The Computer Music Studio at the University of California, Santa Barbara

A studio report

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ABSTRACT

A new facility for computer music composition and multi-media art production, designed by director JoAnn Kuchera-Morin, just opened at the University of California, Santa Barbara’s Department of Music. The center is totally dedicated to professional composition with multimedia and multi-cultural emphasis, research in new software/hardware development specializing in graphic user interface, and acoustics and digital signal processing research. Advanced instructional use for graduate composers and researchers is also available.

The progressive research community at UC Santa Barbara is ideal for extensive inter-disciplinary collaboration among the arts and sciences, including dance, music, drama, electrical engineering, computer science and physics. Multi-cultural aspects of studio extending through all disciplines, have been facilitated by an on-line digital archive of sampled acoustic instruments from Middle Asia, Japan and China, the beginning of an extensive research project of a library of world instrumental sounds. Composers can then embark on studies of other cultures while automating these different musical cultures and constructs into their own musical language. Collaborative research projects among the sciences and the arts include faculty and graduate research in music software and hardware development, sound compression and storage on compact disks, and speech synthesis.

The following studio report further explores the goals of this facility tying in the facility design, hardware, software, project development and programs with regard to these goals. A brief history of the center along with future development is also included.

1. INTRODUCTION

1.1 Studio Philosophy

The studios at Santa Barbara are particularly designed to extend research in technology encompassing many different aspects of the arts, not only of western culture, but also of other cultures as well, thus evolving towards a center for technology in "world music". Professional composition remains foremost as the facility’s main artistic function, with the goal of renowned guest composer residencies. Research and development of software and hardware to facilitate artistic production and expansion of the multimedia applications are essential to the development of the center’s main function. Other research projects which include collaboration with industry, are helping to advance software and hardware development which will integrate larger direct digital systems with smaller real-time applications, thus facil-

80 1987 ICMC Proceedings
tating composition. Development of the above areas will allow for an advanced educational environment for the composer/researcher who completes their studies at this facility.

1.2 The Studio and the University Community

UC Santa Barbara offers one of the most unique environments for artistic and scientific interdisciplinary development. The advanced scientific community immersed in the liberal arts environment, makes an ideal location for practical applications of any scientific tool created. The university community includes the Robotics Institute, formerly located at Bell Labs, the Institute for Theoretical Physics, the Institute for Interdisciplinary Applications of Algebra and Combinatorics as well as a five-story computer systems complex in Engineering and two story micro-computer laboratory. The artistic community contains its own professional dance company as well as symphony. There is also a professional video and television station and a large multi-track recording studio on campus. The interaction of all facilities can be witnessed by the elaborate communications network which connects all buildings, enabling high level transfer of information. The network not only extends throughout the campus, but also to every major research center in California.

2. STUDIO FACILITIES

2.1 Brief History

The Electronic Music Studio at the University of California, Santa Barbara, opened in the fall of 1973, supervised by the Department of Music. The studio originally comprised two rooms which contained analog sound synthesis equipment, upgrading to two micro-computers, digital synthesizers, post-processing equipment and a high-level multi-track recording studio.

The center has now expanded to a professional multimedia art facility encompassing a five-room wing in the Music Department and a research sub-component in the College of Engineering, connected to the Music Department through the broadband network. A four-room multi-track professional recording facility in the Learning Resources Building at the university is currently pursuing plans for conduit connection to the facility in the Music department for recording large chamber ensembles with computer-generated tape.

2.2 Current Facilities

2.2.1 Direct Synthesis Studio

The Direct Digital Synthesis Studio comprises three rooms. The Machine Room contains a VAX11/750 computer running UNIX 4.3 with a 205 megabyte disk for file storage and a 671 megabyte disk for sound storage. The sound conversion system used is the Digital Sound Corporation 200 with 4 channel Digital to Analog and 2 channel Analog to Digital capabilities. An Integrated Media Systems switcher allows audio signals to be routed to different rooms. The musical software facility consists of the IRCAM soundsile system, CARL music software, and MIT's eSound. A Sun 3/160 workstation with 141 megabyte disk esoteric to the VAX, an Apple LaserWriter for hard copy, and a dual density tape drive complete the Machine Room.

The Sound Isolation Room was constructed on raised floating floor slabs and is used for 4 channel near-field monitoring of digital signals and close-miked analog to digital recording. A Terminal Room consisting of a work space environment containing four terminals with headphones for data entry and test-listening complete the Direct Digital Synthesis component of the facility.

