

CCRMA Studio Report

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Abstract

What's new and changed during last couple of years at ccrma. People, equipment, activities, research, music.

1 The cast

The Stanford Center for Computer Research in Music and Acoustics (CCRMA) is a multi-disciplinary facility where composers and researchers work together using computer-based technology both as an artistic medium and as a research tool (correct, but sort of stuffy: in other words, we use computers, we do research, we do music, we have fun). CCRMA is located on the Stanford University campus in a building that was refurbished in 1986 to meet its unique needs. The facility includes a large multi-channel/ multimedia experimental space with adjoining control room/all digital studio, a recording studio with adjoining control room, a couple of general purpose analog/digital studios, several work areas with workstations, synthesizers and speakers, a seminar room, a reference library, classrooms and offices. For a detailed tour and more information feel free to visit us in the World Wide Web at "<http://www-ccrma.stanford.edu/>". The Overview section will give you a fairly detailed review of the latest research and music.

The CCRMA community consists of administrative and technical staff, faculty, research associates, graduate research assistants, graduate and undergraduate students, visiting scholars and composers, and industrial associates. Stanford departments actively represented at CCRMA include Music, Electrical Engineering, Mechanical Engineering, Computer Science, and Psychology. CCRMA has developed close ties with the Center for Computer Assisted Research in the Humanities (CCARH), also affiliated with the Department of Music.

Staff & Faculty: Chris Chafe-Associate Professor of Music, Director; Jonathan Berger-Associate Professor of Music; Julius Smith-Associate Professor of Music and Electrical Engineering; Jay

Kadis-Audio Engineer/Lecturer; Fernando Lopez-Lezcano-Systems Administrator/Lecturer; Vibeke Cleaver-Administrative Assistant; Max Mathews-Professor of Music (Research); John Chowning-Professor of Music, Emeritus; Leland Smith-Professor of Music, Emeritus; John Pierce-Visiting Professor of Music, Emeritus; Marina Bossi; Consulting Professor of Music; Eleanor Selfridge Field-Consulting Professor of Music; Walter Hewlett-Consulting Professor of Music; William Schottstaedt-Research Associate; Gary Scavone, Technical Director; Charles Nichols-Interim Technical Director.

2 The activities

Center activities include academic courses, seminars, special interest group meetings, spring and summer workshops, and colloquia. Concerts of computer music are presented several times each year, including an annual outdoor computer music festival in July. In-house technical reports and recordings are available, and public demonstrations of ongoing work at CCRMA are held periodically. Research results are published and presented at professional meetings, international conferences and in established journals. Compositions are presented in new music festivals and radio broadcasts throughout the world and have been recorded on cassette, LP (ok, ok, not recently), and compact disk.

3 The toys

Currently supported platforms include the Linux and Macintosh worlds. We have now over 30 Intel based PC's running Linux, using a patched and upgraded version of RedHat 7, running 2.4.5 kernels with low latency patches and the ALSA sound drivers. Most of the machines have now high quality soundcards that are capable of doing 24bit/96KHz input-output (four channel Midiman Delta 66 plus the OmniIO external mixer box). Some of the studios have workstations with eight channel Midiman

