About This Issue

As sometimes happens, the compound theme announced on the cover of this issue of *Computer Music Journal* actually comprises two unrelated topics. In the present case, one involves technical research, and the other, music-making. "Pattern discovery" relates in a loose sense to all this issue's technical articles, and in a strict sense to the one titled "Feature Set Patterns in Music." The other topic, "the laptop orchestra," is the subject of the opening pair of articles, from Princeton University.

The Princeton Laptop Orchestra (PLOrk) represents a fairly new type of performing ensemble. Directed sometimes by a conductor, its 15 members operate networked laptop computers, either with the usual keyboard-and-mouse interface or via other controllers and sensors. Each of these computers is connected to its own audio equipment rack and its own onstage loudspeaker enclosure, housing six individually addressable speakers that emit sound in six different directions. The intent is to imbue electroacoustic music with a spatial and sonic presence analogous to that of a conventional orchestra, while exploring the musical opportunities afforded by a relatively large number of networked performers. The first article documents 18 pieces that composers have conceived for this ensemble. The compositions embody various approaches to spatialization, sound design, control, networking, conducting, and game play. The second article explains how the authors teach students concepts and techniques for performing in PLOrk and composing for it. There are no technical prerequisites, but students learn a textual music-programming language (ChucK) as well as a graphical one (Max/MSP). The authors describe their pedagogical approach as informal, improvisational, and interdisciplinary; students acquire technical and artistic knowledge "along the way" toward the goal of making compelling music together.

The next three articles in this issue consist of revised and extended versions of papers first presented at the International Workshop on Artificial Intelligence and Music (Music-AI 2007), held in Hyderabad, India, in conjunction with the 20th International Joint Conference on Artificial Intelligence. We are indebted to the organizers, especially Rafael Ramirez, for providing us with the workshop referees' evaluations of many of the original paper submissions and for discussing with us the most highly rated papers, from which *Computer Music Journal* selected a subset. Our thanks also go to the referees themselves, who kindly agreed to re-evaluate the manuscripts after they had been revised for the *Journal.* (More generally, anonymous peer review serves as a *sine qua non* for the *Journal*. The referees, who are specially selected for each article on the basis of their particular expertise, receive no compensation or other recognition. We honor them all for their dedication to the advancement of the field.)

The first of the Music-AI 2007 articles, "A Genetic Rule-Based Model of Expressive Performance for Jazz Saxophone," employs techniques from evolutionary computation, a subfield of AI. Previous studies of expressive performance have usually been empirical, based on human-created models of expression. By contrast, the present authors' software automatically constructs such models—in this case, sets of "rules" describing how jazz musicians inflect timing and dynamics in melodies. It does so by applying an evolutionary algorithm to a symbolic representation of a set of performances. (In this study, a professional saxophonist played four jazz standards, each at eleven different tempi.) The authors describe how they first extract musical information from the audio recording, using spectral analysis, fundamental frequency estimation, segmentation into notes, envelope approximation, brightness measurement, and so on. The note-level measurements are supplemented by a higher-level musical analysis that is largely based on Eugene Narmour's implication/realization model of melodic expectation. Finally, a genetic sequential covering algorithm operates on the training data and learns new rules, each predicting how a human saxophonist might expressively deviate from the values specified by the musical score. Such rules could, of course, be applied when synthesizing music.

The next article, by Christopher Raphael, tackles the problem of how to separate a monaural audio recording of a concerto into two tracks: one capturing the soloist, and the other, the orchestra. Practical applications include creating an accompaniment track that a soloist can use for practice, à la Music Minus One. This

Front cover. The Princeton Laptop Orchestra in concert. (Photographer: Lorene Lavora; image processing: *Computer Music Journal.*)

Back cover. Two illustrations from the article "Feature Set Patterns in Music."

research assumes access to the information contained in the corresponding musical score. Machine-learning techniques are employed to train the system on preclassified data, where the classes are "soloist" or "accompaniment." The system performs short-time Fourier transforms (STFTs) on the input audio. Each point in the resulting time-versus-frequency space is attributed to either the soloist or the accompaniment, using knowledge of the timings and pitches in the score. The inverse STFT is then applied to the appropriate subset of time-frequency points to generate either the "desoloed" audio or the solo performance alone.

