary categories of musical behaviour which evolved under different selection pressures.

Aims

From fieldwork and transcultural data we analyze if competitive musical performances show features of Turnierkampf in an ethological sense. The result is relevant for the discussion of hypotheses about evolution of musical behaviour and the selection pressures involved.

Method

Fieldwork data and all available reports on ca. 20 song duelling traditions including modern subcultural phenomena are evaluated. We survey formal and functional features of these competitions. We further investigate if the song duels fulfil a set of ethological predictions about characteristics of Turnierkampf.

Results

The observed song duels show several features in common: about 90% follow strict formal rules, 85% are originally male, 75% have a strong implication of status and reward. Most of them impose a significant cost or risk on the participants. These results match with the predicted characteristics of rival Turnierkampf. Furthermore we found that 90% of the competitions occur in nomad, shepherd or simple agricultural societies or in a lower stratum of urban culture. 6 of 20 song duels in separate cultures are originally supposed to control aggression and to avoid violence.

Conclusion

Occurring in many separate cultures, competition is likely to be an ancient and universal form of musical performance. Song duels show all classical features of Turnierkampf with adaptive functions like displaying "fitness indicators" (Andersson 1994), improving social status and controlling aggression between individuals and/or groups. We conclude that the use of music in intrasexual contest contributed significantly to the evolution of human musical abilities and performing behaviour. The original functions of song duels tend to vanish with the development of civilization. On the other hand, social competition by means of musical performance re-emerges in urban subcultures (rap, karaoke).

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Musical grammar of yoiks and the genetic background of the North Saami

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Background in archeology and linguistics

The North Saami people live in North Norway and North-west Finland. They speak a Finno-Ugrian language and their number is ca 30,000. Their ancestors can be traced back to the earliest known archaeological culture in Scandinavia, and their culture springs originally from Aurignacian culture. In English, their song is known as yoik, derived from Saami verb yuoigad, meaning 'to sing'. The verb is used like any transitive verb: The Saami 'kill a wolf' and they 'sing a person'. When having but a few musical instruments, yoiking was their main means of expressing their internal emotions in music.

Background in genetics

In Europe, the North Saami form a genetically distinct group especially in the light of their maternal DNA and the nuclear DNA evidence. This distinctness emerged at least by the time the Saami ancestors were arriving at their present locations some 11 000 years ago. Y-chromosomal evidence indicates a paternal gene pool largely shared with the Finno-Ugrian- and Baltic-speaking populations.

Aim and main contribution

We propose a hypothesis according to which the musical grammar unconsciously regulating the melodic movements of the North Saami singers is at least 40,000 years old. The key to this grammar is a technique based on the use and manipulation of the multiples of simple overtones. It seems that most typical yoik melodies are based on transposing the fundamental tone of the overtone series twice during a melodic line. The theory of a Paleo-European musical grammar may possibly be supported by the data identified by specialists in human genetics and physiology. Studies of Y-chromosomal diversity reveal that Central Asia was the source area of Palaeolithic period migrations into Europe, the Americas and India. The yoik represents the most archaic grammar of music in all Europe. The counterpart of this singing only is met with among the Amerindians — not so clearly among the Paleo-Siberians, whose style seems to represent a more recent layer. (The Ugric-speaking Mansi population, located immediately to the east of the Ural Mountains, may still carry genetic evidence in their maternal DNA from the Early Upper Paleolithic population expansion of anatomically modern humans from the Middle East and/or Southeast Europe.) The similarity of musical grammar of the North Saami and certain Amerindian singing can be understood if we presume that the earliest ancestors of the Paleo-Indians knew the same grammar in Central Asia as did the earliest ancestors of the Paleo-Europeans, the Aurignacians. It is typical of them to use the rudimental modalities which spring directly from overtones. They are not always anhemitonic by nature, as normally interpreted, but more archaic results in transposing the fundamental. The grammar used by thAustralian singers differs from that of the Paleo-Europeans.

It is even more archaic but closer to European song and the yoik than, say, Paleo-Siberian or Chinese grammars. All paleoanthropologists agree that anatomically modern humans emerged in Africa over 100,000 years ago and that the African populations had a central role in the emergence of modern humans elsewhere. However, it is still debated whether modern humans interbred locally with other archaic humans.

Implications

Understanding the logic of yoik makes it possible to explain several other modal systems in northern Africa, Europe and Asia, such as, the emergence of anhemitonic, Paleo-Siberian or European modalities (including tonality).

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Musical content processing for Interactive Multimedia

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Background in musicology

Defining the nature of musical content (and meaning) has been a major preoccupation of many researchers in systematic musicology, aesthetics, phenomenology, hermeneutics and semiotics. Many theories of musical meaning have been formulated but these theories were not connected with the physical signals that carry the information. With a lack of evidence-based grounding these theories remained metaphors, and had no instrumental impact on reality. Modern cognitive/systematic musicology, however, is grounded on evidence-based research and computational processing, and works towards an elaborate testing environment for the development of theories that, ultimately, aim at closing the old gap between sound and musical practice.

Background in computing

Interactive multimedia applications suffer from a serious lack of advanced content processing capabilities in the cognitive, as well as in the affective/emotive, and motoric domains. If these systems have to interact in an intelligent and spontaneous way with users, then it is evident that their communication capabilities should rely on a set of advanced musical and gestural content processing tools. There are indeed many occasions where users may want to interact in a spontaneous and even expressive way with these systems, using descriptions of perceived qualities, or making expressive movements. Progress in the domain of content processing, therefore, is urgently needed.

Aims

This paper presents musicology as a content processing science, and shows how results of both cognitive and affective content processing can be applied in interactive multimedia applications.

Main contribution

The paper introduces an instrumental theory of perception-based musical audio analysis that is based on the understanding of content processing mechanisms and the different time-scales, memories, and cognitive/emotive/motoric modalities involved. The paper overviews the modelling of musical content processing and overviews applications in interactive multimedia systems.

Implications

Musicology that is grounded on evidence-based research and computer modelling offers a very powerful tool for future research, and plays a leading role to successful applications in advanced fields of interactive multimedia.

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An Electronic Corpus of Lute Music (ECOLM): Technological challenges and musicological possibilities

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Background in historical musicology

The systematic investigation of historical repertories (such as that of the Western European lute) poses a number of problems. It is not sufficient merely to store graphical images of sources of lute music, since the tablature notation employed limits their accessibility to a handful of modern performers and scholars. It is necessary, therefore, to devise a system of encoding and presentation in order to provide access to the musical content of those sources. The process of encoding a historical document is an editorial one, demanding a considerable degree of expert knowledge in the subject domain. ECOLM is intended to allow knowledge of the lute and its repertory to be shared with users who do not have specialist academic knowledge or practical experience of the instrument or its sources.

Background in computer science

The technical challenges of ECOLM go well beyond straightforward application of database and web technology. Lute tablature shares several characteristics with the MIDI format, including a number of its disadvantages for abstract music representation. Lute music, being essentially polyphonic in structure, is not simple to encode in transcribed form since tablature notation contains no information regarding, for instance, note-spellings and voice-leading. It does, however, carry a good deal of information about performance practice embedded within the notation. Thus, it is necessary to keep the encoding as close in content to the original notation as possible. Some pieces in the lute repertory were transmitted in many sources, although rarely in the same form; perhaps half of the surviving music is anonymous and much is misascribed. The scale of these problems when dealing with a corpus of, potentially, tens of thousands of pieces makes a clear argument for the development of 'intelligent' processing techniques such as information retrieval and computer-assisted analysis for the purpose.

Aims

The ECOLM project makes available a historically significant corpus of lute music, along with a substantial amount of musical and historical metadata, available via the World Wide Web. The corpus acts as both a reference resource and as a data set for work in computational musicology.

Main contribution

A summary of the work carried out so far within the ECOLM project in musicological and technical aspects, together with a presentation of some of the possibilities offered by new technologies for musicological investigations of the corpus and other repertories.

