Ben Neill and Bill Jones - Posthorn

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Abstract
This paper describes the interactive computer system used in *Posthorn*, a multimedia composition which is performed on Neill's self-designed instrument, the *mutantrumpet*. The technology and aesthetics of the system and the merging of acoustic instrument performance with software-based improvisation are explored in detail.

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Guides, instructions, author's kit, conference publications

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H5.m. Information interfaces and presentation (e.g., HCI): H.5.5 Sound and Music Computing: J.5 Arts and Humanities:

General Terms

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Posthorn is a live performance piece by Ben Neill and Bill Jones for Neill's self-designed mutantrumpet/ interactive computer system. The work is titled after and based on the "posthorn solo", a section of the third movement of Gustav Mahler's Symphony No. 3, originally composed in 1898. *Posthorn* represents the most advanced interactive techniques and ideas that have emerged out of their collaboration which began in the mid 1990's. While their projects have taken on various forms, all of the work they have created together is concerned with merging sound and visual media through live interactive performance technologies.

Neill's mutantrumpet is an electro-acoustic instrument with a wide range of control capabilities. Initially an acoustic instrument (a combination of 3 trumpets and a trombone combined into one), Neill made the instrument interactive with electronics in the mid 1980s when collaborating with the synthesizer inventor Robert Moog. In 1992, while in residency at STEIM's (Studio for Electro-Instrumental Music) research and development lab for new instruments in Amsterdam, Neill made the *mutantrumpet* fully computer interactive. In 2008 Neill created a new version of his instrument during another residency at STEIM.

The mutantrumpet is a highly refined MIDI (Musical Instrument Digital Interface) controller, which enables Neill to interact with a variety of music and video software and hardware. A pickup in the mouthpiece of the instrument attached to a Pitch-to-MIDI converter transforms the acoustic notes and dynamics of Neill's playing to MIDI data. The converter generates note, velocity, volume and aftertouch information. The mouthpiece pickup avoids any possibility for feedback

figure 1 – the *mutantrumpet*, designed by Ben Neill, with STEIM Junxion board and multiple MIDI controllers. Photograph by Eric Calvi

or glitching of the Pitch-to-MIDI device. In addition to the MIDI generated from the acoustic sound, the mutantrumpet has 16 manual controllers in the form of 4 potentiometers, a fader, 2 joysticks with X/Y axis control capability, and 8 momentary switches. These controllers are connected to a Junxion board, a hardware/software interface designed by STEIM. The Junxion system provides great flexibility in routing and managing the MIDI control of the mutantrumpet. One of the more advanced capabilities is the table function, which allows the user to shape the control data through the use of visual graphs. This makes it possible for the MIDI controllers to be constrained to specific scales and patterns in addition to straight linear response curves. The instrument connects directly to the computer via USB.

Acoustically, the mutantrumpet is also expanded from the conventional trumpet design. It has three bells rather than the normal single bell, two sets of valves, and a trombone slide. The extra set of valves controls switching between the 3 bells as well as providing a quartertone valve. Frequently different mutes are used to give each bell a distinctive timbral quality. There are two normal B flat trumpet bells, and one piccolo trumpet bell that is attached to a trombone slide, giving the capability for a true glissando. A clip-on microphone is attached to the bottom bell, this makes the acoustic sound of the instrument available for processing. The acoustic capabilities are designed with electronic performance in mind. The instrument enables acoustic generation of sonic gestures and materials such as filtering and timbral manipulation that are not normally possible on an acoustic instrument. This produces a kind of feedback loop in which acoustic and electronic sound worlds are constantly influencing and affecting each other.

Posthorn uses sampling to transform a pre-existing piece of classical music, a technique Neill has used in several of his previous works. The choice of the "posthorn solo" from the Mahler *Symphony #3* was made in order to emphasize the expressive capabilities of the mutantrumpet and its interactive sonic and visual elements. The solo in the symphony is a kind of pastoral meditation in which the movement of the piece stops and a distant, offstage trumpet is heard playing a simple, taps-like horn call. The expressive quality of 19th century music is exemplified in this excerpt, and offers many opportunities for recontextualization. Writers and conductors have written extensively about this rather extreme section of the symphony emphasizing its strong associations to memory, longing, and detachment. The movement is subtitled "What the Animals in the Woods Tell Me", and the posthorn represents the voice of man in the forest. In *Posthorn*, the forest has been replaced with a virtual sonic and visual environment that is modulated by the dynamics of the live instrument. Mahler indicates in the score that the solo should be played "as if from a far distance", and in performances the soloist is usually offstage or in another part of the hall. This concern with spatiality is also interesting to revisit in light of 21st century musical aesthetics and technologies. *Posthorn* uses dramatic spatial manipulations in its performance.

