USC Viterbi School of Engineering

Viterbi Early Career Chair 2005-2006 Lecture Series

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Chris Chafe, Duca Family Professor of Humanities and Sciences, Stanford University
Director, Center for Computer Research in Music and Acoustics

Tapping into the Internet as an Acoustical Medium

Friday, February 10, 2006, 2:30-3:30PM @ EEB 248

Recent work in network audio transport transforms advanced networks into a new kind of acoustical medium in which sound waves propagate as if traveling through air, water, or solids. Waves sent through the medium are reflected or altered as they bounce between hosts. Propagation delays are used to create echo chambers and build the resonances for "distributed musical instruments." As a side-effect, tones created by network resonances can be used to monitor the quality of the underlying network.

Chris Chafe is a composer/ cellist / researcher with an interest in computer music and interactive performance. The Duca Family Professor of Humanities and Sciences at Stanford University, he has been a long-term denizen of the Center for Computer Research in Music and Acoustics where he directs the center and teaches computer music courses. His doctorate in music composition was completed at Stanford in 1983 with prior degrees in music from the University of California at San Diego and Antioch College. His areas of research involve methods for computer sound synthesis based on physical models of musical instrument mechanics and "SoundWIRE," which explores musical collaboration and network evaluation using next-generation internets for high-quality sound. He has performed his music in Europe, the Americas and Asia, and composed soundtracks for documentary films. From 2001, numerous collaborations with artist Greg Niemeyer have included "Ping" (SFMOMA, Parc de la Villette, Paris and online via the Walker Art Center), "Oxygen Flute" (San Jose Museum of Art, UC's Kroeber Museum), the disc "Extrasensory Perceptions" with music from both installations, and most recently "Organum" which is a synthetic animation taking place in an invented world of larynx creatures (DVD) and led to the "Organum Play Test" for collaborative game play.

The presentation presents three areas of research:

1) auditory methods for monitoring QoS, especially for networks supporting real-time, interactive, bidirectional flows
2) remote musical collaboration using professional-quality, low-latency audio
3) empirical study of human factors affected by some unique acoustical properties of the medium

Network latency, jitter and delay asymmetry affect the speed of sound and are never uniform. By creating distributed virtual sound objects like instruments and rooms and by studying distributed ensembles, we can begin to understand this new sound world. Some effects have been measured empirically and the results contain some surprises. For example, latencies can be low enough that musicians at opposite ends of a path are essentially in the same room, and echo cancellation becomes unnecessary. Multi-channel "echo construction" can be designed to enrich the experience. For audio use, the new territory that is opening is unlike any previous telecommunications medium.

Host: Elaine Chew, IMSC & Epstein Dep of ISE.