Proceedings of the Ninth International Conference on
New Interfaces for Musical Expression

Editors: Roger B. Dannenberg and Kristi D. Ries

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WELCOME TO NIME 2009

We are delighted to host the Ninth International Conference on *New Interfaces for Musical Expression* (NIME 2009) in Pittsburgh, Pennsylvania and, more specifically, at the School of Music at Carnegie Mellon University. The conference is a collaboration with the School of Music, The Carnegie Institute of Technology, the School of Computer Science, the School of Art, the Miller Gallery and the Entertainment Technology Center.

Carnegie Mellon University has a long and distinguished history as a leader in research and technology, but it has an equally distinguished history in the training of young artists. The College of Fine Arts comprises the Schools of Art, Architecture, Design, Drama and Music. Our alumni populate these professions at the highest levels of accomplishment and it is, we believe, the immersion of the strongest possible artistic programs in the midst of a great research university that keeps Carnegie Mellon at the forefront of innovation.

The School of Music normally enrolls 360 majors and minors and employs approximately 95 faculty members in programs including instrumental performance, vocal performance, keyboard and composition. In the fall of 2009, we will welcome the first incoming cohort to new undergraduate and graduate programs in Music and Technology. That program is a tri-college effort, involving faculty with the School of Music, the Department of Electrical and Computer Engineering and the School of Computer Science. It is a rigorous musical and scientific program that embodies the essence of the university in a new and compelling way, merging the most distinctive areas of study at Carnegie Mellon. It would seem that the welcoming of NIME 2009 to our campus is both timely and appropriate. It is our hope that the activities of the NIME 2009 conference will have a long and lasting influence on the creativity used to explore how technology can assist in the making of music in all its possibilities.

After many exciting and successful NIME conferences, we faced a challenge to put together a program of the highest quality. Fortunately, we received many excellent submissions, 209 overall, to NIME 2009. Scientific research submissions were accepted in four categories: long, short, poster, and demo, and we encouraged as well as invited a number of short and long paper presenters to also give demos. Because interfaces and interaction are so important to NIME, we feel that providing a forum for many live demonstrations is particularly important.

All submissions to NIME were reviewed by peers. Papers, posters, and demo submissions each received four reviews, for a total of 484 reviews by 97 reviewers. After manually creating and assigning categories to each paper, we asked reviewers to indicate their areas of expertise. We then used a greedy algorithm to search for an optimal match of reviewers to papers, and we picked the best assignments from tens of thousands of randomized runs. This process gave reviewers some input into the process without the need to search through scores of titles and abstracts for appropriate papers to review. We were quite pleased to receive a letter from a reviewer thanking us for the care with which we chose interesting papers for him to review.

We are very grateful for the enormous effort by all the reviewers. Not only was their input invaluable in creating the scientific program, their constructive comments also have been read and absorbed by the authors. This feedback had an obvious impact on the quality of the revised papers that you will find in these proceedings.

In addition to a single-track scientific program of 50 papers, NIME 2009 will include a special teleconferenced panel featuring Max Mathews, John Chowning and Roger Linn, moderated by Roger Dannenberg and David Wessel. Paul DeMarinis will deliver our keynote address on the topic of "Buried in Noise." There will be 23 demos and 15 posters. In all, there will be more than 90 presentations.

The submissions for performances and installations comprising the artistic portion of the conference totaled 83. Twenty-two performances are scheduled and five installations will be exhibited. There will be three evening concerts and one afternoon concert during the course of the conference, all taking place in the College of Fine Arts' historic Kresge Theater. The installations will take place in Carnegie Mellon's Regina Gouger Miller Gallery and will be available for viewing throughout the conference.

Six workshops will precede the conference on 3 June. The workshops include Sound Synthesis and Algorithmic Composition Using Nyquist and Audacity, Mapping Sensors to Pd via Firmata, Interactivity by Code: SuperCollider, Handmade Electronic Music—The Art of Hardware Hacking, Max MSP and Sensor interfacing with I-CubeX.

The planning, organization and presentation of a conference as diverse in activities as NIME is an enormous undertaking that requires the help and assistance of many people. Space prevents us from naming everyone involved, but there are groups that must be acknowledged. The Organizing Committee members are Roger Dannenberg, Tom Sullivan, Riccardo Schulz, Richard Stern, Golan Levin and Noel Zahler. They have contributed enormous time and effort in making this conference a reality. Members of our staff, Ross Garin, Sharon Guberman, Kristi Ries and Robert Skavronski have taken on the lion's share of the intricacies leading to the realization of this conference. Susan Tolmer has made sure that we can raise enough support from our community to produce this event. Our many partners in The College of Fine Arts and especially our Dean, Hilary Robinson, deserve many thanks, as does our Provost, Mark Kamlet. The Entertainment Technology Center, School of Computer Science, School of Art, the Regina Gouger Miller Gallery (Astria Suparak) and School of Music have been instrumental in making NIME 2009 a success. The NIME Steering Committee, in particular, Sidney Fels, has helped us at every turn of this complex undertaking. Lastly, but certainly not least, we need to thank all the many members of the different selection committees for the their knowledge, help and patience in the difficult task of selecting the programs that create this conference.