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Perfection as performance

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Background in sociology of the arts

Perfection today is argued to emphasise the performing aspect of the self only, rather than establishing a relation between the self and its perfection. Modern perfection refers to the technically perfected devices of behaviour and attitudes of the self as reduced and emptied of sense. (Goffmann 1971, Lasch 1979, Adler and Adler 1989).
It is the star who hits Number One and in doing so repetitiously earns her a "self". Success is the most likely, if not the only source for establishing a self. The rest are losers and their failure condemns them to be imperfect waste to be disposed of.
The reason is found due to the lost tension between the divine and the humane. Indeed the self can neither improve towards the divine nor itself but only be a conformer within a mono-culture of un-reflected stardom. The contemporary function of music must be considered to have shifted to Show and amusement (pop-concerts).

Background in music pedagogy

The technical level of a musician who wants to follow a professional career needs to be so enormously high, that it nearly equals a threat. "Gift" today is understood as the ability to work hard. According to Elias (1986), music like sport has changed into an other-oriented self-constraint de-valuing the idea of a vivid making music together (Schütz) and the perfect moment experienced together.

Aims

The aim is to point at a non reflected and non differentiated cult of stardom exhibiting a soulless technical perfection without any charismatic qualities.

Main contribution

Analysis of the reduction of charismatic musical self-perfection into market oriented performer-perfection. My special interest has been in perfection featuring the de-individualising disciplining factor of a win-out society.

Implications

The technical perfection having gained prominence within a technique oriented practice, competence and dexterity especially in reference to CD registrations is taken to hint at a decreasing "need" of today's society for a mimetic function of classical music.

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On horizons and research agendas for the sociology of musics

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Background in sociology

Historically prominent figures in formulation of objectives and approaches of the sociology of music were Max Weber (1958) and Theodor Adorno (1976). Following the work of Howard Becker (1982), sociology of music has increasingly turned to analysis of social contexts and social organization of production, distribution, and reception of a wider range of musical "works," of music as a "collective activity," and of the "social construction" of musics and their "meanings." These newer directions have sometimes been accompanied by disagreement over the central questions and hypotheses of the sub-discipline.

Background in publishing

Except for very specialized monographs, texts on music and musicians — whether biographies or on "music appreciation," music history, or musical skills and techniques, and including those which make reference to historical and social contexts — have until recently ignored the role of the publishing industry in the patronage of music production and its distribution and reception. Recent scholars have assigned publishing and distribution activity in the 19th century considerable weight both in the careers of composers and in the distribution and reception of their works, and 20th century publication activity is accorded a considerable share in the credit or blame, along with electronic reproduction of music, for the "commodification" of music and its alleged implications.

Aims

We review traditional and current themes, issues, and research approaches of the sociology of Western musics. We note some disagreements about the subject matters of sociology of musics which have emerged.

Main contribution

We argue that a Sociology of Musics, viewed or defined as the "sociology of production, distribution, and reception of musics," can accommodate the entire range of these themes, from Adorno's notion of music as homologous to society, to the Becker Art Worlds (or Music Worlds) tradition of analyses of the social contexts and patterns of production and distribution of art and music, to the ideas of Frith and DeNora about music as a resource for behaviour, health and well-being, and social organization, and about musical components of social reality, to the concepts of Shepherd and Wicke of musical dimensions of culture. We argue for greater use of procedures which allow comparative analyses and, in particular, for development of well-defined Indicators for description, measurement, and analyses of variations and changes in production, distribution, and reception of musics. Finally, we outline suggestions for study of social organization, and effects of societal changes, on the "musical life course" of real population cohorts.

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Deviations from the resonance theory of tempo induction

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Background in music psychology

The salience of pulse perception in listeners attending to musical rhythms has been modeled as a band-pass filter (Parncutt 1994) and a simple resonator with a resonance frequency around 2 Hz (van Noorden and Moelants 1999). These models have been able to explain perceptual responses to a variety of rhythmic pulse trains and to excerpts of music from a wide range of styles. In these studies, the models were applied to predict distributions of perceived tempo for large collections of music. However, in many pieces the tempo is ambiguous, allowing several metric levels to serve as the beat. Is this model also able to explain the distribution of responses of groups of listeners to individual excerpts of music?

Background in computation (music information retrieval)

Many techniques for the automatic extraction of musical tempo from audio files have been developed, including multiple resonator methods (Scheirer 1998), multiple agent methods (Goto and Muraoka 1998), and probabilistic methods (Cemgil et al. 2001). It is typical for such systems to provide a single tempo value or multiple candidate values, often at different metric levels. However, in view of the inherent ambiguity, a single tempo value does not sufficiently describe the group response, e.g., perceived beat, of a single excerpt of music. A better method would accurately describe the relative ambiguity of tempo across group responses.

Aims

We evaluate the appropriateness of a resonance model for tempo induction to predict the tempo perception of a group of listeners to single excerpts of music and we identify rhythmic and acoustic properties for excerpts that deviate from a resonator-model prediction of their perceived tempo.

Method

Two experiments were done in which subjects ranging in musical training listened to and tapped to the beat of excerpts of music comprising a broad set of styles. Histograms of all listeners' tempos were generated for each excerpt and tempos at the two largest peaks in the histograms were recorded and taken to represent the dominant perceived tempos of that excerpt. The relative strength of these peaks was then compared with the distribution as predicted by the resonance model.

Results

The resonance model predicts a majority of the tempo distributions but in some cases, subjects tapped at metric levels higher or lower than the model would predict.
The musical content of the excerpts was examined in order to see what elements in the stimuli create deviations from the model and what elements contribute to the ambiguity of

tempo. Deviations from the resonance theory for pulse perception seem to be generally predicted by a statistic designed to represent periodic dynamic accents in the acoustic waveform of the musical excerpt.

Conclusions

The resonance model for pulse perception is applicable to the perception of tempo in a wide variety of cases but fails for some individual musical excerpts. A preliminary description of the relation between musical content and the perception of extreme tempi and tempo ambiguity is given, providing a starting point for more specific research in the field.

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Music education with hearing-impaired children

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Background in music education

Hearing impairment (HI) in children often includes perceptuo-motor and cognitive impairments, within and beyond the oral-aural-loop. Auditory information may be poorly assimilated, which evokes difficulties in language and speech. Typically, HI is associated with disturbances of fine-grained motor coordination of the systems needed to produce verbal utterances (speech breathing, phonatory, and articulatory systems). Therefore, HI is often no more and no less than a part of a larger-scale communicative disorder, which may affect many sensory-motor components. Advanced audiotechnology (digital hearing aids/ cochlea-implants) offers new possibilities to HI-children. Until recently, however, the capacity of hearing aids or cochlear-implants has been focused on speech perception, not on music perception. Recent research on the interaction of music and language in human child development suggests that music education may support the acquisition of communicative skills in primary school children. The question arises, whether music education can be similarly beneficial for HI-children, particularly in the speech domain.

Background in music psychology

There is a history of research into the mutual relationship of music and language in human development. One important question is, whether and to what extent music learning, e.g. singing, dancing, or playing musical instruments, or simply listening to music, can have measurable and durable effects in other cognitive domains beyond music, in general, and in speech acquisition, in particular. Most studies have addressed the effects of music education in healthy children and adults. By contrast little is known about the effects of music education in hearing-impaired children. Again, the question arises of what are the effects of musical training in HI-children, particularly in relation to speech acquisition, and sensory-motor coordination.

Aims

The general aim of this study is to test the hypothesis that enhanced music education at primary school level may facilitate transfer effects between music and speech domains. It is expected that special training in singing, dancing, and in playing musical instruments aids the development of communicative skills in HI-children. Effects of music education are expected in music-related sensory-motor integration processes, in general, and speech-related processes, in particular. As a first step, it was desirable to develop feasible design for a longitudinal study, which was initiated in 2003. The purpose of the study is to investigate the effects of 'enhanced' (model group, N = 22) versus 'regular' (control group, N = 15) music education with hearing-impaired children.

Method

In order to obtain baseline data of musical, language, and intellectual skills of each participant, various individual and group tests were conducted. Beside routine measurements of sensory-motor functions and language sills, additional measures of intelligence (K-ABC, year 2;6 to 12;5), linguistic competence and vocabulary (AWST 3-6, REYNELL), and musical talent (Jungbluth, PMMA) were collected. Moreover, vocal music and speech performances were audio- and video-taped.

Results and conclusions

Qualitative and quantitative data analyses are still under way. To highlight methodological issues, samples from spontaneous and reproductive singing at to of the study (baseline measurements) will be presented at the conference as well as some initial observations from these data.