cards and digital ADAT lightpipe I/O. The Midiman Delta line of cards has very good driver support under ALSA. Another very good choice for multichannel work and digital I/O are the RME cards, specially the Hammerfall line. The main servers have finally migrated to dual-processor Linux machines with hardware RAID5 disk storage arrays and DLT high capacity backup tape drives. A much needed upgrade in speed and disk storage capacity, and a reduction in the number of critical operating systems to maintain. We are still connected to the Stanford University Network at 100Mb/s, giving CCRMA high speed access to the new Internet 2 GigaPop nodes. At this point the internal network itself is (again!) becoming the bottleneck for high speed server-based work and an upgrade of our main backbone to 1Gb/s ethernet is probably going to happen soon (a lot of work has been done at ccrma lately on transmission of high quality multichannel audio over the internet). All Linux machines have a full Linux installation plus more than 100 extra packages which provides users with hundreds of programs and utilities for sound, graphics and research. As some stubborn individuals still use NeXT's Mail.app mailer (me too!) we keep NeXT hardware running, and some of the lower powered PCs can dual boot Linux and NextStep. The old O2's and the Indy keep running, and users login every once in a while but the platform is not actively maintained any longer. So far the unix world is still platform-transparent and the user information and shared server resources can be accessed from all machines. Supported software in the unix world includes the CCRMA Lisp Environment (which includes Common Music, Common Lisp Music and Common Music Notation), the Snd sound editor, Pd for real-time low latency work and tons of utilities and packages for research and music creation. The Macintosh world has a full complement of MIDI based tools and is used for MIDI applications, notation and digital mixing (with hardware assist from Dyaxis II and 16 and 24 bit ProTools systems in three of the four studios). What used to be the MIDI Studio is now Studio C, a general purpose four channel studio with JBL LSR28 near field monitors that includes a 24 bit fully loaded ProTools system, MIDI tools and a Linux-based multichannel machine. MIDI systems include Yamaha, Roland and Korg equipment including Yamaha DX, TX, SY, TG and VL synthesizers, KX88 keyboard controller, Disklaviers, Korg WaveStations and Wavedrum, Emu samplers and digital delays and effect processors. Also available are IVL pitch trackers, a Buchla Lightning MIDI controller, Radio Drum controllers, MIDI patchers and drum machines from Yamaha and Roland. Studio E has a 16 channel ProTools system with a core card, several DSP Farm cards, Two SampleCell II cards and an 888 interface and

Genelec 1030's for high quality monitoring. Studio D is now an eight channel 3D fully digital studio, with a dual processor Linux-based workstation digitally connected to a Roland VM7100 digital mixer which feeds eight Mackie HR824 monitors. All studios now have Teac DAX8 multichannel digital recorders. CCRMA's recording studio has become a central part of the Music, Science and Technology program, as it is heavily used by students studying audio recording technology. The studio is now fully digital and centered around a Mackie d8b mixer with digital connection to three Tascam DA type digital recorders. Monitor systems include Westlake BBSM-10s powered by Hafler P235s and JBL 4206s powered by a QSC 1080. Outboard gear includes Teletronix LA-2A, dbx 166, and Behringer Compressor compressors, Yamaha SPX-90IIs, a Yamaha SPX-1000, a Korg A-1, two Yamaha D1500 delays, two Rane GE-30 graphic equalizers, and Yamaha Rev-7 and Lexicon 224XL reverbs. Microphones include a Neumann TLM-193, AKG C-414s and C-460s, Electrovoice RE-20s, Sennheiser MD-421 and MD-504s, a Beyer M-500, and several Shure Beta-57s and SM-57s. Also available in the recording studio is a Yamaha DC-7 Disklavier piano. The Ballroom, our main teaching room has an eight channel surround setup, a high quality and low noise video projection system and a renovation is underway to transform it into a very capable small auditorium with 12 speakers.

4 Serious stuff

This array of brief research summaries will give you an idea of the current crop, and who's doing it:

4.1 Computer Music Hardware and Software

- The Synthesis Toolkit (STK); Perry Cook and Gary Scavone
- Common Lisp Music, Snd and Common Music Notation; William Schottstaedt
- Common Music; Heinrich Taube
- A Dynamic Spatial Sound Movement Toolkit; Fernando Lopez-Lezcano
- grani, a granular synthesis instrument for CLM; Fernando Lopez-Lezcano
- ATS (Analysis/Transformation/Synthesis): a Lisp environment for Spectral Modeling; Juan Pampin

4.2 Physical Modeling and Digital Signal Processing

- Modeling High Frequency Modes of Complex

Resonators Using a Waveguide Mesh; Patty Huang, Stefania Serafin and Julius Smith

