institut für elektronische musik und akustik

Open CUBE – Lecture and Concert

Professor **David Worrall** and Sonification Students of Visda Goudarzi present:

Sonification of Scientific Data

Mittwoch, 19.03.2014, 17 Uhr, IEM CUBE, Inffeldgasse 10/3, 8010 Graz

In Zusammenarbeit mit der Gesellschaft zur Förderung von Elektronischer Musik und Akustik – GesFEMA

Lecture:

Sonification of Scientific Data **Professor Dr. David Worrall**

Scientists use data as evidence in their daily practice, as well as in the communication of the findings of such practice to each other and to the general public. Many practicing scientists are skeptical of the usefulness–or even validity–of using data sonification in their work. For those who work with sound, this can be somewhat surprising, even confronting but needs to be understood. In this talk David wants to discuss what scientific data is and some of the purposes, metaphors and modeling techniques that he uses when soniculating data for scientific purposes, and in his other cultural practice, as a composer. He will illustrate the talk with some statistical examples and from his current work in monitoring heart function and computer networks.

Sonic Heat Maps **Benjamin Stahl**

Sonic Heat Maps is a Sonification tool to display Temperature Data. The user can navigate around the globe using the cursor, or navigating over time.

Data is collected by Wegener Center for Climate and global Change. Thanks to Andrea K. Steiner and Martin Jury for providing the data.

Sonification Study 1 **Andres Gutierrez Martinez**
Can you hear the wind? **Andreas Fuchs**

A gentle breeze may be a blessing on a hot summer day, hurricanes can be devastating catastrophes. This project does not focus on understanding an overall progression of wind data, but to give an windlike impression with sound. Therefore wind is presented as small sound particles which move through space and are given an relative speed and direction. The sound particles are modulated with a pulsed envelope as reference.

The data in the presentation is taken from the CMIP project and represents simulated wind data from the Max Planck Institute for Meteorology with a starting point of the simulation in the year 2005. In the presentation different geografic locations are chosen to sonify distinctive temporal events.

SoniCardio **Benjamin Stahl & Jonas Helm**

SoniCardio is an audio visual teaching aid. Teaching and learning in schools and universities are predominantly based on visual models of technical or biological structures. The sense of hearing mainly remains an instrument for communication between lecturer and student. SoniCardio is an application with the attempt to use the advantages of multichannel perception for the particular case of the electrical conduction system of the heart. This Sonification is designed for half a dome of speakers, adapted to the user standing in front of the screen.

The heart's electrical conduction system is based on spreading depolarization. The heart-muscle cells change their electrical potential and pass this change on to their neighbors. This depolarization triggers the contraction of the muscle cells. For this matter, special conduction cells transmit depolarization very fast on specific lines. These sequences are presented visually as well as by a spatial sonification. Other, slower cells, subsequently transmit the depolarization within the rest of the heart-muscle. This event generates a spreading, plane sound, while being shown in the visualization. The electrocardiograms (ECG/ German: EKG), which are shown on the sides and trigger the events mentioned above, are finally sonified and spatially placed like they are shown on the screen. The program's main focus is not the analysis of ECG data, rather it's a try to synchronize auditive and visual perception in an animation for teaching purposes.

Mixtures and recollections (1981: 5 minutes) David Worrall

This short work is a study in spatial counterpoint. It uses physical space to mix, differentiate and occlude a three-part repeating “canon” of the random ordering of harmonics of the tones of the Gregorian chant Veni Creator Spiritus. Each of the three parts circles in quadrophonic space at a different velocity. At each “invocation,” of each of the three parts, the harmonics are resorted (or re-collected) so that they are eventually all in ascending pitch order. All three parts eventually come together in time and space. In performance the musical flourishes or gestures are formed by the spatial coincidence spatial of tones from all three layers. This is somewhat emphasised in this 2 channel mix. [Melbourne University Computer Music Research Project studio. Software Synthesis on a Mainframe using Music-C sound synthesis software. Programmed by the composer in APL. 14 bit DACs on a mainframe computer with sound synthesis using Music-C]

I am on the net through an interface different to the one you use when you do (2005: 8 minutes) David Worrall

This is an installation work which employs language translation software to provide "resonances" of original spoken and textual materials in multiple-listening-post installation spaces. The inexact nature of such language translations (such as that provided by the babelfish website, for example) are used to resonate the text using multiple feedback pathways to create a "Chinese whispers" environment.