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Songs without words: A case study of an autistic child

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Background in music psychology

Singing is a socially important activity, and in this function it is usually performed simultaneously by a group. Thus, the development of singing involves not only the acquisition of melodies and words but also precise attunement to the timing structure and melodic features given by the social environment, which leads to a considerable conventionalization of performance. How does singing develop in a person who has no access to social activity due to a severe developmental disorder?

Background in linguistics

Speaking, like singing, is a cultural form of human vocal activity. Unlike singing, the usual mode of performance in speaking is individual turn-taking, as in dialogue. In language development, dialogic interaction and communicative intent give important impulses for the adaptation of a child's phonetic output to the sounds of the target language. However, lyrics to songs are in some ways different from spontaneous speech. In the early stages of language development, communicative content plays little or no role and the phonetic form is related to the musical features of melody and rhythm.

Aims

Our aim is to contribute to a better understanding of the interrelationship of language and music in singing. The presentation describes the vocal activity of a child with infantile autism who sings songs although she completely lacks any kind of language, focusing on the development of musical and phonetic features of her singing in comparison to the model songs. The autistic girl is intrinsically oblivious to the social aspects of performing music. An investigation of her musical performance in the course of the years shows in which way her musical behaviour goes a different way from that of normal children. As to the linguistic aspect in this special case, the only area of speech she produces is the phonetic realization of the songs she sings. We investigate whether the subject's phonetic output shows any sign of development in the absence of language.

Method

The study is based on a long-term video documentation of the single case, covering the period from age 3 - 15. The recorded singing events amount to about two hours of audio data or 269 instances of singing covering 28 different songs. Phonetic and musical transcriptions were prepared.

The subject's musical abilities and phonetic repertoire were assessed. Her phonetic and melodic output was examined longitudinally with respect to her approximation to the model forms.

Results

The autistic girl reveals good musical abilities in singing. The longitudinal examination reveals a stage of fairly exact reproduction abilities at three years, a peak of high musical variability and creativity in middle childhood and relative stagnation in musical inventiveness in her youth. The phonetic analysis reveals two things. Firstly, the phonetic structure and inventory used by the subject remains highly restricted, even with a regressive tendency. Secondly, within these bounds, this girl shows signs of phonetic learning, although she apparently has no representation of a language system whatsoever. Over the years, her renditions of the phonetic side of singing gradually approximate the model forms.

Conclusions

The autistic girl's musical ability in singing has developed even in the absence of language. We attribute her stagnation in musical development to her lack of social exchange. We interpret her deviant sound production as a radical adaptation of speech sounds to musical purposes. The fact that she approximates the sounds of the original lyrics points to a residue of voluntary articulatory control in the absence of language.

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Similarity measures for melodies: Mathematical systematization and psychological evaluation

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Background in music psychology

Melodic similarity is a key concept in many of musicology's subdiciplines, and the variety of algorithms for measuring melodic similarity is abundant (for an overview see Vol. 11 of Computing in Musicology and Vol. 18, Nr. 3 of Music Perception). But though some melodic similarity measures have been subjected to psychological testing (e.g. Schmuckler 1999; Eerola et al. 2001; Hofmann-Engl 2002), until today there has been no comparative study which takes into account a wide variety of algorithms, and that could inform about which of these measures are cognitively most adequate and which are not.

Background in mathematical music theory

The topology of the space of mathematical melodies, an abstraction from musical melodies, reducing them to pairs of onsets and pitches (represented as numbers), should be explored in the face of empirical findings. As a first step, a systematic and mathematical classification of similarity measures is done, which is inevitably necessary for a general discussion and for further research, and a general and abstract definition of a similarity measure is given.

Aims

The aims of the study are two-fold: First, existing measures need to be systematized according to their mathematical structure and their possible application to different dimensions of melodies (pitch, interval, onsets, duration, harmonic content, motives). Second, the measures that are cognitively most adequate need to be determined.

Method

Methods include mathematical systematization and a psychological rating test for melodic similarity of 99 subjects with a strong background in music. 14 melodies mainly from pop music and 84 variants of thereof were used as stimulus material. The similarity values of about 50 implemented algorithms are compared to ratings of subjects who show reliable and stable similarity judgements. Linear regression was used to combine and weight different algorithms in order to obtain a better prediction of subjects' ratings.

Results

Very high inter-subject correlations were found (values of Cronbach's alpha around 0.97). Ranking lists comparing the output of the similarity algorithms to subjects' ratings were obtained. Generally, measures based on the edit distance and different n-gram measures were found to be most effective. Contour data gave better results than raw pitch and interval data. The weighting of pitch data according to their duration appeared as an useful option for most measures.

Conclusions

Subjects with stable similarity judgments seem to have the same notion of melodic similarity. Their estimations of this unobservable dimension are highly similar. Thus, there seems to be something like 'true' melodic similarity. It showed that for different rating tasks and scenarios subjects alter their rating strategy and pay attention to different dimensions. Three 'optimal' measures for three different scenarios were obtained from linear regression analysis.

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The subjective effects of infrasound in a live concert setting

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Background in human acoustics

Researchers (e.g. Yeowart et al, 1967), have confirmed humans can detect airborne infrasound (sound below 20Hz in frequency). Research on fish by Todd et al (2000) has shown low-frequency sound can stimulate the sacculus. Infrasound has also been linked to mood in two strikingly different contexts. One is in sacred organ music (pipes over 8.5 metres long generate infrasound). The other is ostensibly haunted sites (Tandy, 1998).

Background in music psychology

Juslin and Sloboda (2001) suggest using the 'reaction triad' (i.e. subjective feelings, expressive behaviour and physiological response) to study our emotional response to music. The simplest emotion studies, however, use spoken or written words to assess only one part of the reaction triad: subjective feelings. Word-based studies require subjects to report their emotions using adjective checklists, rating scales or open response forms.

Aims

Our primary aim was to measure an audience's emotional response to airborne infrasound, in a live concert setting (the Purcell Room, London).

Method

This live event was based around a program of ten pieces for piano and/or electronics, many with long sections of heavy bass that could mask any infrasound present. Sarah Angliss specially composed the piece *She goes back underwater* with infrasound masking in mind. This program was played in two identical concerts which ran back-to-back. A different audience attended each event. Prior to two each concert, audience members were asked to indicate their present emotion on four scales. At four points in each concert, labelled A, B, C and D, they were also asked to assess their emotional response to the piece they had just heard, using these scales. In addition, they were asked to report any unusual experiences, rate their intensity and state whether they thought the infrasound was present or absent during the piece. In each concert, infrasound (a sine wave at 17*Hz*) was present during two of the four pieces under test. The two concerts were counterbalanced for infrasound. In the first concert, the 17Hz signal was present in pieces B and D. In the second concert, it was present in pieces A and C.

Results

522 people completed questionnaires. When infrasound was present, the number of strange experiences reported increased by around 22%, even among those unaware of its presence. Unusual reports included a 'sense of coldness', 'anxiety' and 'shivers down the spine', 'calmness' and 'moments of clarity'. There was also an increase in the intensity of any feelings reported.

Conclusion

The concert/experiment has provided a wealth of data on the responses and arousal levels of audience members over the course of a contemporary music programme. Infrasound seemed to have a significant effect on the number of unusual experiences reported among an audience.

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Relationship between texts and tunes in the Siberian folksongs

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Background in ethnomusicology

In Siberian folksong, texts are of primary importance and tunes secondary. Field interviews with the Samoyed people demonstrate that the tradition carriers themselves perceive the text and tune relationship in a similar way. The songs are performed to tell a story and, for this reason, the verbal component seems to take over the musical one. The Samoyed people have a considerable repertoire of autobiographical songs. In 1901-1906, a Finnish linguist and folklorist Juha Artturi Kannisto organised expeditions to visit the Mansis. He denoted autobiographical songs as fate songs. Kannisto characterizes these as lyric songs, where the moods, experiences and fate of the author (a man or a woman) are described. He adds that these songs are also called vodka-drinking songs, since they are often performed when "the vodka has opened the mouth and the heart" (Kannisto 1930: 203). Nowadays we call such songs personal songs – a term coined by linguists whose primary interest is directed towards the verbal text. We might define a personal song as closely related to the performer and her/his life course.

