STUDIO REPORT

RECENT DEVELOPMENTS AT THE CENTER FOR CONTEMPORARY MUSIC

MILLS COLLEGE

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ABSTRACT

The Center for Contemporary Music at Mills College is a center of historic importance in electronic music in the United States. Described here are some of the Center's recently developed systems, public and educational programs including research and development in computer music composition and synthesis.

CCM PROGRAMS
- Graduate programs which focus on composition and research in a variety of media, including algorithmic composition, intermedia systems, digital synthesis, real-time computer music systems, music software, performance and experimental aesthetics
- Undergraduate programs in electronic-audio and computer music
- Seminar in Formal Methods Series, now four years old, with prominent guest speakers in various areas including artificial intelligence in the arts, perception, experimental aesthetics, systems design, and computer music
- Artist and Technical Residency Program with associated workshop and concert events
- Active performance series featuring guest, faculty, staff, and student artists in electronic music, inter-media, performance art, and other areas of new music and performance
- Public Access policy and community interaction

CCM FACILITIES DEVELOPMENT HIGHLIGHTS
- HHML, a recently developed real-time computer composition and performance language intended for the exploration of formal and perpetual constructs
- diverse music applications of the MCM/SD P system, including several experimental music software packages, a graphics language, and interactive performance
- TOUCH, a keyboard digital synthesizer, with FOIL-B and MetaFOIL, instrument definition languages and a powerful meta-compilation environment
- research in performance input structures and devices
- integration of studio and instruments using various data communication and synchronization formats (including MDUC/SMF), and inter-studio audio and digital communication
- hybrid synthesis environments, with languages like PATCH/EY and MASC (developed by Dan Ufield)
- applications of the Mills College VAX L/380 Berkeley UNIX BSD 4.2, and the Hewlett-Packard 6400 logic development systems
- continued use of various microprocessor systems in individual development projects
- multi-track recording studio projects

Examples of work realized recently at the CCM will be played at the conference, and the staff and general facilities will be described.

1. INTRODUCTION

The following is a brief description of recently developed programs and activities at the Mills College Center for Contemporary Music. The period begins roughly in the fall of 1980, when several new staff members came to the Center (including the current Director, David Rosenboom), and several new projects and programs began. During the past four years, there has also been substantial modification of the studio facilities and pedagogical emphases, in part to reflect the interests of faculty, staff, and students there, and in part a natural response to evolving artistic visions.

2. CURRENT STAFF AND FACILITIES OVERVIEW

The current CCM staff includes David Rosenboom, Director, and faculty members Larry Polansky, Technical and Adjunctive Staff, principal software developer, and faculty member; Sean Gershwin-Lancarini, Technical Director; Richard Povall, Technical Assistant, studio manager, hardware designer, and principal recording engineer; Maggi Payne, faculty member and principal recording studio technologist; David Heilts, filmmaker, performance artist, faculty member in film. All of the staff

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members are active composers and performers. In addition, there are five Graduate Assistants whose responsibilities include software and hardware development, studio maintenance, public access and CCM administration, concert production, informal and formal teaching, working with guest composers and members of the community, and much more. At present, there are about 45-50 undergraduates enrolled in CCM classes, and 25-30 graduate students working toward an M.F.A in Electronic Music and the Recording Media at the CCM. There are another 10-12 graduate students working toward the M.A in Performance and Literature who use the facilities regularly, as do a large number of students, public access users, and members of the Bay Area and international artistic community who are involved with the activities of the CCM in some way.

There are at present five main studios in use:

- hybrid computer music studio
- multi-track recording studio
- hybrid electronic music studio
- dubbing and editing studio
- IRC studio

In addition, there are several workshops and development rooms, for both staff and students, a main administrative office containing extensive archives, computer facilities, technical and program documentation, several "living areas", and a fully equipped concert hall (not part of the CCM proper) which has been wired for electronic and multi-media performances.

3. PROGRAMS

3.1 CLASSES AND SEMINARS

3.1.1 ELECTRONIC MUSIC There are four classes currently offered in electronic music, two at the undergraduate level and two at the graduate level. The undergraduate course covers the basics of analog and synthesizer, analog and computer music, while the graduate course is more advanced. Both classes are oriented toward practical studio techniques, experimental music, live performance and "homebrew" electronics, and the role of women in the field (see below). The undergraduate course is taught by students.