The Best Paper award of the Music-AI 2007 workshop went to Mathieu Bergeron and Darrell Conklin for their paper "Representation and Discovery of Feature Set Patterns in Music." The authors substantially revised that paper for publication in this issue, expanding it to include, among other things, a description of a fast heuristic algorithm. Pattern discovery in music denotes the detection of repeated or similar structures (such as melodic patterns), which among other uses may inform music-theoretical analysis, information retrieval, and style emulation. Conventional approaches to musical pattern discovery constrain a pattern to a sequence of values of a single musical feature (such as pitch, duration, or interval) or of a fixed combination of features (such as interval paired with duration). But some undeniably similar musical passages resist being detected by these comparatively simplistic techniques. By contrast, the present authors' more flexible approach can characterize some parts of a pattern according to certain features whereas other parts of the same pattern are described by completely different features. Within a pattern, not only the features but also their number may vary. Furthermore, the authors provide a way to explore the search space in a general-to-specific manner, finding patterns that are sufficiently distinctive (i.e., specific) but not too infrequent. The authors illustrate their method using melodies composed by the prolific French songwriter Georges Brassens.

The Conklin and Bergeron article can be considered an exemplar of symbolic music information retrieval (MIR), operating as it does on music represented as a collection of notes. The other main branch of MIR, which operates on audio, is exemplified by the final article in this issue, concerning beat detection. (Unlike the preceding three articles, this one did not stem from a Music-AI 2007 paper.)

Jia Zhu and Ye Wang investigate whether it is possible to extract the tempo of a popular-music recording in the MP3 audio format, without first converting the data to decompressed audio samples. Their motivation is to run the beat-detection algorithm on mobile devices that have limited processing power, memory, and battery life. The authors have implemented a system comprising three different beat detectors, of progressively greater complexity, to adjust as needed to the resource constraints. These three respectively operate on the "compressed domain," which refers to the demultiplexed MP3 bitstream prior to the actual decoding; the "transform domain," which refers to data at an intermediate stage in the MP3 decoder; and the "PCM domain," which refers to the fully decoded audio samples. As might be expected, the first of these detectors is very fast, and the last is the most accurate. The authors find that the transform-domain detector provides a good trade-off for mobile devices.

Computer Music Journal

Volume 32, Number 1 Spring 2008

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Announcements

Journées d'Informatique Musicale 2008

The 2008 Journées d'Informatique Musicale (Computer Music Days) will take place in Albi, France, 27–29 March 2008. The themes for the meeting are Interfaces for the Creation of Sound and Music, and Spaces and Sound Spatialization. Topic areas include tools for musical analysis, formalization and representation of musical structures, automatic composition, modeling and simulation of sound and perception, and research center reports.

Web: gmea.net/jim08/index.php/

SEAMUS at Salt Lake

The 2008 National Conference of the Society for Electroacoustic Music in the United States (SEAMUS) will be held in Salt Lake City 3–5 April 2008. This year's conference is dedicated to Vladimir Ussachevsky, who was in residence at the University of Utah from 1970 to 1990, and will highlight his piece *Colloquy* for orchestra and tape, premiered by the Utah Symphony in 1976.

Web: seamus2008.music.utah.edu

Electroacoustic Music Studies Network in Paris

The annual Electroacoustic Music Studies (EMS) Network International Conference of 2008 will take place in Paris 3–6 June 2008. The theme for the event is "*Musique concrète*—60 years later" with reference to the pioneering work of Pierre Schaeffer and others, many of whom worked in the same city where the conference will take place. The focus will be on the relationship between sound and music, so topics will include strategies for creating new sounds, the influence of tools on music, how sounds contribute to building musical structures, and the recurring EMS theme of terminology in the field. The increasingly active EMS Asian Network (EMSAN) track will also be featured throughout the conference in presentations and performance. Prior to the meeting, there will be a special study session on the sociopolitical implications of electroacoustic music, Composing Today.

Web: www.ems-network.org

Sonic Interaction Design

A workshop entitled Sonic Interaction Design: Sound, Interaction, and Experience will be held in Florence, Italy, on 6 April 2008 during the annual Computer/Human Interaction (CHI) conference. The goal of the workshop is to "gather research and creation efforts in sound technology, design, art, music, and psychology into a coherent body of knowledge capable of assisting the design of the sonic appearance of future environments, events and artifacts." The workshop is organized as part of a European Cooperation in the field of Scientific and Technical Research (COST) action which created four Sound Interaction Design working groups: (1) Perceptual, cognitive, and emotional studies of sonic interactions, (2) Product sound design, (3) Interactive art and music, and (4) Sonification.