Background in linguistics

Ross and Lehiste (2001) have used methods from acoustical phonetics in order to study the text and tune relationship in Estonian folksongs. Their study has targeted the temporal structure of folksongs, since quantity plays an important role in the lexical and grammatical differentiation of words in the Estonian language. Ross and Lehiste (2001) found that the metre of folksongs tends to impose its own structure onto the acoustical shape of vocal production. Important quantity distinctions which are maintained in spoken language, are greatly reduced in singing. This phenomenon may partly be explained by a relatively free combination of elements from the text and the tune corpora in the folksong repertoire.

Aims

A closer analysis of the repertoire of personal songs reveals a slightly different picture from a common stereotype. Frequently, contents of those songs are not directly autobiographical. This study aims at studying the relationship between a song and its performer in personal songs. We would like to define the most valid criterion for identification of a song as the personal song.

Method

It is a longitudinal study based on fieldwork of the first author in Siberia from 1983 to 1993. One and the same personal songs have repeatedly been recorded as performed by one and the same informants. Both texts and tunes have been analyzed, in order to find out which component of the two is subject to more variation. A number of interviews have been conducted with the performers.

Results

The text of one and the same song may describe completely different events as performed at different times. Those events need not necessarily to be related to the 'owner' of the song. Melodies of the personal songs are not subject to variation. Sometimes a personal song may be performed as consisting of semantically meaningless words. In such cases, however, the listeners still attribute it personally to its performer. This situation may be related to the shamanistic tradition because shamanistic actions, too, are usually performed in the singing mode. A shaman is expected to rely on assistance from the gods, demons, and ancestral spirits everybody of whom possesses a personal melody. This way, sounding of a particular melody in the ritual context refers to an acting demon or spirit.

Conclusion

In all vocal music genres but the personal songs of the Samoyed people, a song is firstly defined by its text. But in the personal song repertoire, a song is primarily defined by its melody. Even if the text is not related to life course of the performer, the song is attributed to her/him because of the melody. Like in the shamanistic tradition a particular melody refers to a specific spirit, in secular music a particular melody refers to a specific person.

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Computer-assisted composition with algorithmic implementations of pitch-perceptual theory

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Background in music psychology

The perception of tonal sonorities and of relationships between them was investigated by Terhardt (1974) and by Parncutt (1989). A tonal sonority comprises pure-tone components with different frequencies and sound pressure levels. Mutual masking among the components affects their individual audibility. Within complex sonorities, harmonic patterns of components are perceived as fused complex tones; Terhardt called their pitches "virtual" and developed a model to predict their perceptual salience. Parncutt evaluated the perceived relationship between successive sonorities in terms of the extent to which they have perceived pitches in common (*pitch commonality*) and the distances between salient successive pitches (*pitch distance*).

Background in composition

Hindemith (1937) proposed controlling the dissonance of the chords in a progression to gradually increase towards the middle of a phrase and decrease towards the end. Many other composers have invoked and applied algorithms for musical or perceptual parameters such as the dissonance or complexity (e.g., Barlow, 1987). Parncutt and Strasburger (1994) explained how modern pitch-perceptual theory could be incorporated into computer-based composition. A possible approach is to enumerate all possible sonorities within a given set of constraints, some of which relate to pitch perception (e.g., by restricting the calculated salience of the most salient pitch in the sonority), and then to compose progressions from these sonorities in which the pitch commonality of, and pitch distance between, successive pairs of sonorities (or of each sonority in relationship to a reference sonority) are restricted to given ranges. Ferguson (2000) was the first to extensively and successfully apply this concept to composition.

Aims

Our aim is to create pieces and compositional styles that are complex, tonally original, and nevertheless accessible to general audiences. Our method is to incorporate implementations of pitch-perceptual theories into the compositional process.

Main contribution

We present a summary of our compositional approaches and findings, focussing on perceptual assumptions, conceptual aspects, and the details of the computer programming. We discuss Ferguson's adaptations of Parncutt's original concept and the underlying artistic and practical issues that motivated them (with sound examples).

Implications

Babbit claimed that because composers are experts, listening to their music requires expert listening (Peles, 2003). On this basis, and guided by the overriding goal of originality, contemporary composers routinely and deliberately ignore the perceptual constraints of

their listeners. If properly understood and implemented, perceptual theory can offer a solution to this problem. It provides a means of systematically exploring and creating new tonal systems that is more successful than aurally guided trial and error.

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An empirical study on the sensation of roughness

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Background in acoustics

Helmholtz discovered two different kinds of roughness: Depending on the frequency difference a 'finer and sharper' or a 'coarser' kind of roughness is perceived (Helmholtz 1868). The dependence of roughness on the frequency of modulation of amplitude-modulated sound shows a band-pass characteristic with maximum roughness at a modulation frequency of 70 Hz. In addition to that, a so called *R-roughness* (Springer & Weber 1998) exists with a maximum at about 30 Hz, which corresponds to Helmholtz's 'coarser' kind of roughness.

Background in psychology

In order to measure sensations, a paired-comparison technique can be used from which – given the assumptions of the *Bradley-Terry-Luce (BTL) model* – a ratio scale of the attribute in question can be derived. Applying a cluster analysis, a set of observations is classified into two or more mutually exclusive unknown groups, where members of the group share common properties. A factor analysis is used to extract a small number of motivations (factors) out of a large variety of individual judgements.

Aims

To explore which particular model of roughness corresponds best to the subjective sensation of *clattering* or *roughness* of electric engine units, and to find out whether subjective *clattering* is a combination of various sensations.

Method

A paired-comparison of 15 engine sounds is performed on 22 subjects, who have to decide for every pair which stimulus sounds *rougher* or more *clattering*. In addition, by a questionnaire the subjects indicate what sensations they feel are similar to *roughness* and *clattering*. Furthermore, the subjects are interviewed about reasons for their decisions.
Complementarily, the roughness and other sensations of the stimuli in the test are determined applying the models implemented in the software *PAAS* (Sontacchi 1998).

Results

The results show high consistency and reliability. Cluster analysis leads to only one group, and factor analysis shows only one common factor for the subjects' decisions. The results of the questionnaire indicate only low agreement between the subjects. The BTL-scaled clattering was compared to the calculated values of roughness, fluctuation strength, tonality and sharpness using *PAAS*.

Only the calculated roughness correlates highly with the empirical data. In detail, among the different parameters of roughness, the model of R-roughness leads to best correspondence with the empirical data (r=0,94).

Conclusion

We conclude that clattering of electric engines can best be modelled by the parameter R-Roughness; complex psychoacoustic variables do not yield higher correlations.
Subjects show substantial differences in describing their impressions even in standardised questionnaires, although their decisions are very similar.

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A segmentation-based prototype to compute string instrument fingering

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Background in automatic music performance

Several representational levels are involved in the performance process [Dannenberg, 1993]: a performance environment should be concerned in i) getting a score, ii) analyzing it, like a human performer would do, iii) modelling the constraints posed by body-instrument interaction, iv) manipulating sound parameters. While there exist some satisfactory solutions at level iv) (e.g., the guitar physical model in [Cuzzucoli, Lombardo, 1999]), levels ii) and iii) still pose unanswered questions. In particular, we address the fingering problem, that deeply affects the physical and expressive qualities of the sound being produced (cf. [Parncutt et al. 1997] for keyboards and [Gilardino, 1975] for guitar).

Background in computing

Parncutt et al. (1997) propose an ergonomic model for short fragments of keyboard music. [Sayegh, 1989] proposes a computationally efficient algorithmic solution (based on a shortest path algorithm) to the fingering process in string instruments.

Aims

We aim to show that cognitive-based and suitable fingerings for string instruments can be achieved by a computationally efficient algorithm.

Main contribution

Our work is a first step in extending Sayegh's approach in a cognitive direction: while Sayegh computes the optimum (i.e. the least difficult one) fingering considering the whole piece, we take into account a number of features concerning the musical intentions, that underlie the fingering decision process. In this paper we focus on a specific feature, namely the segmentation. Musical phrase grouping is a well known feature of general music cognition (cf. [Temperley, 2001]). The score is manually pre-processed to extract the phrases that form it. And it is on this constituent structure that the model minimizes the difficulties for the fingering process, first within a phrase and then between subsequent phrases. It computes fingering for melodies without any length limitations, by estimating difficulties that come from the physical features of the instrument and the morphology of the hand.

