Summer School in Sound and Music Computing 2007, Stockholm

List of mini-project proposals

PROPOSAL BY THE CLOSED PROJECT: JULY 2-4, 2007

http://closed.ircam.fr/

Although sound technologies offer nowadays inexhaustible possibilities, the creation in sound design must still meet the functional constraints linked to the aesthetic concepts, considering a specific context of use. The aim of the mini-project on sound design is to approach the sound design process in three main steps to create informative sounds:

Phase 1 (Day 1 -> 2 hours): ANALYSIS

- **phase 1.1**: HGKZ. Introduction of examples illustrating coupling of sound and action in everyday life and discussion of questions that emerge in analyzing them. Participants will be provided a simple design framework, and will be led in a short ideation exercise to generate design concepts.
- **phase 1.2**: IRCAM. Starting from a catalogue of classes of existing sounds (resulting from a task-in-progress done at Ircam about classification levels), participants will perform a perceptive experiment in order to produce a description of the sound properties to communicate an appropriate action for a specific design concept case defined before. This description will contribute to the design project specifications on Phase 2.
- **phase 1.3**: HGKZ+IRCAM. Design project specifications for a restricted and pre-defined set of actions: exhaustively, « crumpling », « rolling », « bubblestream », « bouncing-shake », « friction », but possibly, 3 among these 5 will be chosen.

Phase 2 (Day 2 -> 2 or 3 hours): CREATIVE SYNTHESIS

- **phase 2.1**: UNIVERONA. Participants will be asked to write down how they would sonify each action, and which expectation they have from their sonification plan.
- **phase 2.2**: Sound production tools will be provided to the participants on the basis of physical modeling algorithms. A number of presets will be proposed as well (see the Closed Deliverable D2.1). This tools will enable to form a grid of possible sounds, through proper parameterizations of the proposed synthesis algorithms. Patches will be provided with the possibility of dumping the generated sounds onto the hard disk. In this way the participants will be able to first produce a variety of sounds, then to partial rework and reorganize them by means of a multitrack wave editor in order to generate more complex and articulated sonic examples. As a result of the project, the participants will be asked to write down :
  - a track of the modifications that they operated to the preset parameters
  - a written log of the actions taken in the mixing phase
  - a free analysis of the results obtained

Phase 3 (Day 3 -> 2 hours): VALIDATION

- **phase 3.1**: IRCAM. An evaluation test, where all the participants play the role of users for the sounds generated by the other participants : in this last phase, participants will perform another perceptive experiment in order to mutually evaluate their own productions in term of comparing the sound creations with the specifications.
- **phase 3.2**: NIPG. An active learning experiment will be processed by means of the preset parameters chosen by the participants and evaluated in the test. We will demonstrate how psychoacoustically inspired signal processing in conjunction with machine learning techniques for temporal sequence processing (Hidden Markov Models) can be used to automatically determine the function of sounds, given a sufficient amount of training samples. The underlying theory will be explained and a couple of experiments will be conducted with HTK (Hidden Markov Model Toolkit) exploring different configurations of the model. These methods show approaches that - in the future - can lead to a general purpose tool for automatically predicting functional-aesthetic attributes of sounds, thereby serving as a tool in a semi-automated sound design process.

PROPOSALS BY THE BRAINTUNING PROJECT: JULY 2-5, 2007

http://www.braintuning.fi/

Head-Bang-O-Rama

Manager: Anders Friberg (KTH)

Similar to Guitar Hero or Virtual Air guitar ((http://www.virtualairguitar.com/) the user play/control the music by headbanging. The head is potentially a powerful gesture controller since the balance system provides extensive feedback about the head movement to the user. Several types of control can be envisioned. A simple one would be to just control the intensity of the music with the intensity of the headbanging. Another possibility could be to decode the emotional expression of the head movement and translate that to the musical expression. This is rather straightforward using the tools at KTH. Technically, the idea is to use a TrackIR device (http://www.naturalpoint.com/trackir/) that senses head movement and rotation in 3D and connect that to pd (pure-data). A bit of c code needs to be written for the connection between TrackIR and the pd. The rest could be implemented in pd.