- Toward High Quality Singing Synthesis with Varying Sound Qualities; Hui-Ling Lu
- Scanned Synthesis; Max Mathews, Bill Verplank and Rob Shaw
- Parameter Manipulation for Composing with Physical Models; Juan Reyes
- Acoustic Research and Synthesis Models of Woodwind Instruments; Gary Scavone
- Realistic and Extended Physical Models of Bowed String Instruments; Stefania Serafin
- Pattern Recognition Approaches to Invert a Bowed String Physical Model; Stefania Serafin
- Digital Waveguide Modeling of Acoustic Systems; Julius Smith
- Synthesis of a Neolithic Chinese Flute; Tamara Smyth, Patricio de la Cuadra and Chris Chafe

4.3 Digital Signal Processing

- Linear Prediction Analysis of Voice Under the Presence of Sinusoidal Interference; Yi-Wen Liu, Aaron Hipple and Kyunsuk Pyun
- An efficient and fast octave-band filter bank for audio signal processing of a low power wireless device; Kyunsuk Pyun
- FFT-Based DSP and Spectral Modeling Synthesis; Julius Smith
- The Bayesian Approach to Segmentation and Rhythm Tracking; Harvey Thornburg
- Integrated Online-Offline Methods for Audio Segmentation; Harvey Thornburg
- Rhythm Tracking and Segmentation with Priors: A Unified Approach; Harvey Thornburg
- Identification of a Time-Varying Sinusoidal Model; Harvey Thornburg
- A Simplified Approach to High Quality Music and Sound over IP; Chris Chafe

4.4 Controllers and Musical Instruments

- The Metasaxophone Project; Matthew Burner
- Incorporating Haptic Feedback into Interfaces for Music Applications; Chris Chafe

- The Performer-Instrument Interaction: A Sensory Motor Perspective; Chris Chafe

- Influence of Attack Parameters on the Playability of a Virtual Bowed String Instrument; Chris Chafe

- TouchSound: Haptics in Sound Editing; Lonny Chu

- The Accordiatron: A New Gestural MIDI Controller; Michael Gurevich

- The vBow: Experiments in the Haptic Feedback and Physical Model Sound Synthesis of a Virtual Violin; Charles Nichols

- Alternative Controllers for Physical Model Development (and Fun!); Gary Scavone

- Designing Controllers: The evolution of our Computer-Human Interaction Technology Course; Bill Verplank

4.5 Audification of Data

- Auditory Representation of Complex Data; Jonathan Berger, Michelle Daniels and Oded Ben Tal

- Sound Waves on the Internet from Real-time Echoes; Chris Chafe, Scott Wilson, Randal Leistikow and David Chisholm

4.6 Psychoacoustics and Cognitive Psychology

- Evaluation of Masking Models; Aaron Hipple and David Merrill

- The State of the Art and Future Directions in Sound Source Separation; Aaron Steven Master

- Categorical Perception of Sound Sources; Stephen Lakatos, Gary Scavone and James Beauchamp

- Potential Applications of Linguistic Theory to Music Theory; Leigh VanHandel

4.7 Machine Recognition in Music

- Estimation of Sinusoids in Audio Signals Using an Analysis-By-Synthesis Neural Network; Guillermo Garcia

- Visualizations of Tonality; Craig Sapp

- Audio Content-Based Retrieval Methods and Automatic Style Classification; Unjung Nam

4.8 Historical Aspects of Computer Music

- New Realizations of Electroacoustic Works; Chris Burns
- A Short History of Digital Sound Synthesis by Composers in the USA; Chris Chafe

4.9 Computer Assisted Music and Acoustics Research

- The Center for Computer Assisted Research in the Humanities (CCARH); Eleanor Selfridge Field
- The Musical Acoustics Research Library; Gary P. Scavone and Max V. Mathews
- Web-Based Infrastructure for Research and Teaching; Julius Smith