The graduate seminars in Electronic Music deal with current techniques in programmable electronic media and their relation to experimental acoustic cultures, including systems theory, computer-aided instruments, music algorithms and programming languages, circuitry, signal processing and synthesis, communications theory, and performance input structures. In addition, a graduate/composer studio Research Seminar in Music Theory explores the frontiers of our understanding in formal musical perception and includes an introduction to music composition as an important medium and tool for experimentation. These classes meet in the CCM and make frequent use of the many guest artists who visit the CCM, as well as the special expertise of other staff members.

A large part of the CCM educational experience, however, takes place on a highly personal level, in which students work with staff, faculty, members of the community, and perhaps most importantly, each other, in an atmosphere of considerable encouragement and technical freedom. Much effort is made to ensure significant access to all facilities whenever possible, and many students contribute greatly to the CCM's contributions to hardware and software design, implementation, and documentation. Students also help in important ways that shape the educational and artistic approaches of many aspects of the program.

3.1.2 SEMINAR IN FORMAL METHODS

This Seminar series, now in its second year, is directed by Larry Polansky and David Rosenboom, and has been funded alternately by the Mills College Music Department and the National Endowment for the Arts, as well as receiving smaller funding from other sources. The aims of this series have been to encourage a community of minds and ideas at the CCM centering around current notions of formal methods in the arts, experimental aesthetics, new designs in electronic music systems and music languages. The series has been enormously successful, both in attendance and in the quality of presentation and discussion. There have been about 50 guest speakers, and other informal seminars in the arts; such seminars have been given in the same time slot by other artists, with focus on topics more endemic to the arts; these seminars were given at the Center itself (programming language and machine architecture workshops, for example, or on the intracacies of a given device).

A partial list of past guests in the series (Fall 1985 - Spring 1986) includes David Tudor (twelve), Lynn Cooke (twelve), Edgar Coons (five), John Chowning (five), Joanna Xenakis, Kenneth Gaburo, John Swell, Tom Berio, James Tenney, John Cage, Glenn Branca, George Lewis, Phil Durrant, Dana Delevy, Helmut von Foerster (twelve), Michael Schippling, Chris Brown, David Weiss, Phil Burke, Joe Burton, Ron Kavalia, Tim Perkis, and others.

Talks in the series have included discussions of psychoacoustics and music perception (Wesell), Coop's formulations of musical languages (Rodenberg and Rosenboom, Polansky), Cooke, Burke, Delevy, design of a real systems (Burch, Davies, Kavalia), Schippling, Schwendler examinations of natural language (Kawasaki, Polansky) and even what might be termed part "systems theory" (von Foerster, Hindelang). Some (including Xenakis' formulations 'metric') were easy categorization. All talks have been recorded, and a project already underway, and to which we are seeking funding, is to transcribe and edit selected seminars for a limited edition. Hopefully, this will happen in the near future. The emphasis on Formal Methods Series is expected to continue, and we are hoping to expand our scope to include such issues as information theory, artificial cognition, object-oriented systems, experimental psychology in the arts, and artificial and natural mathematical thought.

3.1.3 ARTIST AND TECHNICAL RESIDENCY PROGRAM

In 1984-5, with the partial support of the National Endowment for the Arts, a intense residency program was established, which we hope
and expect to continue in future years. The intent of the program was to bring in artists/technicians innovators for short periods of time to complete more 'personal' or of their own choosing but with significant collaboration and support from CCM personnel. Our goals were "to see" and "to engage" the artist in the context of setting out to create an experience that would happen with students and faculty present. The goal was to create a specific area, or a location, or set up a particular experience for a specific student group. The program was highly successful. The three artists invited for 1984-5 were Charles Amirkhanian, David Malherbe, and Ron Koivula. Mr. Amirkhanian worked intensively with Richard Posluszny and produced a new work, "Hunting and the Course of Abstraction," which he presented along with other works new and old in a public lecture/concert. David Malherbe worked each night for a week with the Mills Contemporary Performance Ensemble and its director Larry Polansky, and produced a concert of his work (most arranged especially for the group). Ron Koivula participated extensively in several performances of various systems at the Center. He performed a concert of his work, "Unnatural," at the Center, in collaboration with Larry Polansky, using the laser display on the stage of the large orchestra's design and the Japanese inspiration for the form of the work. Each of these three spent what can only be described as happy and productive periods at the CCM, teaching, subjects ranging from software event scheduling algorithms and input structures (Koivula's) to the computer music and polka (Malherbe). Since this three-fold specification of artists was successful, we plan to continue it in the future, but will by no means make it restrictive. In addition, we intend to try and share a better representation of culture, art, video, and multi-media artists in the future.