Implications

The preliminary experiments with the prototype result to be more cognitively reliable and closer to a human expert's performance with respect to the ones provided by a global optimization approach like Sayegh's. These results support an integration among computer

science techniques, cognitive modelling, music analysis and theory for a promising approach to the automatic music performance.

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Implicit learning of Indian music by Westerners

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Background in music cognition

Studies by Bigand and Barrouillet (1996), Perruchet, Bigand, and Benoit-Gonin (1997), Bigand, Perruchet, and Boyer (1998) ,Tillmann, Bharucha, and Bigand, E. (2000) show that short exposure to an artificial grammar trains listeners to distinguish between stimuli that obey and disobey the rules. The present study considers the extent to which rules of a musical tradition with which subjects have had no contact are learned.

Background in comparative musicology/music theory

Within Bhatkande's monumental anthology (1965/1910-32) the examples of rag Alhaiya Bilawal provide a basis for contriving stimuli that obey and disobey Alhaiya Bilawal's rules.

Aims

To test the hypothesis that after 10 minutes of exposure to Alhaiya Bilawal subjects would correctly distinguish between instances of the rag and examples that diverged.

Method

15 subjects heard 20 2-tala-cycle passages from Bhatkande's model melodies for rag Alhaiya Bilawal. They then heard 20 passages of the same length and musical format: 5 from the first session, 5 from Bhatkande's anthology that had not previously been heard, 10 that diverged. Subjects indicated which of the 10 divergent-plus-lure pairs sounded like the passages heard in the first session.

Results

A majority of the non-Indian/non-musician subjects correctly identified the 10 divergent stimuli in the second session. Subjects correctly identified stimuli that diverged from the rules of virtually all rags and families of rags more often than those that diverged from the more constrained rules of Alhaiya Bilawal. A pair of stimulus-pairs that resulted in correct identifications by relatively few subjects involved transformations of Clough and Douthett's 'usual diatonic' collection into anhemitonic pentatonic (1991: cf.also Rahn 1999).

Conclusions

An implicit-learning design holds promise for corroborating and clarifying cross-culturally various musical systems' claims to universal validity.

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Linearity in language and music: Constraints that processing imposes on performance

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Background in linguistics

In his 1994 book *A Performance Theory of Order and Constituency*, John Hawkins seeks to answer the following linguistic questions: Can rules and principles of linguistic syntax be explained by considerations of processing, and by the temporal sequencing of speech? How can listeners work out what the syntactic structure of the sentence is, given the phonetic speech stream provided by the speaker? To what extent are the grammatical conventions of human language shaped by performance? Leaving behind Chomsky's theory of a Universal Grammar (1965), and relying on the empirical support of cognitive psychology, Hawkins claims the existence of a universal *innate processor* that constraints the different options left unsolved by the grammar itself.

Background in music theory

Up to the present day the most comprehensive view on musical structural organisation has been Lerdahl and Jackendoff's *A Generative Theory of Tonal Music* (1983). Combining the formal methodology and psychological concerns of Chomskian Linguistics with the insights of Schenkerian music theory, Lerdahl and Jackendoff make an attempt to describe how a listener that has knowledge about a specific musical idiom is able to understand complete musical structures. The existence of a musical Universal Grammar would hypothetically allow people to learn any musical language with an incredible correction and rapidity. Nevertheless, as happens with natural language, the existence of a Universal Grammar is dubious for music, too. It seems pertinent, therefore, to develop an alternative analytical method for music, using processing-oriented, non-innatist approaches.

Aims

I seek to find out whether language and music can be studied in the light of processing needs. In order to do this, I explore a linguistic model that asserts the above possibility in the case of natural languages, namely John Hawkins's *A Performance Theory of Order and Constituency* (1994). Then, I apply Hawkins's model to specific musical examples of the Western tonal tradition and see whether it could be effectively used as a methodological tool in musical analysis or just as a model in order to draw interesting analogies between language and music performance and processing. Last, I expose my conclusions.

Main contribution

A functionalist — that is, non-generativist — approach to musical language explains the mechanisms that hearers put into practice when they listen to a specific piece of music and try to understand its internal organisation. Such an approach also accounts for the strategies that composers and performers develop in order to make sure that the structure of a piece will be processable by the audience in real time. In Hawkins's terms, this approach shows how processing constraints condition the grammars that underlie the construction of musical compositions, and vice versa, how the fact that certain musical constructions are easier to process make them become part of the musical grammar of specific tradition.

Implications

Hawkins's model works for music in the sense that it is a tool that can help music researchers to start building up a performance/processing based hypothesis for music. His *Theory of Performance and Constituency* gives us ground to reject — or at least, to question — the innatist theories of music understanding that have dominated the field of musical investigation for the last twenty years.

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Virtual space and cinema: The front-back presentation of sound

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Background in acoustics

The depth of acoustic events represents one of sound spatialisation most ambiguous aspects. If left-right effects may be easily simulated through the loudspeakers position or through dynamic modifications depending on a distribution of the signal in accordance with the "duplex theory of localization" (ILD and ITD) [Yost 2000, p. 182] and through alterations of further acoustical aspects [Chowning 1992], the front-back presentation of sound is more complex and involves a lot of acoustical and psychoacoustic implications [Blaubert 1999; Moore 1997]. However, since the beginning of the *media* (Radio, Cinema, Television), the main system of recorded sounds enjoyment still remains a frontal listening and this aspect was generally ignored despite his evident relation with scientific prerequisites and the connection between the events narration and its acoustical description.

Background in film music theory

The sound influence on the cinema analysis is generally limited to the music. Music is that way considered as a background soundscape and may be regarded as more or less related with the plot or as playing some narrative role. This perspective allows both semantic and compositional discussions and historical or biographical investigations, leaving frequently out technological aspects related to the production and the acoustic organization of sound events. The only eligible theory to give a description of all sound events which are reproduced in the movies is the acousmatic one, drafted on early stage by Pierre Schaeffer [Schaeffer 1952, 1966] and later specified for the cinema by Michel Chion [Chion 1982, 1991, 1996, 1997]. The acousmatic perspective, however, although directly derived from the historical core of electroaustic music, does not satisfy all acoustical, narrative and compositional aspects of sound events. The acoustical representation of space, and the front-back presentation particularly, is very pregnant both for electroaustic music and for surround systems, but it is rarely present in the discussions about cinema [Altman 1992] and its integration with the narration and the movie as a whole is generally misconceived.

Aims

The cinema, as one of the most important *media* of our culture, is a "technological art". It lives and grows with the technical world and draws from it the necessary tools for its realizations. Together with mechanical instruments the Cinema engages however further methodological processes of the scientific thought and joins them together with the tradition of the literary narration. In particular the movie is a place where the natural events simulation and the physical reality description of the represented world meet each other. In these cases the use of adequate techniques of acoustic presentation helps the pictures events to determine more precisely the physical place in which it was realized: the *space* in which the action is set or which the director wants to emphasize. Today the left-right dimension of the acoustic space is adequately represented. This has been achieved by the progressive proliferation of loudspeakers from the stereo sound system to the surround [Lertpanyavit 1995]. But the representation of the sound depth seems still remain substantially ambiguous and apparently lacking in a particular systematization: With the observation of two film scenes, the first

taken out from *The Secret of Roan Inish* by John Sayles and the second from the first episode of the Saga *The Lord of the Rings,* is possible to determine some aspects of the use of acoustical depth in the cinema and its relation with the narrative intentions.

Main contribution

The presentation of the sound, set in the virtual reality representing the cinematographic space, supports not only a more realistic action, but constitutes a value by itself. It is able to connect the scientific acquaintances and the expressive tradition of the literary narration and helps preserving the historical tradition. Acoustic events in the cinema are not merely the translation of reproducible natural phenomena: they rather are the results of clear intentions of the directors and the sound designers. The latent organization of acoustic events in the cinema, and especially the front-back presentation of sound, seems to rise from the old systematization used in early monophonic radio [Arnheim 1993; Mantelli 1956]. This constitutes a confirmation of the value of the acousmatic theory, and revels the connection between different sound events of diverse repertoires joined by technological instruments.

Implications

Analysing all sound events of a movie and their space organization, the attention shifts from the composer and his work to the sound designer and the director narrative intentions. This aspect ratifyes the remarks of Walter Benjamin [Benjamin 2000] about cinema as "collective work" and reveals the urgency of a widening of musicological investigations, especially those which are technological related, about the whole collaborative process of media production. This will be useful for a better determination not only of all aspects of electroacustic music, cinema and radio productions, but also for the popular music and other related repertoires.