5 Noisy stuff

- **Oded Ben-Tal:** “fortepiano” (2000) for 4-channel tape; “How silent comes the water” (2000) for piano; “Saraband” for flute, clarinet, cello, piano, percussion and computer-generated sounds; “Socratic Dialogues” (1999) for violin, percussion and 8 winds; “Soliloquy” (1999) for cello and computer-generated sound.
- **Jonathan Berger:** “My Lai” (2001) for solo piano; “Echoes of Light and Time” (2000) sound installation in collaboration with Dale Chihuly; “Marcatto Sempre” (2000) for clarinet; “Miracles and Mud” (1999) for period instruments and digital bird organ.
- **Chris Burns:** “Misprision” (2001) for flute and guitar; “Gineman” (2000) for harpsichord; “Fabrication” (2000) for trumpet and electronics; “78” (2000) for clarinet, violin and piano; “Questions and Fissures” (1999) for soprano saxophone and CD; “Strain” (1999) for four-channel tape; “Escuela” (1999) for piano and interactive electronics.
- **C. Matthew Burtner:** “Animus / Anima” (2001) for voice and electronics; “S-Trance-S” (2001) for computer metasaxophone; “Delta” (2001) for electric saxophone; “Natigviksuk” (2000) for home-made radio transmitters; “Oceans of Color” (2000) for 27 solo saxophones; “Signal Ruins” (2000) for prepared piano, bass drum and electronics; “Noisegate 67” (1999/2000) for computer and metasaxophone; “Stone Phase” (1999) for computer-generated tape; “Frames/Falls” (1999) for amplified violin, amplified double bass and electronics.
- **Chris Chafe:** “Ping” (2001) a sound installation in collaboration with digital artist Greg Niemeyer; “Transect” (1999) for CD; “Riding the Tiger” (1999) film music; “Voice Coil” (2000) celletto and live synthesis.
- **Ching-Wen Chao:** “The Captured Shadow” (2001) for soprano trombone, delay and tape; “SOUNDSTATES” (1998/2001) for percussion and tape; “Elegy” (2000) for Celletto; “Studies for 2 Pianos” (1999); “Counterattack” (1999) for clarinet and delay; “String Quartet No 2” (1998/1999); “Soundstates” (1998) for percussion and tape.
- **David A. Jaffe:** “OTHER WORLDS: An homage to Carl Sagan”, concerto for Zeta electric/MIDI violin and symphonic band; “The Seven Wonders of the Ancient World”, a seventy-minute concerto in seven ten-minute movements.
- **Christopher Wendell Jones:** “Matragn” (1999) for clarinet and computer-generated sound.
- **Damian Keller:** “P2000” for compact basoon, disc, glass and eight-channel tape; “The Trade” soundtrack for installation, collaboration with visual artist Ariadna Capasso; “Working Title”, sound installation; “touch'n'go / toco y me voy” (1998/1999) for eight-channel tape and actors.
- **Seungyon-Seny Lee:** “Je est un Autre II” (2000) for 3 dancers, video images, installations and computer-generated sounds; “Je est un Autre (Self is Other)” (1999/2000).
- **Fernando Lopez Lezcano:** “iICEsCcR-rEeAaMm” for four channel tape; “House of Mirrors” for PadMaster, midi instruments and soundfile playback
- **Charles Nichols:** “Strata II” (2001) for flute and interactive computer programming; “Interpose” (1995/1999) for guitar and computer-generated tape;
- **Juan Carlos Pampin:** “On Space” (2000) for percussion sextet and electronics.
- **Juan Reyes:** “Oranged (lima-limon)” for tape; “ppP” for piano and tape; “Los Vientos de Los Santos Apostoles” for fixed length models or organ pipes;
- **Kotoka Suzuki:** “Sift” (2000) for violin and computer-generated tape; “Yoei” (1999) for computer-generated tape, six percussionists and a dancer attached to real-time activated sensors.