Web: www.cost-sid.org/wiki/CHIworkshop

Electroacoustic Music in Santa Fe

The Contemporary Music Program of the College of Santa Fe has scheduled the twelfth annual International Festival of Electroacoustic Music in Santa Fe, New Mexico, 3–6 March 2008. This year featured guests are to include Gordon Mumma as the Composer in Residence, Ulrike Brand as a performer, and Olivia Block as both a composer and performer.

Web: sfifem.csf.edu/SFIFEM_about.html

Algorithmic Music at UCSC

The sixth Workshop in Algorithmic Computer Music (WACM) is scheduled for 3–6 March 2008 at the University of California, Santa Cruz. Participants will work with an instruction team lead by David Cope, and study basic techniques of algorithmic composition and analysis using the LISP programming language. Software will be developed for a Markov-based rules program, a genetic algorithm, and a project modeled on the Experiments in Musical Intelligence program.

Web: sfifem.csf.edu/SFIFEM_about.html

Interactive Music in Bergen

The second Bergen Interactive Music Conference (BIMUC 08) is scheduled to take place 28–30 April 2008 in Bergen, Norway. The focus is on challenges for music education in schools, universities, communities, and art institutions in bringing new approaches to music in learning and creative and artistic development to young people.

Web: www.bimuc.no

News

Brazil Symposium

The eleventh Brazilian Symposium on Computer Music was convened in São Paulo 1–3 September 2007. The Brazilian Symposia are organized by the Computer Music branch of the Brazilian Computing Society, and is hosted by the University of São Paulo. The Symposium consists of technical and music paper sessions, discussion panels, and concerts. Roger Dannenberg delivered the keynote, and Mikhail Malt delivered an invited address for the Symposium.

Web: gsd.ime.usp.br/sbcm/2007/english/index.html

Musical Acoustics in Barcelona

The 2007 International Symposium on Musical Acoustics took place in Barcelona 9–12 September 2007. Single-track sessions focused on specific classes of instruments, the singing voice, electronic musical instruments, and perception, and one afternoon was entirely devoted to physical modeling. The conference coincided with the opening of the new Barcelona Museum of Music.

Web: isma2007bcn.org

Musical Semantics in Genova

The second international conference on Semantics and Digital Media Technology (SAMT) was held in Genova, Italy, on 5 December 2007. The workshop brings together researchers interested in understanding the mapping between low-level audio features and contextual interpretations of music. The focus was on models of musical perception, methods for the extraction, analysis, and representation of linguistic descriptions of music. On the other side of the semantic gap, low-level audio features and analysis of music structure were also discussed.

Web: irgroup.cs.uni-magdeburg.de/lsas2007

Ars Electronica 2007: Goodbye Privacy

The 2007 Ars Electronica festival, Goodbye Privacy, took place during September in Linz, Austria. Ars Electronica attracted over 30,000 visitors this year for a rich variety of seminars and presentations in addition to media art exhibitions in the form of performances, installations, and networked and participatory events. Computational and innovative means of generating and using sound play a significant role in many of the media works presented at Ars Electronica (see Figure 1).

Web: www.aec.at

Music Communication Science

The inaugural International Conference on Music Communication Science (ICOMCS) was held 5–7 December 2007 in Sydney, Australia. The objective of ICOMCS is to develop an interdisciplinary understanding or application of music cognition, perception, and performance. A broad range of session topics was covered including the psychology of performance, phrase structure reconstruction from performance data, data sonification, bio-signal interfaces, measuring audience reactions, and rhythmic pattern learning.

Web: marcs.uws.edu.au/links/ICoMusic/program.html

Music and the Brain

The Music, Brain, and Cognition Workshop took place 7–8 December 2007 in Whistler, Canada, as part of the Neural and Information Processing Systems Conference (NIPS). The conference recognizes music as "organized sound" and spans topics from signal processing and musical structure to the cognition of music and sound. The conference supports interaction between the machine learning and the neuroscience/brain imaging communities with the goal of fostering breakthroughs in various areas of music technology such as music information retrieval, expressive music synthesis, interactive music making, and sound design.