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Let the music play the feelings: The performative effect of music in advertising

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Background in theory/analysis

The theory of Ethos in the classic Greece, or the Affection Theory in the baroque as a theory of the musical meaning, have given the value of sign to certain musical figures. Music can be considered as a language, since it can transmit messages (Eximeno, 1978). It presents a structuring function of the message, and a semantic function, supporting the verbal message, and as an element with own affective meaning (Carrera, 1981).

Background in cultural studies

Throughout history, the ability of music in order to influence people has been considered. In fact, music is a very important expressive way not ignored by sociology (Weber, Marx, Adorno...). On the other hand, the persuasive ability of music, as a basis of attraction and attention, causes that it is considered as an important and performative element of the advertising manifest.

Aims

To analyse the cognitive deep structure of the music used in advertising. This deep structure will be used to diagnose the coherence between the different elements composing the advertising message.

Method

A sampling of TV advertisements has been made, in order to guarantee the heterogeneity of the advertising concepts as well as of products. For each announcement, the musical elements have been registered. Then, a measurement scale has been used in order to score different characteristics of music. The tool is composed by a questionnaire of 42 objectively evaluable indicators by the announcements observation, and by twelve variables made from the statistical treatment of these indicators. These variables were validated by a panel of music experts. Once closed the measurement process, the resulting data matrix was put under several multivariant statistical analyses in order to diagnose the existence of a possible meaning structure.

Results

The validation process of the musical thematization showed an important agreement between the different experts (alpha=.92). Later, the application of the thematization questionnaire was used for each one of the TV advertisements, and the results were recorded for their analysis with statistical software. The empirical study concludes that transmitted linguistic repertoires are reorganized based on Osgood, Suci & Tannenbaum Semantic Differential Scale dimensions: activity, evaluation and potency (Osgood, Suci & Tannenbaum, 1957). In fact, music transmits coherent information by itself, without other channels support.

Conclusion

From a practical approach, the different musical values have been operativized in order to produce an objective advertising musicological analysis. This method is also applicable to other communicative subjects like electoral campaigns. After the advertisement analysis, we can observe that music transmits a parallel message.
This opens the possibility to design a tool to evaluate the message transmitted by music, by registering and coding its objective musical values.

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Relation of music and images in brain structures processing fear

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Background in music psychology

One could say that music is an open representational object, in that the listener can associate to music several different emotions. By comparison with images, where visual scenes can really be directly threatening for the watcher, music is never really threatening (Lecourt, 1994). However it can induce a real feeling of fear. Such fear is thus generated by the real-life of the subject him/herself who become at the same time source and direct target of the threat (built by its unconscious). A few studies have shown that music can induce an emotional state (Khalfa et al. 2002; Niedenthal et al., 1999; Kenealy, 1997), but they did not compare the separate and combined effect of music and images.

Background in music neurobiology

Most of the neuroimaging studies on fear have used the visual modality and static stimuli (pictures). Results showed a major role of the amygdala (LeDoux, 2000, Amaral, 2000) as well as the insula, the anterior cingualate and the prefrontal cortex (orbitofrontal; Morgan & LeDoux, 1999 ; Davidson, 2002). However, fear is not only caused by visual stimuli ! Music is for example a strong emotional vector. Blood et coll (1999, 2001) used PET to study the cerebral activity associated to affective responses to music. Results showed changes in several paralimbic and neocortical structures as a function of the dissonance and of the positive/negative evaluation of the musical stimuli. Thus music could recruit similar structures to those indicated by previous studies with visual stimuli as being associated to emotional states and to motivation or reward.

Aims

Test whether the emotions engendered by music rely on similar neural substrates as emotions engendered by visual stimuli. Test whether the combination of the two modalities gives rise to a quantitative or also qualitative change in the brain response.

Method

6 types of conditions will be used in the present study. 1) fearful video sequences; 2) neutral video sequences; 3) fearful music; 4) "neutral", calm music; 5) fearful video sequences with fearful music; 6) neutral video sequences with neutral music. Subjects will watch/listen to the stimuli and answer on a 5 point scale whether they found the stimulus fearful or not. We will measure the heart beat, the electro dermal response and the BOLD signal change in a 3T scanner for functional MRI.

Expected Results

We will use the neutral conditions to contrast them to the fearful conditions. This should allow finding the brain structures involved in the feeling of fear. We will then compare within these structures the signal changes in the video, music and video+music conditions. Overall we expect to find similar patterns of activation that may however differ due to the different modality of stimulation (different primary areas to limbic areas connections) and due to the

different degree of fear engendered by the stimuli. Moreover, a broader network might be involved in the multimodal condition due to the need of combining and integrating the visual and auditory information.

Conclusion

Most of the results on fear processing come from studies that only used visual stimuli. This study will bring new information about the cerebral structures involved when fear is engendered by auditory stimuli or by the integration of visual and auditory stimuli. Moreover the use of dynamic visual stimuli (video clips) will increase the ecological validity compared to the static faces generally used in previous studies. The results will be important in refining a complete and coherent psychological model of fear processing. A deeper knowledge of the functioning of the brain structures involved in emotional processing may permit to refine the specificity and efficacy of therapeutic treatment used for certain psychiatric disorders like anxiety, panic crises, phobias and obsessional-compulsive disorders.

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Polyaesthetic education – A bridge between arts, sciences, and education

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Background in musicology and the science of arts

Polyaesthetic education is based on two integrative ideas: the integration of sciences, arts and education, and the integration of the modes of experience provided by the different senses. It criticises the development of strictly isolated curricula for education in music, arts, literature and science which ignore the connections as well as the interdependence between the arts and sciences as well as the polyvalence of aesthetic experience.

Background in psychology and psychological aesthetics

Polyaesthetic education is based on the idea of the "unity of the senses" as suggested in particular by the phenomenological tradition (cf. Erwin Straus, 1956). These ideas correspond with the concept of "psychological aesthetics" integrating the particular aspects of "psychology of art", "music psychology" or "psychology of literature" and aiming at developing a psychological theory of aesthetic experience in order to cover these separated disciplines.

Background in music education and applied aesthetics

The practice of polyaesthetic education is based on sound scene improvisation (see Roscher et al., 1991). Sound scene improvisation forms a valuable instrument in musical education to extend aesthetic experience aiming at the variety of sensual expression. Based on this tradition, different projects have been developed to integrate dance, theatre and music in reception and production.

Aims

A short review of polyaesthetic theory and practice, as developed by Wolfgang Roscher at the University "Mozarteum" (Salzburg) since 1982, shall be presented as an example for an interdisciplinary approach integrating the different arts as well as arts and sciences.

Main contribution

The idea of polyaesthetic education shall be demonstrated as an interdisciplinary approach to aesthetic experience (including musicology) which may be implemented also in pedagogical practice.

Implications

A comprehensive account of aesthetic experience and practice requires expertise from the humanities (music history, history of arts, aesthetics), from the sciences (psychology, sociology) and from the arts. Art education could benefit from the development of curricula which are not limited to isolated arts but emphasise the links between them.

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When reproduction fails in children's singing

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Background in music psychology

The roots of a child's singing development lie in infant vocal play, the starting-point of language (Papousek, 1994; Stadler Elmer, 2002). The developmental paths of language and music then drift apart, speaking becoming dominant. When young children sing, they pay more attention to whether musical and phonetic structures fit together than to word meaning.

Background in linguistics

In early language development (babbling), children experiment with speech sounds, which they practise untiringly in ever-new combinations. From the beginning of word production, children create utterances which are gradually adapted to the form and structure of the target language. In this developmental programme, learning the lyrics of a song is a special case, because it is not improvisation (creation of novel utterances) but reproduction.

Aims

What characteristics and processes can be found in children's singing of songs when they sing on request? How do melody and text interact in singing performance when a child is unable to give a perfect rendition of the original text or melody? What are the consequences for the development of singing?

Method

A cross-sectional study with longitudinal additions was carried out in two Braunschweig kindergartens. 86 children aged 3 to 6 years participated in the study. An audio CD with selected children's songs was played to them once a day for 3 months. The children's reproductions of these songs were then recorded. Musical and linguistic transcriptions of the performances were prepared. Song reproductions were categorized as reproductions, variations and improvisations relative to model songs. We also categorized children's behaviour toward the task of singing, integrating motivational factors into the evaluation of singing performance.