The MusicalBook

Managers: Roberto Bresin (KTH) and Gualtiero Volpe (InfoMus lab, Genova)

This project combines computer vision (Eyesweb) with expressive music performance (pDM) .
The main idea is to develop a new musical instrument that is based on a book for children. Each page of the book shows a different musical instrument on a colourful background (red, yellow, blue, green, etc.). Each instrument has different background colours. By recognizing the colours on the book pages, the book itself can be used for controlling the soloist instrument in a music score. By analysing the movements of the book (i.e. speed of page turning, characteristics of gestures, movement patterns, etc.) it will be possible to control the expressive content of the music performance. Possible use of this new musical instrument could be in music therapy for children.
Tools which will be used in this mini-project are:
Eyesweb: http://www.eyesweb.org/
pDM: http://www.speech.kth.se/music/performance/download/

Emotion classification of film music examples

Manager: Olivier Lartillot

The objective of the project is to characterize various classes of emotions evoked in film soundtracks in terms of their respective audio and musical features.

Two sub-projects can be distinguished: one that assumes a set of five basic emotions (happy, sad, tender, angry and fear), another where emotions are projected into a three-dimensional space (activity/valence/tension).

Each project uses the same corpus of musical material, comprising a large repertoire of contemporary film soundtracks. The rating of the emotional contents of the corpus has already been carried out at the University of Jyväskylä. In addition, the participants of the project are invited to rate the examples by themselves, and might also, depending on the time available, conduct the experiment among other participants of the summer school. In parallel, audio and musical features will be extracted from the soundtrack examples, using the MIRtoolbox program that has been developed by our team. Mapping of the audio and musical features to the emotion ratings and categories will be carried out using different visualization, statistical and data-mining techniques.

This project is expected to offer an example of the state-of-the-art audio feature extraction scheme, new insights to the area of music and emotion, and in particular present comparisons between these two dimensional and categorical approaches to music-induced emotions.

Suggested reading:

T.-L. Wu and S.-K. Jeng. "Automatic emotion classification of musical segments". ICMPC 2006.

G. Tzanetakis, and P. Cook. "Musical Genre Classification of Audio Signals". IEEE Transactions on Speech and Audio Signal Processing, vol. 10, no. 5. pp. 293-302 , 2002.

Scherer, K. R. "Which Emotions Can be Induced by Music? What Are the Underlying Mechanisms? And How Can We Measure Them?" Journal of New Music Research, Vol. 33, No. 3, pp. 239-251, 2004.

PROPOSALS FOR APPLICATIONS WITH MOBILE PHONES: JULY 2-5, 2007

Rapid-prototyping of mobile music applications
Manager: Lalya Gaye (Viktoria Institute)
Applying the design and prototyping techniques described during the mobile music technology lectures, sketch a novel mobile music or locative audio application. Within groups, you will come up with concepts that you will further develop using simple props and design scenarios, and illustrate possible implementations by prototyping them on mobile phones using for example Python.

Audio applications for the mobile phone
Manager: Sten Ternström (KTH)
These projects are all about acoustic analysis. They are not novel ideas by themselves - the challenge is to identify the constraints imposed by the mobile phone platform and to suggest solutions; and to implement a simulation or prototype.

- Tuning meter for guitarists. Can the concept of instantaneous frequency (see e.g. Roark, 2006) be used for F0 extraction?
- A voice accumulator that displays statistics of SPL and F0 over several hours (radio turned off). Assume a contact
  microphone, so that ambient noise can be ignored. There is literature that establishes an approximate relationship between SPL and contact mike level for speech.
- F1-F2 vowel pronunciation analyzer. How might one display F3 as well? (needed for Swedish)
- Room reverberation analyzer. Is popping a balloon a good excitation method or not?
- SPL meter for pop concerts and clubs. Are high sound levels a measurement problem on this platform, or not?

Suggested reading:
Roark RM (2006): Frequency and Voice: Perspectives in the Time Domain Journal of Voice, Vol. 20, No. 3, pp. 325–354