Web: homepage.mac.com/davidrh/MBCworkshop07/Workshop.html

Score Space in Norway

Yolande Harris hosted a workshop on Score Spaces 19–24 November 2007 in Maastricht. Score Space explores a spatial approach to musical composition in an electronically extended environment. It focuses investigation and experimentation on issues such as how an expanded notion of musical score can support new practices of electronic instrumental music and media art, and how the score can be used to incorporate motion, location, and environmental data into interaction with sound. Guest speakers for the workshop included Jacob Kirkegaard and Hilary Jeffery.

Web: introinsitu.nl/workshop

Figure 1. Siren, *Ray Lee at Ars Electronica.* Siren *is a whirling, spinning spectacle of mechanical movement, electronic sound, and light.* Source: rubra.

The Brussels-Paris-Geneva Spectrum

The second edition of the International Edition of Spectral Music, Spectrum XXI (II), took place 29 October–7 November 2007 across venues in Brussels, Paris, and Geneva. Art Directors Ancu Dumitrescu and Ana Maria Avram organized a program that included concerts of acousmatic music, live electronic music and diffusion, and mixed performances with traditional instruments, as well as conference participation from musicologists.

Web: festivalspectrum21.tripod.com/spectrum.pdf

Mass Digitization

The British Library Center for Conservation hosted the British Library Sound Archive conference, "Unlocking Audio: Sharing Experience of Mass Digitisation" in London 26–27 October 2007. The conference explored the planning and strategies required for the successful execution of large-scale audio digitization projects and the technical and practical issues involved. The presentations are aimed at mass digitization practitioners for sharing of best practice and considering emerging standards.

Web: www.bl.uk/collections/sound-archive/unlockingaudio.html

Música Viva 2007 Competition Winners

Miso Music Portugal has announced the winner of the Eighth Electroacoustic Composition Competition, Musica Viva 2007. The two top prizes went to Pei-Yu Shi for *Fall, aus der Zeit . . . ,* and Arturo Fuentes for *Fosil KV.* Honorable mentions were awarded to Nicolas Bernier for *Liaisons Mécaniques,* and Georges Forget for *Orages d'aciers.* Fernando Mota's piece, *Manchetes,* was recognized as the Best Portuguese Piece. The international jurors for the competition were Francis Dhomont, Sabine Schäfer, Joachim Krebs, and Miguel Azguime.

Web: www.misomusic.com

Digital Arts Awards 2007

The Keio Research Institute in Japan presented the 2007 Digital Arts Awards for students working in the areas of Digital Cinema, Interactive Media, and Digital Music. In the Music category, the winner was the Gruppo Labun (Vincenzo D'Angelo, Stefano Fumagalli, and Alessandro Perini) from the Conservatorio di Musica di Como in Italy for their electroacoustic performance piece, *D-Homo.* Honorable Mentions were awarded to Soh Igarashi (Keio University, Japan) for *Convergence,* and to Juraj Kojs (University of Virginia, USA) for *In Secret.* The Digital Music jury was comprised of Toru Iwatake (Keio University), Masahiro Miwa (Institute of Advanced Media Arts and Sciences), and Jon Appleton (Dartmouth University, USA).

Web: daa.sfc.keio.ac.jp/2007/en/index.html

European New Music Promoters Awards

The European Conference of Promoters of New Music (ECPNM) has announced winners of its competition for the composition and interpretation of live-electronic music projects. The award was granted to the German duo Con:Fusion (Sascha and Marcia Lemke) for #*Un4scene*#.

Organizing partners of the award who will be programming the prize-winning piece during the coming year include the Estonian Academy of Music in Tallinn, Estonia; the European Live Electronic Center in Lüneburg and Hamburg, Germany; the Computer and Electronic Music (CEM) Studio in Rotterdam, The Netherlands; Aspekte in Salzburg, Austria; the Centri Musicali Attrezzati (CEMAT) in Rome, Italy; Portuguese Music Information Centre (Miso Music) in Rebelva, Portugal; and Gaudeamus in Amsterdam, The Netherlands.

Web: www.ecpnm.com/bull/ecpnmbull.htm

New Research Center in Manchester

The University of Manchester, England, has recently launched the NOVARS Research Center for Electro-acoustic Composition, Performance, and Sound Art. NOVARS is named in honor of the seminal work of the same name by composer Francis Dhomont. The new £2.2 million facility includes four new experimental music studios, a cluster room, and a concert hall constructed with state-of-the-art acoustic design and building materials. The Mantis Festival was the occasion for the launch which included a three-day series of events and music.

Web: www.novars.manchester.ac.uk