Results

Preservation of phonetic structure seems to be more important than the meaning of the words. Often, a nonsense word preserving the rhyme is used, while semantically meaningful variants (with or without rhyme) are rare. If wrong wording disturbs the rhyme structure, children tend to hesitate or break off. Musical performance reproductions show a great range in quality. Children with an imperfect command of their singing voice tend to adopt their

speaking voice. Children with more singing experience keep to their singing voice and can generally maintain the melody contour. There are also some confident singers whose pitch rendition is more or less precise. All three types were found in both age groups.

Conclusion

Children treat a song as a unit of words and melody. Whether a song reproduction is carried through to the end depends on the way a child handles the text when the original words are not available. For the retrieval of text, phonetic and rhythmic elements are important cues; the semantic aspect seems less important. Melodic cues are usually found at the beginning of a form part such as verse or chorus. Children usually set in at these points and not in the middle of a phrase. Children can get stuck on the words but not on the melody, because melody reproduction develops as a gradual approximation of the whole melody to the target form, making ample allowance for deviations in pitch. Since for most children, the request to sing leads to increased stress, we plan to investigate the relationship between a child's behaviour toward a singing task and the ensuing singing performance.

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Verbal descriptors for the timbre of the classical guitar

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Background in acoustics, psychoacoustics, signal processing

When a string is put into vibration by plucking it, the sound signal lacks those harmonics that have a node at the plucking point. More generally, the spectral envelope of a plucked-string tone is comb-filter-shaped with its first local maximum F_1 located at half the ratio of the fundamental frequency over the relative plucking position along the string. The other local maxima in the magnitude spectrum are odd integer multiples of F_1. The correlation between plucking position and brightness is well-known and coarsely describes the timbral palette of the instrument. The magnitude spectrum of vowels displays up to five formants due to the resonance of the vocal tract, which is, in first approximation, a tube closed at one end, therefore also favoring odd resonant frequencies.

Background in music performance and pedagogy

The guitar is an instrument that gives the player great control over the timbre. Different plucking techniques involve varying the finger position along the string, the inclination between the finger and the string, the inclination between the hand and the string and the degree of relaxation of the plucking finger. Guitarists perceive subtle variations of these parameters and they have developed a very rich vocabulary to describe the brightness, the color, the shape and the texture of the sounds they produce on their instrument. Dark, bright, chocolaty, transparent, muddy, wooly, glassy, buttery, and metallic are just a few of those adjectives.

Aims

The aims of this study are 1) to establish an inventory of adjectives used by guitarists to describe timbre; 2) to investigate the correlations between plucking techniques, acoustic signal characteristics and perceptual dimensions of the timbre space; 3) to identify the acoustical basis to some perceptual analogies between guitar and vocal sounds.

Method

We asked 22 guitarists to define in writing 10 adjectives they commonly use to describe timbre. We also asked them to describe the gesture associated with each adjective and to provide synonyms and antonyms.

Results

In an attempt to establish a rough map for the mental representation of timbre of this group of guitarists, we have organized the adjectives into clusters, where each cluster regroups synonyms of a given adjective. On the map we obtained, the adjectives seem to organize themselves along a main axis, from bottom left to top right. This axis roughly corresponds to plucking position, from the middle of the string up to the bridge.

Conclusions

Among the adjectives that we collected, we noticed that an interesting set seem to refer to phonetic gestures. In fact, although the acoustical systems of the guitar and of the voice mechanism are structurally different, we have found that guitar tones and a particular set of vowels display similar formant regions. Deriving timbre dimensions from phonetics by applying some distinctive features of speech sounds to guitar sounds, we were able to clarify the vocabulary used by guitarists to describe timbre.

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A constraint-based approach to grouping in language and music

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Background in music psychology and music computation

In Lerdahl and Jackendoff's Generative Theory of Tonal Music (1983), the authors try to formalize cognitive processes seen in music, referring to Chomskian (generative) linguistics. Among other processes found in musical cognition (such as harmonic tension and detecting rhythmic patterns), they describe the process of grouping single pitch-events into larger scale units. Lerdahl and Jackendoff propose a rule-based system involving two kinds of rules: well-formedness rules and preference rules. Temperley (2001) already developed a rule-based computational model of rhythmic pattern recognition which was partly based on Lerdahl and Jackendoff's theory.

Background in linguistics

A recently developed, but already quite influential theory in several subdomains of linguistics is Optimality Theory (Prince and Smolensky (1997)). A distinguishing property of Optimality Theory, which follows from its roots in neural network modeling, is its use of violable constraints instead of inviolable rules. The interaction among these violable constraints can be characterized formally, which allows for the computational modeling of linguistic processes in a straightforward manner. The resulting system is able to deal with preferences but at the same time yields very precize predictions with respect to possible and impossible linguistic structures and meanings.

Aims

We aim to develop a cognitively motivated musical parser that is based on constraint optimization in linguistics for grouping pitch-events into larger-scale units.

Methods

Computational modeling
The rules proposed by Lerdahl and Jackendoff governing the process of grouping in music are implemented in the logic programming language Prolog. Their interaction is modeled as OT constraint interaction.

Empirical evaluation of the computational model
In an experiment involving ten subjects the preference rules were evaluated. Using different techniques, the results for both individual subjects and for the group of subjects were compared with each other and with the results of the computational model (parser).

Results

The rules proposed by Lerdahl and Jackendoff could be implemented without difficulties and resulted in a comprehensive and working OT based model. In contrast to Lerdahl and Jackendoff's theory, our computational model is also able to account for the interaction

among the preference rules. Our model determines an optimal grouping structure for every given sequence of pitch-events. Although there was some variation among the subjects involved in the experiment, the model's output was comparable to the results of the subjects.

Conclusions

From a comparison of the results of our musical parser with the results of a number of experimental subjects, we conclude that language and music seem to make use of similar mechanisms for the grouping of auditory events. These mechanisms include the generation of possible grouping structures and the evaluation of these structures against a set of violable constraints. The optimal musical group is the one that optimally satisfies the total set of constraints on musical grouping.

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Intonation accuracy when singing in ensemble

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Background in psychology

In musical performance it is common that players and singers deviate significantly from any of theoretical scale models. Ternström & Sundberg (1988) studied performance, by six choir singers, of a cadence consisting of eight tones. The average standard deviation of performed intervals in their study was 13 cents as compared to the equally tempered scale, and deviations of the individual intervals may have reached as much as plus or minus 45 cents.

Background in music performance

In ensemble singing, a performer is frequently unable fully to rely on the pitch of tones performed by her/his partners because it is unclear to what extent the partners are able to maintain position of the overall scale pattern on the pitch axis. A singer has to make permanent choices between two alternatives: either to give priority to the purity of harmonic intervals between her/his own voice and the partner voices, providing that the partners are able to control the position of scale on the pitch axis, or to ignore the quality of harmonic intervals and/or chords and rather to consider the correspondence of produced tones to her/his personal inner scale etalon as the most important task. Such decisions need to be made very fast during the actual performance. Many of the techniques commonly used for the teaching of singing, however, have never been systematically investigated (Phillips 1992).

Aims

We have studied strategies of how a singer adjusts the sizes of harmonic intervals to another voice in ensemble performance.

Method

The subjects were seven voice students from the Estonian Academy of Music. A simple two-voice vocal exercise was used as the material. Each subject had to perform the upper voice. The lower voice was synthesized in a computer. Performances of the subjects were digitally recorded. The upper voice of the exercise consisted of ascending minor seconds and pure fifths. The lower voice consisted of ascending pure fourths and major thirds. There were five different modifications of the lower voice. Each one started on a slightly different pitch. The first modification of the lower voice corresponded to the equally tempered scale. In the second and the third modification, the fourth and third intervals were intoned 20 and 40 cents narrower, respectively, and in the fourth and fifth modification, 20 and 40 cents wider as compared to the equally tempered scale. In addition, the sound pressure level of the synthesized lower voice was varied. The subjects were instructed to perform as close as possible to a real concert situation. The recorded performances were analyzed using the Praat 4.1 software.

