

# Table of Contents

## I-Mathematical Modeling and Computation in Music

### Invited Lectures

Rhythm and Transforms, Perception and Mathematics . . . . .	1
<i>William A. Sethares</i>	

Visible Humour – Seeing P.D.Q. Bach’s Musical Humour Devices in <i>The Short-Tempered Clavier</i> on the Spiral Array Space . . . . .	11
<i>Elaine Chew and Alexandre François</i>	

### Metalanguage and Representation

Category-Theoretic Consequences of Denotators as a Universal Data Format . . . . .	19
<i>G�rard Milmeister</i>	

Normal Form, Successive Interval Arrays, Transformations and Set Classes: A Re-evaluation and Reintegration . . . . .	25
<i>Ciro Scotto</i>	

### Melodic, Motivic and Metric Levels of Description

A Model of Musical Motifs . . . . .	52
<i>Torsten Anders</i>	

Melodic Clustering within Motivic Spaces: Visualization in <i>OpenMusic</i> and Application to Schumann’s <i>Tr�umerei</i> . . . . .	59
<i>Chantal Buteau and John Vipperman</i>	

Topological Features of the Two-Voice Inventions . . . . .	67
<i>Kamil Adilođlu and Klaus Obermayer</i>	

Comparing Computational Approaches to Rhythmic and Melodic Similarity in Folksong Research . . . . .	78
<i>Anja Volk, J�rg Garbers, Peter van Kranenburg, Frans Wiering, Louis Grijp, and Remco C. Veltkamp</i>	

### Harmonic Levels of Description

Automatic Modulation Finding Using Convex Sets of Notes . . . . .	88
<i>Aline Honingh</i>	

On Pitch and Chord Stability in Folk Song Variation Retrieval . . . . .	97
<i>Jörg Garbers, Anja Volk, Peter van Kranenburg, Frans Wiering, Louis Grijp, and Remco C. Veltkamp</i>	
Bayesian Model Selection for Harmonic Labelling . . . . .	107
<i>Christophe Rhodes, David Lewis, and Daniel Müllensiefen</i>	
The Flow of Harmony as a Dynamical System . . . . .	117
<i>Peter Giesl</i>	
Tonal Implications of Harmonic and Melodic $T_n$ -Types . . . . .	124
<i>Richard Parncutt</i>	
<b>Computational Models in Music Psychology</b>	
Calculating Tonal Fusion by the Generalized Coincidence Function . . . . .	140
<i>Martin Ebeling</i>	
Predicting Music Therapy Clients' Type of Mental Disorder Using Computational Feature Extraction and Statistical Modelling Techniques . . . . .	156
<i>Geoff Luck, Olivier Lartillot, Jaakko Erkkilä, Petri Toiviainen, and Kari Riikkilä</i>	
Nonlinear Dynamics, the Missing Fundamental, and Harmony . . . . .	168
<i>Julyan H.E. Cartwright, Diego L. González, and Oreste Piro</i>	
<b>Computational Models for Musical Instruments</b>	
Dynamic Excitation Impulse Modification as a Foundation of a Synthesis and Analysis System for Wind Instrument Sounds . . . . .	189
<i>Michael Oehler and Christoph Reuter</i>	
Non-linear Circles and the Triple Harp: Creating a Microtonal Harp . . . . .	198
<i>Eleri Angharad Pound</i>	
<b>Comparative Computational Analysis</b>	
Applying Inner Metric Analysis to 20th Century Compositions . . . . .	204
<i>Anja Volk</i>	
Tracking Features with Comparison Sets in Scriabin's Study op. 65/3 . . . . .	211
<i>Atte Tenkanen</i>	
Computer Aided Analysis of Xenakis-Keren . . . . .	220
<i>Kamil Adiloğlu and G. Ada Tanir</i>	

- Automated Extraction of Motivic Patterns and Application to the  
Analysis of Debussy's *Syrinx* ..... 230  
*Olivier Lartillot*
- Pitch Symmetry and Invariants in Webern's *Sehr Schnell* from  
*Variations Op.27* ..... 240  
*Elaine Chew*
- Computational Analysis Workshop: Comparing Four Approaches to  
Melodic Analysis ..... 247  
*Chantal Buteau, Kamil Adiloğlu, Olivier Lartillot, and  
Christina Anagnostopoulou*

