Studio Report
Peter Otto
Computer Music Studies
State University of New York at Buffalo
222 Baird Hall, Buffalo, NY 14260
otto@ucb.edu

ABSTRACT
Since September of 1990 we have been actively engaged in rebuilding SUNY at Buffalo's Computer Music Studios. These efforts have led to the establishment of two new facilities for students, and two studios devoted primarily to faculty research and special projects. The combined facilities are sufficient to serve approximately twenty active users. This presentation will include a description of the facilities and the work done by students and faculty using the studios, highlighted by slides and audio demonstrations. Research projects as well as compositional efforts will be mentioned.

1. MISSION
The primary mission of the Computer Music Studios of SUNY at Buffalo is to provide facilities and instruction in electronic and computer music technology, along with knowledge of the history and literature of computer and electro-acoustic music, and to facilitate the production and performances of works by student and faculty composers. Secondly, the mission of the studio is to advance general knowledge in the field of computer music and new music technology by conducting research and/or development projects that are of theoretical or practical usefulness to composers locally as well as generally.

2. SOME HISTORY
The Music Department of SUNY at Buffalo established a reputation for computer music in the Seventies and Eighties as a result of the research, publishing, pedagogical and compositional activities of Prof. Lejaren Hiller. Hiller's recognition as a researcher was in part earned for his work in algorithmic composition, which laid foundations for work in that area which continues today. Besides the students for whom study under Hiller was seminal, Hiller's legacy at SUNY Buffalo (UB) includes the establishment of a rich selection of relevant volumes and periodicals in the music and technical libraries as well as the establishment of a suite of rooms in Sert Hall on the UB North Campus that have been dedicated to, and are reasonably well suited for, computer music facilities.

Following Hiller's retirement in 1989, Prof. David Felder successfully campaigned for a University commitment for funding of extensive new computer music studio facilities at UB. Peter Otto and Rick Bodack were hired to build new facilities and direct the development of computer music activities.

3. CURRICULUM
The Music Department of SUNY at Buffalo has a strong composition program serving about 20 Master's degree and Ph.D. candidates. Most graduate composers elect to study computer music in one or more courses.

The current curriculum features the following offerings:

- Music 511/512 offers a two term introduction to composition using small systems. Topics include "computer literacy", MIDI, an extensive study of the Max programming language, and an introduction to synthesis and sampling using commercial hardware as well as Digidesign software and hardware. Digital audio editing and soundfile manipulation using Sound Tools are also studied. Small scale compositional projects are produced by students each term. Otto has taught this course in the 90-91 and 91-92 school years.
• Music 611/612 is a two-semester introduction to composition using Next Computers. Topics include introduction to the Next Computer environment, graphic user interface, the DAT (digital audio tape) system, and the Commodore 1551. Students work in pairs to compose a piece of music for the Next's synthesizer. The technical details of the hardware are demonstrated in a workshop setting.

• Independent studies and special composition tutorials allow students to explore special topics and projects.

• The Graduate Composition Seminar has served as a means for faculty to present instruction on the topics of algorithmic composition and computer music literature.

Improvements in several computer areas are needed in order to offer a more comprehensive education in new music technology and computer music composition. A basic analog and digital audio course is needed for students with little prior experience in new music technology. As a partial remedy for this situation, a course called "Contemporary Music: Aural Perception of Sound" will be offered in Fall, 1995, offering basic information on new music and audio technologies for performers as well as composers who are interested in this area. Other hopes for improvements include budgeting for scheduled guest lecturers on various topics in computer music.

4. TECHNICAL FACILITIES

The College of Arts and Letters has generously supported the acquisition of equipment and refurbishment of facilities over a four year period, which concludes during the 92-93 academic year. Four major studies have been established and are described below:

• 110D Production/MIDI Studio serves the dual function of providing a facility for digital audio editing and processing as well as composition with MIDI synthesizers. A Macintosh Quadra 950 is the main computer, complemented by large capacity hard drive. Complete Digidesign Sound Tools software and hardware is supported on the Quadra, with a four-channel Pro Tools expansion planned for fiscal year 95. Other software supported includes Opcode's Max and standard sequencing and synthesizer/sampler editing programs. A Soundcraft Delta-200 series mixing console provides 36 analog input channels. Monitoring is provided by a pair of B&W 801 loudspeakers powered by a Fostex-40 amplifier. In addition, a separate quadraphonic monitoring and specialization system runs off the Soundcraft's subgroups. DAT recording is available, as is a suite of synthesizers and processing equipment, including Yamaha TX-402 and TG-77 synthesizers, Yamaha SPX-1000 and Lexicon PCM-70 effects processors, two Divor-11 mixers with format converters, and an Akai S-1000 PB. Several MIDI controller technologies are in use in this studio and a custom-made console houses all the equipment and wiring.