The basic musical shape of *Posthorn* is fixed according to the melodic structure of the Mahler piece. While the melody is kept somewhat intact, its details are improvised both in how the melodic material is unfolded

and in the timbral variations and dynamics of each performance. The time scales of the original music are extended in both directions, with some sections greatly elongated and others sped up to extremely fast tempos. The dialogue between the acoustic instrument and the interactive system provides another improvisational element. The sonic and visual feedback from the interactive media guide the work into unforeseen areas each time it is performed.

In *Posthorn* three computer programs respond to Neill's playing in real time. The pitches and dynamics of the acoustic performance are first translated into MIDI information, then sent to all three programs simultaneously. LiSa, a live sampling program from STEIM, enables Neill to grab samples and modify them in real time. The live samples of Neill's playing are transformed on the fly through a variety of DSP (Digital Signal Processing) functions controlled by the MIDI controllers on the mutantrumpet. Samples of earlier performances of the piece can also be recalled and combined with the material that is evolving in real time. This reflects back on the concept of memory in the original Mahler work.

The second program is Ableton Live, which enables Neill to trigger and modify the playback of MIDI sequences from the mutantrumpet and to process the audio output of LiSa using DSP functions such as GRM (Groupe de Recherches Musicales de l'Institut National de l'Audiovisuel) Tools. The MIDI input from the mutantrumpet triggers a sample of the orchestral chord which immediately precedes the entrance of the posthorn solo in the original symphony. As the piece progresses the sample is modified in pitch, duration and density by the dynamic and pitch content of the acoustic sound as well as the mutantrumpet's on-board MIDI controllers.

The third program, Modul8, runs on a second computer and translates the MIDI data from the mutantrumpet into real time digital video control. The dynamics of the live acoustic instrument performance modify one set of parameters in the video, and the live sampled material creates another set of visual effects. Neill is also able to manipulate the video from the manual MIDI controllers on the mutantrumpet. Bill Jones creates the video footage and control matrix for this part of *Posthorn*. The imagery consists of digital video samples of the natural world, a virtual response to Mahler's original journey through the forest.

Posthorn is an exploration of the expressive possibilities of interactive performance. As new technologies continue to be developed, more refined systems are emerging in which computers become creative partners with artists in the process of making music and art. This expressive potential of interactive performance also points to improvisation, which plays an important role in *Posthorn*. Interactivity implies improvisation in order for the user to fully explore the capabilities of a system. The degree to which it is employed can vary widely, but some element of spontaneity is demanded by the new interactive interfaces that are being designed today. The interaction of the sonic and visual media systems in *Posthorn* creates what writer Matthew Fuller has termed a "media ecology", in which multiple processes are combined into a creative ecosystem.

With the advancement of new live performance software applications it is possible for a composer to create structures that utilize a variety of media and

that are varied, enhanced and modified through improvisation. A composition becomes a set of potential possibilities rather than a fixed set of sounds and images. *Posthorn* employs this kind of open structure, while still adhering to the basic outline of a preconceived musical form.

The ideas of multiplicity and hybridity are central to the composition and performance of *Posthorn*. The MIDI information that is generated from Neill's performance is applied to both the sonic and visual realms simultaneously in real time, with one set of data being interpreted by several different computer programs at once. This type of dynamic interactive performance offers tremendous potential for the future. A truly synthesized audio/visual art form is now possible through the evolution of computer interactivity, and *Posthorn* is an example of this new kind of work.

figure 2 – Live performance of *Posthorn*, Issue Project Room, Brooklyn, NY, March 2009.

figure 3 – Still from *Posthorn* interactive video

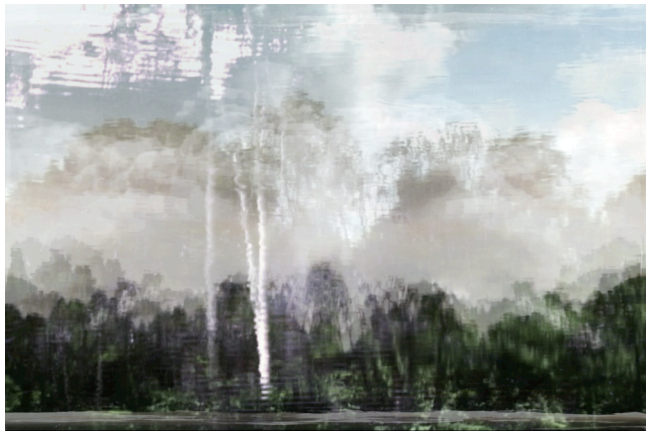

figure 4 – Still from *Posthorn* interactive video

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