3.1.4 PERFORMANCE SERIES
Over the past four years, the Center has maintained a healthy balance between bringing in guest artists and encouraging performance by CCM personnel. With the support of the NEA and the Music Department, we have been able to bring in several guest performers, covering a wide variety of styles. A partial list of these includes Malcolm Goldstein, James Tennek, George Lewis, David Debrzinski, Kenneth Gaban, Salvatore Martirano, Margaret Fischer, Andrew Hewitt, Percussion Unit, Carl Stone, Ron George, David Dunn, Dan Cooley, Antonia Andrette, Alvin Lucier, Eutocia Krimsky, Joan LaBarbara, Western Front Society, David Pata, Gordon Mumma, Trichy Shankaran, The Partch Ensemble, Walter Zimmermann, J.B. Floyd, and many others.

This year's guests include: David Tudor, Michel Kaelin, Linda Montanari, Larry Metz, Richard Teitelbaum, Doug Hall, and others.

In addition, CCM and Mills College faculty concerts occur frequently. In recent years, works by composers Lou Harrison, David Rosenboom, Charles Sher, Maggi Payne, Jody Diamond, and others have been heard. With the retirement of Lou Harrison, who will surely miss all (both personally and artistically), we are fortunate to have added Anthony Braxton to our faculty in 1985. All CCM and master's candidates in composition are required to give thesis concerts, and these are always of professional, or at one's disposal. Depending on enrollment, there might be between 10-15 of these in a given year. Informal concerts by students and staff are also quite common, as are concerts by outside groups simply using the Mills facilities, with "friendly" technical support from the CCM.

3.1.5 PUBLIC ACCESS PROGRAM
The CCM has continued its long-standing and historic commitment to community public access. The recording studio, hybrid electronic music studio, dubbing and editing studio, film studio, and other facilities (by special arrangement) are open to the public at very low cost. In addition, the CCM provides technical assistance from staff and graduate assistants. The public access policy is geared towards general, not restricted to non-commercial artists in general, since there is a perceived need for an advanced, well-equipped facility that will inexpensively serve the needs of experimental artists. There has been a great public use of these studios by outside users in the past few years, including recent and theater companies, independent composers, electronic music students, and electronica music ensembles.

Personnel at the CCM often collaborate with outside artists for various inter-media projects. Some recent groups and artists with whom the CCM has collaborated include: George Crumb, Frances Conlan, Anthony Braxton, Bob Hughes, OP, Playstation, Antenna Theater, Paul Drew, John Alper, Damon Pipes, Ed Schubert, Ted Cha, Cut, Sound, Bob George, David Dunn, Dan Cooley, Antonia Andrette, Alvin Lucier, Eutocia Krimsky, Joan LaBarbara, Western Front Society, David Pata, Gordon Mumma, Trichy Shankaran, The Partch Ensemble, Walter Zimmermann, J.B. Floyd, and many others.
4. SOME RECENT TECHNICAL DEVELOPMENTS

4.1 HMSL

HMSL, the Hierarchical Music Specification Language, is an experimental, compositional, performance, and research computer system developed recently at the CCM by Larry Polansky and David Rosenboom, with assistance from other CCM staff and students. This language is described in some detail elsewhere in these proceedings (by the same authors). HMSL, and its theoretical ramifications, are a significant part of the technical and artistic development at the CCM over the last two years—a part of our general concern with music languages and experiential approaches to musical artificial intelligence. HMSL is currently being used in courses, by composers, and by CCM personnel in a wide variety of contexts and applications.

4.2 THE TOUCHE

The TOUCHE digital synthesizer, developed by David Rosenboom and Buchla and Associates, is an important performance, composition, research, and educational facility at the CCM. The TOUCHE at the CCM uses the languages FOIL-42 (an instrument definition language) and Meta-FOIL (a meta-compilation environment), both written by David Rosenboom. Plans exist for the interfacing of the TOUCHE to HMSL.

4.3 INPUT STRUCTURES

An important area of research interest is computer music input structure devices, and several experimental devices are presently in design and construction stages. Since a major focus of the CCM has always been on the design and implementation of small, computer-based performance devices, we are always seeking new and radical ways to communicate with these machine intelligences. Much of the design of HMSL, for example, assumes a generalized notion of stimulus/response that enables the system to communicate with a wide variety of input devices, such as those in the case of biofeedback input, for example, David Rosenboom's work with the TOUCHE and other systems has explored these ideas as well. We encourage students to investigate, by their own hardware and software experiments, alternate modes of musical data representation and performance communication systems, and many students have designed their own instruments to further their own particular compositional visions.