• 113 Faculty Research Studio houses a NextCube with two IRCAM/Ariel Signal Processing Workstation (SSP) cards (Lindenman, 1991), and an Audiomation Contact MIDI Panel with various ancillary and monitoring equipment. This is the platform for the MixNet Project, which is described in another paper in these proceedings (Osterhbach/Master, 1992).

• 115 Classroom/Workstation Room is currently being reconfigured to add a Macintosh CI and a Mac IIx to a facility that already includes two Next Machines and a Macintosh Quadra 950, excluding DAT and quadraphonic monitoring. The Next machines are primarily used by students running software synthesis projects while the Macintoshes will be used for music notation, two-track editing and "pre-production" work to be completed in 110b.

• 116 Faculty Workstation is devoted primarily to score preparation and special graduate-faculty projects. A Mac C, a NEXT Cube, a 16-channel Soundcraft Delta-200, a Studer-Edwards deck, and various MIDI devices are available in this space.

• Network: all four spaces are connected via EtherNet. Two Next Cubes are in turn being connected to the campus computing network. Print spooling via EtherNet is available on the Next and Macintosh computers. Soundfile compatibility among Nexts and Macs has been established. Disk space is generally ample, while backup is handled using a Wang DAT-based tape archival system and NEXT optical disks.
5. COMPOSITIONAL ACTIVITIES

Faculty works completed or nearing completion during the first two years of facilities refurbishment at SUNY Buffalo include:

- **November Sky** by David Felder, for Flute (Doubling Piccolo and Bass Flute) and Quadraphonic Playback System. This work utilized extensive soundfield manipulation in various devices and will likely be expanded in the future to include various routines constructed specifically for the piece using the ISPW.

- **Separatrix** by Rick Bediak, for Violin and Live, Interactive Signal Processing System. This work uses chaotic computational routines to simulate decayed and pitch-shifted processing of live violin materials.

- **Kinosis Vehicle** by Peer Otto, for MIDI Mallet Instrument, MIDI Keyboard Instrument and Live, Interactive Signal Processing System. Written using the MAX programming language, the work features extensive use of quadraphonic processing using two DMP 11 mixers and MIDI controlled effects processing.

Sophisticated works employing a rich variety of styles and techniques have been completed or are nearing completion by graduate composers Ted Dawson, Houston Dauzay, Paul Elwood, Eric Garsky, Steve Gieson, Vincent Hammer, Tornas Henriquez, Rick Sanborn, David Segovia, and Scott Thomas.

6. FACULTY AND TECHNICAL SUPPORT

Day-to-day maintenance as well as many important studio development tasks of the Computer Music Studios of SUNY at Buffalo are handled in large part by several talented and devoted Graduate Assistants, including Vincent Hammer, Rick Sanborn, and Scott Thomas. System administration has been handled by Rick Bediak with assistance from Scott Thomas. Studio administration has been the responsibility of Peer Otto. Facilities of this magnitude would benefit with the addition of a staff technician with expertise in NeXT and Macintosh computers as well as fabrication and maintenance of digital and analog audio hardware. However, severe budgetary problems experienced recently in the SUNY system have hindered to some extent the technical development of the studios. Additional support is needed to bolster instruction in software synthesis, to fund the composition of some research projects, to support a staff technician, and to provide system administration.

7. CONCLUSIONS

Substantial progress has been made in creating a powerful and compelling environment for the study and production of computer music at UB. Much work remains to be completed, however. Short-term goals for the studios include:

1. the stabilization of the technological base (particularly the newly wired and upgraded 11th studio),
2. introduction of the ISPW into the curriculum and for graduate composers' projects,
3. minimal funding of a technical staff position,
4. external support for the MaxNet project, and
5. increased compositional productivity in the studios.

Longer term goals include the need to become more technically and financially self-sufficient, bolstering the curriculum for computer music, and establishing sustaining funds for equipment upgrades and replacements. The establishment of a summer program for computer music instruction is being explored, both as a means of generating revenue and to provide additional learning opportunities for UB composers.

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9. REFERENCES