2.2.2 Real-Time Recording and Monitoring Studio

The Real-Time Recording and Monitoring Studio comprises two rooms separated by glass for visual recording capabilities. These two rooms are constructed exactly on the same principle as the sound isolation room and contain digital post-processing equipment, MIDI controlled digital and analog synthesizers, and multi-track recording facilities. Immediate upgrade of this facility includes two Apple Macintosh computers running UNIX with Integrated Media Systems stereo D/A, A/D converters and MIDI interfaces; a new 16 track tape recorder, computer controlled mixing and switching capabilities, and new post-processing peripherals and MIDI controlled synthesizers. A Sun 3/50 will also be included.

2.2.3 Research Facility Component

There is a small research sub-unit in the Computer Systems Laboratory College of Engineering. This unit currently runs identical software to the Computer Music Studio and is designed for indivi-
dual research and development purposes. The unit shares, a NAX-1117B80 with other research and development applications in computer science and electrical engineering. DSC200 stereo D/A, mono A/D converters are shared with speech synthesis applications.

2.3.4 Communications Networking

Both the Computer Systems Laboratory and the Department of Music studios are networked through broadband communications. The Direct Synthesis and Real-Time studies will be connected by ethernet, enabling use of NFS on all machines. Audio communications will also extend to Lotte Lehman Concert Hall.

The local communications network is connected to the university network via the broadband, allowing for large data volume transfer throughout California.

3. RESEARCH, CREATIVE ACTIVITIES AND ACADEMIC PROGRAMS

3.1 Creative Activities 1986-1987

Guest Composers and Lecturers are an integral part of the professional development of the faculty. The following guest participated in activities described below:

Composer, Thea Musgrave, just completed a commissioned work for solo horn and computer-generated tape for the International Horn Society. Janis Xenakis was Composer in Residence and Guest Visiting Lecturer. James Andrew Moore, Robert Morris, and Allan Schindler were Guest Lecturers. Composer, Henry Brus will embark on a large scale multi-media work for baritone and 16 channels of instruments, spatially spaced throughout the concert hall.

In-house activities included the composition of several works by JoAnn Kuchera-Morin and talented students. A Cantata for soprano solo, 4 female voices, computer-generated tape and the Eichhalm oriental collection of instruments is currently being composed by Kuchera-Morin and was commissioned by soprano, Elizabeth Manion.

Collaboration with the various arts departments including Dance, Film Studies and Visual Arts is generating projects which research new areas concerning integration of movement in dance, music and the visual arts.

3.2 Research

3.2.1 Music Software

New computer music software is developed by the technical and research coordinator of the studio, Dan Timis. A new user extendable program allows for very efficient mixing and sound processing. The number of input/output channels is unlimited, making possible the use of this program in conjunction with the analysis/synthesis capabilities of the phase vocoder for very sophisticated transformation and interpolation of natural sounds.

The new Sun and Macintosh workstations will make possible extensive use of graphic interfaces to drive existing musical applications. One of the next projects will be a synthesis package allowing the user to design instruments by connecting modules which represent synthesis algorithms.

3.2.2 Digital Archive

In the past two years, multi-cultural development of the facility has begun with the exchange of artistic ideas among the countries of the Pacific Rim Region. This project has been developed by starting a digital archive of instrumental sounds from the Pacific Rim countries, and is the first step towards codification of the musical cultures of this area. The archive contains digital samples of over 400 different musical instruments from Middle Asia, Japan and China. The instruments are housed at UCSB under two different collections. The next step concerns interactive communication with the Pacific Rim countries by observation and recording of their music and dance ceremonies and a continual expansion of the archive by the addition of this recorded field material and new instrumental samples collected while in these regions. At the same time that we as a Western European culture are assimilating Eastern traditions and thought into our work, a cross exchange of our musical heritage and culture with the Pacific Rim area will also be shared. This type of interactive communication between society’s whose art and culture are based on inherently different traditions will bring further understanding and communication with these areas.
3.3 Academic Programs

A one-year course in computer music and a one-year course in real-time sound synthesis is taught by Dr. JoAnn Kuehre-Morin to prepare those students who will work at the facility for advanced individual study.

Students who major in Music Composition with a special emphasis in digital sound synthesis, along with a few specialized slots for a new major entitled Computer Applications in Music (an interactive major between computer science and music), will receive advanced individual programs for development within their specialized fields.

4. PLANS FOR FUTURE DEVELOPMENT

Plans for future expansion include the addition of more sound isolation rooms and the continual expansion of computing power and sound storage by networking workstations and increasing disk space.

Multi-media applications will also be developed by investigating the possibilities of networking the video and large recording studio at the university to the computer music facility and concert hall.

It is planned to introduce computer graphics into the facility by working with the high-resolution graphics-based machines. Future research includes software and hardware development for computer graphics and video for multi-media art productions, and continual expansion and development of the current communications network to include high-level transfer of digital audio/video data to different buildings on campus, as well as to other research centers in California.