Results

The singers adjust to the partner's intonation only when the synthesized voice performed lower than the equally tempered etalon ($p < 0.05$). When the accompaniment voice performs higher than the equally tempered etalon, then the singers tended to overcompensate this to the opposite direction ($p < 0.001$).

Conclusion

The intonation behavior of singers in ensemble performance is remarkably asymmetrical. Singers adapt their intonation to the partner voice only when the latter is getting lower.

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Development of expressive timing in student clarinet performances

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Background in music performance pedagogy

Research concerning instrumental teaching has gained momentum in recent years, but most studies have generally focussed on the learning experience of students or on teacher behaviour and teacher/student interaction within instrumental lessons (see e.g. Siebenaler, 1997, Burwell, Young & Pickup, 2003). Whilst graded instrumental examinations provide opportunities to compare and assess student performances at the end of the learning process, such systematic assessment is not usually engaged in at the early stages of learning a new work. As such there is little understanding of the factors which affect a student's developing performance.

Background in music psychology

Many studies have sought to investigate moment-to-moment fluctuations of tempo in performance (see e.g., Palmer, 1997; Gabrielsson, 1999). Most of these studies have focused on adult expert performers, and often assume that changes in instantaneous tempo are 'expressive' rather than due to technical errors or difficulties (although see Juslin, Friberg and Bresin, 2002). Student performances are expressively timed, but with lesser magnitude than experts (Palmer, 1989). There is little known, however, about the short-term development of expressive timing.

Aims

To better understand the different factors which impinge upon measured tempo in student performances, especially in relation to more or less overt attention to musical structure on the part of the teacher.

Method

16 intermediate standard clarinet students played the opening of a piece at the beginnings and ends of 3 consecutive lessons with 4 different teachers. The teachers either taught in their normal style (2 students) or as directed by the first author, who asked the teachers to pay particular attention to musical structure (2 students). Performances were audio recorded and (1) analysed to extract onset times and intensity and (2) rated by three independent judges.

Results

(1) Direct measurements of timing and intensity did not suggest identical phrasal boundaries but judges' perceptions of phrasing corresponded with that suggested by intensity profiles; (2) the minimisation of extreme tempo fluctuations in later performances corresponded with the overall increase in judges' ratings; (3) timing and intensity profiles did not differ between groups but judges displayed a strong preference for control performances; (4) the analytical group made greater improvements over the course of lessons than the control group.

Conclusion

It is difficult to disambiguate 'expressive' and 'accidental' timing features in student performances without recourse to additional observational data. Measuring performances provides insights into how young musicians develop expressive means, but this must be supplemented by other forms of inquiry.

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Toward a cognitive analysis of musical creativity: Improvisation in jazz

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Background in psychology

Researchers investigating the cognitive processes underlying creativity have studied many different domains. The phenomenon of improvisation in jazz occurs in "real time" and is therefore one of the most demanding uses of creative thinking. Background in music theory. In a groundbreaking study of the improvisations of alto saxophonist Charlie Parker, Thomas Owens transcribed and analyzed many of Parker's recorded solos, finding repeated patterns of notes, or formulas.

Aims

Our main hypothesis, based on Owens, is that Parker was a formulaic improviser. Second, we hypothesize that those formulas are used in ways that are analogous to words and phrases in language.

Method

We used the Statistical Package for the Social Sciences program (SPSS) to search for formulas in a number of solos by Parker, Young, and Pastorius on a single tune: Donna Lee (and Indiana, on which Donna Lee is based). We also used programs to investigate relationships among the patterns within solos and to represent those relationships graphically.

Results

In Parker's six solos, almost 3400 formulas of various lengths were found, with more than 450 five-note formulas and almost 200 eleven-note formulas. Almost 90% of the 400 notes in Parker's solos, on average, were included in the five-note formulas, indicating that formulas played a major role in his improvisations. We also examined the changes in formulas over time.

Conclusions

We present a method that can be used to analyze the structure of the creative process in jazz. Our data support Owens's conclusion that Parker was a formulaic improviser. While formulas play an important role in the solos of Young and Pastorius, they are less pervasive and shorter in length than in Parker's solos. Our study also demonstrates systematic changes over time in players' repertoires of formulas. The results provide strong support for the notion that the search for structure in improvisations is well-directed, and that viewing improvisation as analogous to production of speech is a useful way of viewing the creative process in jazz.
Furthermore, to the degree that there is structure to the creative process in other domains, the present methods may be widely useful in understanding creative thinking.

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VOXed: Technology as a meaningful teaching aid in the singing studio

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Background in vocal pedagogy

The standard pedagogical model employed in the conservatoire studio typically involves weekly/twice weekly lessons with an expert, supported by private practice and performance. The teacher is engaged in a psychological translation of the student's performance, for example by turning musical gestures into language, and the student is engaged in a further translation of the teacher's verbal and visual feedback into adapted singing performance. A dual possibility thereby exists for the misinterpretation of information. Anything that can provide more robust and easily understandable feedback to both teacher and student would seem to be worthwhile, and this forms the basic premise behind this work.

Background in acoustic analysis

The displays implemented include: acoustic pressure waveform, fundamental frequency, spectrogram, spectrum, spectral ratio, vocal tract area, and minimum, mean or maximum vocal tract area against time.

Aim

This paper describes an ongoing AHRB-funded research project to evaluate the usefulness or otherwise of real-time visual feedback technology in the singing studio. The primary purpose of the work is not to optimise the technology itself for this application, but to work alongside teachers and students using an action research methodology to study the impact of real-time visual feedback on the students' learning experience.

Method

Previous work has suggested that simple displays of a small number of analysis parameters are generally the most effective when learning performance skills and the displays employed have been implemented along these lines. In particular, the system makes available analyses of individual parameters plotted against time that can be used singly or in any combination, depending on the specific vocal activity being supported. Specific areas of concern include:

- the extent to which the technology will be accepted in the studio
- the ease-of-use of the technology, both in the studio and elsewhere for private practice
- the nature of the data offered by the technology
- how the data can be integrated into singing teaching and learning
- the readiness with which the data can be interpreted and utilised
- whether the technology overly intrudes into the learning and teaching experience
- any potential perceived threat posed to the users by the use of technology

Conclusion

The paper will discuss the design, implementation and application of the technology as well as the positive impact it has had on the teaching and learning process. Screenshot examples will be provided to illustrate how it has been used to support specific activities in the singing studio.

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Visualization of musical structure

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Background in musicology

The internal structure of musical works and relations to its context belong to the major subjects of musicological efforts, be they paper based or computer aided. Currently those structures are either described textually or by diagrams that are mostly produced ad hoc by musicologists. Existing music visualizations by software are either quite simple, e.g. the part-track views in sequencer software, or very specific, e.g. similarity matrices (Foote and Cooper 2001).

Background in cognitive science and computing

Concepts maps or knowledge maps are tools to support the cognitive representation of complex domain knowledge. They use graphs with nodes representing concepts or objects and edges representing relations or actions. Concept and knowledge maps have shown to improve learning compared to using text (O'Donnell et al. 2002, Jonassen 1992). Musical information has a very rich multi-dimensional structure, for which such mapping techniques are well suited. Mapping techniques, especially mind maps, are popular as software tools, but they have hardly been applied to music.

Aims

We explore the potential of concept maps to musical information, in particular to internal and external musical structures and relations. The questions are whether and how the techniques of concepts maps are applicable to music, how maps can be generated automatically, and used beneficially for interaction and navigation. Concept maps needs to be extended to support focusing on certain parts of the map or certain types of objects or relations.

Main contribution

The application of concept maps to music shows, that graph visualization of musical structures and relations is appropriate for creating and using musical knowledge. The relation of music within itself and to its context can be represented naturally as graphs, representing musical objects or general information and their relations, which can be of various types with various attributes. It allows to represent network-structured information, e.g. analytical relations of musical parts, in an extensible and easily accessible way. What needs further work is reflection of temporal and hierarchical structures in the visualization layout. Suitable techniques are currently being developed in a module for network graph visualization as a part of the MUSITECH (http://musitech.fmt.uos.de) project at the university of Osnabrück.

Implications

Networked graph visualizations like concept maps are an appropriate tool for the creation, navigation and editing of musical information. Thus it is desirable to have more elaborated layout, display and navigation techniques that are adapted to the special temporal and hierarchical aspects of music.

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