## Posters

- Computer-Aided Investigation of Chord Vocabularies: Statistical  
Fingerprints of Mozart and Schubert ..... 250  
*Eva Ferková, Milan Zdímal, and Peter Sidlík*
- The Irrelative System in Tonal Harmony ..... 257  
*Miroslaw Majchrzak*

## II-Mathematical Approaches to Music Analysis and Composition

### Invited Lectures

- Mathematics and the Twelve-Tone System: Past, Present, and  
Future ..... 266  
*Robert Morris*
- Approaching Musical Actions ..... 289  
*John Rahn*
- A Transformational Space for Elliott Carter's Recent  
Complement-Union Music ..... 303  
*John Roeder*

### Mathematical Approaches to Composition

- Networks ..... 311  
*Tom Johnson*
- From *Mathematica* to Live Performance: Mapping Simple Programs to  
Music ..... 318  
*Katarina Miljkovic*
- Nonlinear Dynamics of Networks: Applications to Mathematical Music  
Theory ..... 330  
*Jonathan Owen Clark*

## Mathematical Approaches to Musical Analysis and Performance

Form, Transformation and Climax in Ruth Crawford Seeger's String Quartet, Mvmt. 3 ..... 340  
*Edward Gollin*

A Local Maximum Phrase Detection Method for Analyzing Phrasing Strategies in Expressive Performances ..... 347  
*Eric Cheng and Elaine Chew*

## Klumpenhouwer-Networks

Subgroup Relations among Pitch-Class Sets within Tetrachordal K-Families ..... 354  
*Jerry G. Ianni and Lawrence B. Shuster*

K-Net Recursion in Perlean Hierarchical Structure ..... 365  
*Gretchen C. Foley*

Webern's Twelve-Tone Rows through the Medium of Klumpenhouwer Networks ..... 375  
*Catherine Nolan*

Isographies of Pitch-Class Sets and Set Classes ..... 386  
*Tuukka Ilomäki*

## Leonard Euler at the Crossroads of Music Theory

The Transmission of Pythagorean Arithmetic in the Context of the Ancient Musical Tradition from the Greek to the Latin Orbits During the Renaissance: A Computational Approach of Identifying and Analyzing the Formation of Scales in the *De Harmonia Musicorum Instrumentorum Opus* (Milan, 1518) of Franchino Gaffurio (1451–1522) ..... 392  
*Herbert Kreyszig and Walter Kreyszig*

Combinatorial and Transformational Aspects of Euler's *Speculum Musicum* ..... 406  
*Edward Gollin*

## Posters

*Structures Ia Pour Deux Pianos* by Boulez: Towards Creative Analysis Using OpenMusic and Rubato ..... 412  
*Yun-Kang Ahn, Carlos Agon, and Moreno Andreatta*

The Sieves of Iannis Xenakis . . . . .	419
<i>Dimitris Exarchos</i>	
Tonal, Atonal and Microtonal Pitch-Class Categories . . . . .	430
<i>Fernando Gualda</i>	
Using <i>Mathematica</i> to Compose Music and Analyze Music with Information Theory . . . . .	441
<i>Christopher W. Kulp and Dirk Schlingmann</i>	

### III-Mathematical Approaches to Music Theory

#### Invited Lectures

A Diatonic Chord with Unusual Voice-Leading Capabilities . . . . .	449
<i>Norman Carey</i>	
Mathematical and Musical Properties of Pairwise Well-Formed Scales . . .	464
<i>David Clampitt</i>	
Eine Kleine Fourier Musik . . . . .	469
<i>Emmanuel Amiot</i>	

#### Towards New Music-Theoretical Concepts

WF Scales, ME Sets, and Christoffel Words . . . . .	477
<i>Manuel Domínguez, David Clampitt, and Thomas Noll</i>	
Interval Preservation in Group- and Graph- Theoretical Music Theories: A Comparative Study . . . . .	489
<i>Robert Peck</i>	
Pseudo-diatonic Scales . . . . .	493
<i>Franck Jedrzejewski</i>	

#### Dasian, Diatonic and Dodecaphonic Set Theory

Affinity Spaces and Their Host Set Classes . . . . .	499
<i>José Oliveira Martins</i>	
The Step-Class Automorphism Group in Tonal Analysis . . . . .	512
<i>Jason Yust</i>	
A Linear Algebraic Approach to Pitch-Class Set Genera . . . . .	521
<i>Atte Tenkanen</i>	
Author Index . . . . .	531
Index . . . . .	533