4.4 STUDIO INTEGRATION

All of the studios are now linked by audio and digital lines, and we are continually seeking to improve and expand this communication network. We are currently implementing various data communication and synchronization formats, including SMPTE and MIDI, to facilitate an even broader range of communication and control possibilities.

4.5 HYBRID ENVIRONMENTS

The CCM's facilities include several analog-digital hybrid environments, which include PATCH-I, an analog control language designed and written by Lynne Cowan of Buchla and Associates, and MACS, written by Dan Kelley of San Jose State University. PATCH-I is an implementation of a 5100 6800 microprocessor system with a special single-board 6502 based keyboard control system (PACE) and programmed at the CCM. MACS runs both on the 5100 8080 environment (co-resident with HMSL) and on an S-100 based 8080 system in the hybrid analog electronic music studio. That studio is used in large part by undergraduates and public access users, and as such offers an advanced and experimental facility that is open to everyone as well as advanced users. In addition, other systems, including ones based on the Macintosh and other more commercially available systems, temporarily set up in various readings for educational, compositional, and experimental purposes. One example of an unusual educational experiment in hybrid systems, was the use of software commercially available for the Macintosh (software for electronic music education and other standard functions of an analog synthesizer, in a beginning electronic music class.

4.6 APPLICATIONS OF THE VAX AND HP4000

LOGIC DEVELOPMENT SYSTEM

Music software currently running on the Mills College VAX 11/780 includes the UCSD CARYL system, MPL (an algorithmic composition language contributed by David Worrall of Australia), a VAX version of FORM, and a variety of software written by CCM personnel. The VAX system is used extensively for documentation, research, composition, and other activities. We are currently planning a version of HMSL, with the Compaq version of the Macintosh written in the SUPAC environment. The CCM has received very positive support of the Mills College Math and Computer Science Department, and there are now several VAX terminals at the Center. In addition, we plan to use one of the VAX lines for data communications with HMSL.

The Hewlett-Packard 54400A logic development station was donated from Hewlett-Packard to the college, along with its use as a storage area by the CCM and the Math and Computer Science Department. It has proved invaluable as a tool for complete hardware design, implementation, and debugging. We also plan to use it in its 54500 simulation capability, C implementation, and software performance analysis functions.

4.7 OTHER USES OF MICROPROCESSOR SYSTEMS

The CCM maintains a small computer development laboratory for use by graduate students and staff in research and experiments. The use of special and general purpose microprocessor systems for performance instruments is quite common at the Center, and some recent examples have included...
work by Chris Brown, who built his own signal processing instrument as part of his Master's Thesis, which was a set of works for instrumentalists and electronics called His Master's Voice; Phil Stone and James Mcker, who produced a concert entitled On a Wing and a Song which featured a hang-glider controlled computer synthesis instrument; Tsubji Tominaka and Richard Powell, who developed his own computer controlled switching system for a major video and mixed media work, Coming of Age. Many students have integrated the use of more commercially available microprocessors, like Commodores, Macintoshes, and Apple IIs into their performance and compositional work, and some have made significant hardware or software advances on these systems. The Macintosh has been used recently, for example, by Scot Gresham-Lancaster, in an accurate realization of the complex, 'free style' just intonations of faculty member Lou Harrison's At the Tomb of Charles Ives.

4.8 RECORDING STUDIO PROJECTS

The Multi-Track Recording Studio, which is adjacent and connected via audio and control lines to the hybrid Computer Studio, is one of the most frequently used facilities at the CCM. Many commercially released albums and tapes have been recorded there over the years, and this continues to be true at the present time. Recently, we have replaced the main multi-track deck and mixing board with newer, more state-of-the-art facilities, and plans include automation and digital recording equipment, as well as a full, integrated video facility in the studio. Recent works realized in the studio include David Rowewood's and Jaqueline Hunsberger's Daytime Viewing; Larry Polansky's Visceral EP for Four Voice Cantata Corps Brown's Alternating Currents; James Tenney's Septet for Six Electric Guitars and Bass; Jay Glenn and Marisa La Palma's IXNe; Richard Zovars' soul number, and many other works by both CCM personnel and members of the community. Maggie Payne teaches a class, jointly offered to both music and communications students, in recording studio techniques, and frequent seminars in advanced use of the facilities are held by Richard Powell and Scot Gresham-Lancaster.

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