We hope you enjoy NIME 2009.

With all best wishes,

Noel Zahler, DMA
Professor and Head
School of Music
Carnegie Mellon University

Roger B. Dannenberg
Associate Research Professor of Computer Science and Art
School of Computer Science and School of Art
Carnegie Mellon University

NIME 2009 KEYNOTE

"Buried in Music"

Paul DeMarinis
Friday, June 5, 2009 11 am

Paul DeMarinis has been working as an electronic media artist since 1971 and has created numerous performance works, sound and computer installations and interactive electronic inventions.

He has performed internationally, at The Kitchen, Festival d'Automne a Paris, Het Apollohuis in Holland and at Ars Electronica in Linz and created music for Merce Cunningham Dance Co. His interactive audio artworks have been shown at the I.C.C. in Tokyo, Bravin Post Lee Gallery in New York and The Museum of Modern Art in San Francisco.

He has been an Artist-in-Residence at The Exploratorium and at Xerox PARC and has received major awards and fellowships in both Visual Arts and Music from The National Endowment for the Arts, N.Y.F.A., N.Y.S.C.A., the John Simon Guggenheim Foundation and the Rockefeller Foundation.

Much of his work involves speech processed and synthesized by computers, available on the Lovely Music Ltd. compact disc "Music as a Second Language ," and the Apollohuis CD "A Listener's Companion" Major installation works include "The Edison Effect" that uses optics and computers to make new sounds by scanning ancient phonograph records with lasers, "Gray Matter" that uses the interaction of body and electricity to make music, and "The Messenger" that examines the myths of electricity in communication.

Public artworks include large-scale interactive installations at Park Tower Hall in Tokyo, at the 1996 Olympics in Atlanta and Expo 1998 in Lisbon and an interactive audio environment at the Ft. Lauderdale International Airport in 2003.

NIME 2009 PANEL

An international teleconference with computer music pioneers
John Chowning, Roger Linn, and Max Mathews

John M. Chowning was born in Salem, New Jersey, in 1934. Following military service he studied music at Wittenberg University, where he concentrated on composition and received his degree in 1959. He then studied composition in Paris for three years with Nadia Boulanger. In 1966 he received the doctorate in composition from Stanford University, where he studied with Leland Smith. With the help of Max Mathews of Bell Telephone Laboratories and David Poole of Stanford, in 1964 he set up a computer music program using the computer system of Stanford's Artificial Intelligence Laboratory. This was the first implementation of an on-line computer music system ever.

Beginning in 1964 he began the research leading to the first generalized sound localization algorithm implemented in a quad format in 1966. In 1967, John Chowning discovered the frequency modulation (FM) algorithm in which both the carrier frequency and the modulating frequency are within the audio band. This breakthrough in the synthesis of timbres allowed a very simple yet elegant way of creating and controlling time-varying spectra. Over the next six years he worked toward turning this discovery into a system of musical importance. In 1973, he and Stanford University began a relationship with Yamaha in Japan, which led to the most successful synthesizer technology in the history of electronic musical instruments, known as "FM synthesis".

He has received fellowship grants from the National Endowment for the Arts and was artist-in-residence with the Kunstlerprogramm des Deutschen Akademischen Austauschdiensts for the City of Berlin in 1974, and guest artist in IRCAM, Paris in 1978, in 1981, and in 1985. His compositions have been recorded on compact disc, WERGO 2012-50. In 1983 he was honored for his contributions to the field of computer music at the International Computer Music Conference in Rochester, New York. He was elected to the American Academy of Arts and Sciences in 1988. In 1992 he was given The Osgood Hooker Professorship of Fine Arts by the School of Humanities and Sciences at Stanford. The French Ministry of Culture awarded him the Diplôme d'Officier de l'Ordre des Arts et Lettres in 1995 and he was given the Doctorat Honoris Causa December 2002 by the Université de la Méditerranée.

Chowning taught computer-sound synthesis and composition at Stanford University's Department of Music and was founder and director of the Center for Computer Research in Music and Acoustics (CCRMA), one of the leading centers for computer music and related research.