The text for I am on the net is based on a translation of the composer Alvin Lucier's I am sitting in a room (1970) for voice on tape. Here is Lucier's original text:

I am sitting in a room different from the one you are in now. I am recording the sound of my speaking voice and I am going to play it back into the room again and again until the resonant frequencies of the room reinforce themselves so that any semblance of my speech, with perhaps the exception of r-r-r-rhythm, is destroyed. What you will hear, then, are the natural resonant frequencies of the room articulated by speech. I regard this activity n-n-n-n-not so much as a demonstration of a physical fact, but more as a way to s-s-smooth out any irregularities my speech might have.

Lucier's text is morphologically transformed into:

I am on the net through an interface different from the one use when you do. I am submitting the coding of my written text and I am going to submit it back into the net again and again until the resonant syntaxes of networked mind reinforces itself so that any semblance of my text, with perhaps the exception of of of subject, is destroyed. What you will hear, then, are the natural resonant syntaxes of networked mind articulated by text. I regard this activity not not not not so much as a demonstration of a linguistic fact, but more as a way to to to smooth out any irregularities my text might have.

Examples of transformations of this text can be found at:

http://www.avatar.com.au/worrall/index.php/installations/1-i-am-in-the-net-through-an-interface-different-from-the-one-you-use-when-you-do

Air for flutes and live electronics (1989: 15 min.)

Flute: Mardi McSullea. Electronics: David Worrall

Air is in two movements and consists entirely of flute and transformed-flute sounds. It opens with an Alap - a prelude movement for solo flute in which the musical materials of the work as a whole, including an extended range of techniques such as multiphonics, key-clicks and other noises, are gradually exposed. It is played with a sense of drama and intensity which is enhanced by the flautist sometimes being required to inhale through the instrument. The flute is discreetly amplified with some reverberation.

The second movement is an improvisation and consists of live flutes and computer–controlled streams of sampled and transformed flute sounds. In preparation for the performance, the flautist and electronicist plan the improvisation within the guidelines given in the score. They then select from a large collection of samples of the transformed flute sounds, and prepare various subsets to be used at various stages according to the plan.

Air was commissioned by Mardi McSullea and first performed by her and the composer using his Streamer performance software in Canberra in 1989.

Cords 2b (1994: 18 minutes) David Worrall

In its original form Cords is a polymedia performance work for real-time computer animation and computer music using digital feedback techniques. In the original version, made in collaboration with Virginia Read, the music emanates from 16 channels of loudspeakers in a portable performance space: a 7 metre radius geodesic hemisphere, and the images are projected on large screens encircling the audience (pictured on the first Page.)

Cords 2b is a stereo sound-only realisation with more sophisticated real-time analysis and response algorithms.

The work is in three movements, a plucked drone softly pulsing throughout:

1. Plucked string sounds with accelerando/decelerando percussion accompaniment.
2. Percussion solo featuring simultaneous lines, each with different tempo schemes.
3. Bowed string sounds with percussion accompaniment.

Cords 2b was composed on two on Macintosh Plus computers and performed in real-time using the composer's own software Streamer, written in FORTH.

David Worrall's Biography

David Worrall is an experimental composer, and scientist in the Experimental Audio Research group at the of the International Fraunhofer-Institut für Integrierte Schaltungen in Erlangen, Germany and an Adjunct Senior Research Fellow in the School of Music at The Australian National University. He has published both creative works and scientific papers, won various awards and held fellowship positions in Australia, UK, Europe and the USA. His creative practice encompasses instrumental and electroacoustic composition, sound poetry, polymedia installations that include the design and construction of portable event theatres, the development of software frameworks for music composition, text transformation as well as the sonification of information in large or high-frequency multivariate datasets. His current research at Fraunhofer IIS includes the use of sonification for monitoring biomedical symptoms and computer networks.

David has been actively involved in the establishment and governance of a number of organisations. He is currently a Board Member of the International Community for Auditory Display (ICAD) and Regional Editor for the journal Organised Sound (Cambridge University Press) for which he has just co-edited a issue on data sonification. In 2009 he was made an Honorary Life Member of the Music Council of Australia.

Details zur Open CUBE Konzertreihe unter:

http://iem.kug.ac.at/veranstaltungen/open-cube.html