Roger Linn is a designer of electronic music products, best known for his invention of the LM-1 Drum Computer, the first programmable, sampled-sound drum machine in 1979. Manufactured by his company Linn Electronics, the LM-1 and its successors the LinnDrum and Linn9000 provided the drums for countless hit records during the 1980s by artists including Prince, Madonna, Michael Jackson, Tina Turner, Peter Gabriel, Elton John, Rod Stewart, Devo and Bruce Hornsby, and are considered a major influence on the music of the era.

In 1988, he designed the innovative MPC60 MIDI Production Center for the Japanese Akai Company, with his signature appearing on the product's front panel. Combining a sampling drum machine with a real-time MIDI sequencer, this product gradually became the industry standard in the production of hip-hop, rap, dance and related music styles throughout the 1990s, and has been credited as a significant influence in the evoluation of hip hop music. This was followed in 1994 with the enhanced MPC3000 and others, and the MPC product line is still successful 20 years later. In addition to these designs for Akai, he also helped designed products for a variety of companies during the 1990s, including the Japanese Roland company.

In 2002, he returned to manufacturing his own products—as well as his love of the guitar—with the release of a groundbreaking guitar effects product called AdrenaLinn. Used on hit recordings by artiss such as John Mayer, Green Day and Red Hot Chili Peppers, and winning numerous international music product awards, AdrenaLinn transforms a guitarist's tone by using variety of innovative rhythmic filtering methods, all in sync to an internal drumbeat. This was followed in 2003 by the enhanced AdrenaLinn II, the M-Audio Black Box (containing many AdrenaLinn features) in 2005, and the AdrenaLinn III in 2007.

Apart from his music product career, Roger is a guitarist and songwriter, having co-written hits for Eric Clapton ("Promises", 1979) and Mary Chapin Carpenter ("Quittin' Time", 1991), and having toured as a guitarist with the pianist and songwriter Leon Russell in 1976 at age 21. He and his wife Ingrid currently reside in the hills of Berkeley, California and he occasionally performs around the San Francisco bay area on guitar and mandolin. You can see him playing traditional Italian songs on mandolin at Berkeley's Caffe Trieste on the 1st Monday evening of each month from 7 to 9 p.m. He also hosts the Rog Mahal Concert Series at his home, providing an intimate venue for creative musicians of various styles of music.

Max V. Mathews was born in Columbus, Nebraska, on November 13, 1926. He studied electrical engineering at the California Institute of Technology and the Massachusetts Institute of Technology receiving a Sc.D. in 1954.

He worked in acoustic research at AT&T Bell Laboratories from 1955 to 1987 where he directed the Behavioral and Acoustic Research Center. This laboratory carried out research in speech communication, visual communication, human memory and learning, programmed instruction, analysis of subjective opinions, physical acoustics, and industrial robotics.

From 1974 to 1980, he was the Scientific Advisor to the Institute de Recherche et Coordination Acoustique/Musique (IRCAM), Paris, France. In 1987 Mathews joined the Stanford University Music Department in the Center for Computer Research in Music and Acoustics (CCRMA) as Professor of Music (Research) where he developed a new pickup for electronic violins and a real-time computer system for music performance called the Conductor and Improv Programs and a 3D MIDI Controller called the Radio Baton.

At Bell Labs in 1957, Mathews demonstrated synthesis of music on a digital computer with his Music I program. Music I was followed by Music II through Music V and GROOVE. All were involved in the composition and performance of music on and with computers. These programs have been influential in the development of computer music. For this pioneering work he has been called the "father of computer music," and most recently, "the great grandfather of techno!"

Mathews has conducted research on computer methods for speech processing, human speech production and auditory masking, and developed techniques for computer drawing of typography. He created the first computer singing, "Bicycle Built for Two," made famous by the Kubrick movie *2001* as the swan song of the dying computer. The developer of "Music V" synthesis software and "Groove," the first computer system for live performance, he is also the inventor of the Radio Baton, a computer-driven device that allows the user to conduct their own orchestral performances from MIDI files stored in the computer. This gives the user control over tempo, dynamics and balance among all the orchestral instruments. The commercial software product "Max" was based on Mathews' ideas for a flexible, user-patchable sound generating system.

Mathews is a member of the National Academy of Sciences, the National Academy of Engineering and is a fellow in the American Academy of Arts and Sciences, the Acoustical Society of America, the IEEE, and the Audio Engineering Society.

Among the more idiosyncratic forms of recognition he has received, Mathews' Electronic Violin was featured recently on the cover of Playboy magazine. He has won the IEEE Gold Medal, Acoustical Society of America Silver Medal, and the Chevalier de l'Ordre des Arts et Lettres, République Française.