

# Horizontal

Ben Neill

Ramapo College of New Jersey, Mahwah, NJ  
bneill@ramapo.edu

**Abstract.** *Horizontal* is a series of audio-visual pieces by composer Ben Neill for his self-designed electro-acoustic instrument, the *mutantrumpet*, with live interactive audio and video. The pieces utilize digital reproductions of paintings by artist Andy Moses as their visual material. Musically the work blends Neill's richly timbral melodies and textures with glitchy, minimal beats and deep sub bass lines. A series of subtly shifting sonic animations of Moses' paintings are generated simultaneously with the music through Neill's performances on the *mutantrumpet*. *Horizontal* is flexible in duration and can be presented either in a performance or installation format.

**Keywords:** new interfaces for musical expression, audiovisual, multimedia, acoustic and digital, human computer interaction, improvisation

*Horizontal* is an audio-visual performance by composer Ben Neill with imagery by painter Andy Moses. In *Horizontal* live computer interactivity is implemented in the realms of both digital audio and video simultaneously using Neill's self-designed hybrid instrument, the *mutantrumpet*.

Hybridity has become a term commonly used in cultural studies to describe conditions in contact zones where different cultures connect, merge, intersect and eventually transform...In the case of digital environments, we must also address communicative interaction in the convergence of real and virtual spaces. Digital hybridity works across and integrates a diverse range of modes of representation, such as image, text, sound, space and bodily modes of expression. (Spielmann and Bolter 2006)

The concept of hybridity is a central focus of Neill's work as a composer/performer. The *mutantrumpet* itself is a hybrid amalgam of expanded acoustic instrument and electronic technologies. The synthesis of audio and visual material has been a strong theme throughout Neill's career, as well as the blending of ideas and compositional techniques from high art and popular culture. *Horizontal* continues these multimodal approaches, blending improvisation with composition and blurring the lines between art music, popular music and visual art.

The *mutantrumpet* was initially designed as an acoustic instrument combining three trumpets and a trombone in the early 1980's. Neill added electronics in the mid 1980's when collaborating with synthesizer inventor Robert Moog. In 1992, while in residency at the STEIM (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, and has continued its development there in 2014 and 2016. The current *mutantrumpet* has two normal B flat trumpet bells, two sets of valves, and one piccolo trumpet bell that is attached to a trombone slide, making glissandi possible. The extra set of valves controls the switching between the three bells, and different mutes are used to give each bell a distinctive timbral quality. Half valving makes timbral shifts reminiscent of electronic filtering possible, and a quartertone valve enables microtonal performance. The acoustic trumpet sound is converted to MIDI data via a pickup in the mouthpiece connected to a pitch to MIDI converter that generates note, velocity, volume and aftertouch information. The current *mutantrumpet* incorporates a STEIM Junxion board, mounted under a plate of clear Lexan plastic. There are eight momentary switches on the Lexan panel, as well as four continuous MIDI controllers in the form of potentiometers and a fader. On top of the instrument, right next to the second set of valves, are two joysticks with X/Y axis controls. Another potentiometer is mounted on the first valve slide, located on the other side of the instrument body. The *mutantrumpet* connects to the computer via USB; the Junxion software maps the controllers on the board to a variety of routings. Many different configurations can be created in Junxion, including tables which shape the response curves of the controllers. There is a clip-on microphone attached to the bottom bell, making the acoustic sounds of the instrument available for processing. All MIDI notes are generated by

the mouthpiece pickup, which helps to minimize feedback or glitching of the Pitch to MIDI device. Software applications frequently used include Junxon, LiSaXC (the STEIM live sampling program), Ableton Live, Jack Router, and numerous audio plugins. Resolume is used for the live video interaction.



Figure 1. The current version of the mutantrumpet, built in 2014.

Subotnick describes the two types of input control in live electronic performance as “static control in which the computer is told to activate certain functions by simple start/stop commands” as well as “dynamic control in which some form of sensing device is used which reads aspects of performance qualities.” (Subotnick 1999) Both approaches are used in *Horizontal* and are applied to several different processes.

## 1. Live sampling with LiSa XC

As Neill performs, the acoustic sounds of the mutantrumpet are sampled in real time using LiSa XC. The sampling process is triggered by switches on the instrument. One switch initiates replacing the sample buffer, another overdubs the sound to the existing recorded audio. The samples are then played back either through Neill’s played MIDI notes or by Ableton Live, whose MIDI sequences can control the playback of LiSa. Neill modifies the samples in real time as they are played back using the instrument’s continuous MIDI controllers. Parameters that are modulated include filtering, length and start points of the samples, granular synthesis, duration, pitch, and dynamics. The output of LiSa is connected to an audio track in Ableton Live through Jack Router, making the live sampled sounds available for further processing using plugins in Live. The live sampled sounds are directly connected with the acoustic performance and make up the

primary melodic and harmonic structure in the music. The emphasis is on transformation of the acoustic sounds into complex sonorities and textures.

## 2. Ableton Live performance control

*Horizontal* is an open ended performance which is broken up into multiple sections or scenes of flexible duration. The mutantrumpet's switches are used to navigate through and activate the scenes. Ableton Live is fully controlled by the mutantrumpet's continuous and momentary controllers. Software synthesizers are played directly from Neill's notes and dynamics, and the percussion and bass sounds are also triggered in Live. Live's capability to introduce chance or random elements to the playback of sequences is utilized extensively. In addition, Ableton sends program changes to the video program Resolume that trigger the visual presets for each piece.

## 3. Resolume video control

The visual component of *Horizontal* consists of sonic animations of paintings by Andy Moses. Each section uses digital reproductions of two paintings that are mixed and animated in real time using Resolume's MIDI and audio control capabilities. The mutantrumpet's controllers are mapped to both audio and visual parameters, creating a true synthesis of the two media in performance. For instance, filter frequency is often mapped to the same controller as image brightness or color, creating a perceptible connection between the audio and visual dimensions. The joysticks, which are frequently used for pitch control of live sampling, are mapped to tables that outline the harmonic series; this overtone mapping is also applied to the visual parameters, creating audio/visual harmonics. The audio of the mutantrumpet, its directly played synthesizers in Live, and its live sampled sounds are all used to animate the visual material. The visual feedback can help the audience to perceive the interactivity of the performance. (Arfib 2005)



Figure 2. Still from *Horizontal* video, original images by Andy Moses

Moses' paintings are a futuristic hybrid of abstraction and landscape suggesting the theme of a horizon through the use of smooth horizontal lines. Often painted on concave and convex surfaces that resemble Cinerama movie screens, the luminous pieces evoke a sense of dynamic movement and the play of light. Neill chose the imagery because of its simplicity and minimal composition, which directly relates to his musical aesthetic. Following on the theme of dynamics and light in Moses' paintings, Neill's performance highlights the simultaneity of sonic and visual control. The video can be mapped on to multiple screens or projectors depending on the venue and mode of presentation. In addition to concert performances, *Horizontal* has also been presented in an installation format.

Neill has always conceived the mutantrumpet as a vehicle for his compositional ideas and approaches as opposed to being primarily a design project; the instrument is inseparable from its musical applications. As discussed in a recent *Leonardo* article by Johnston and Ferguson, “We need to consider fully the reciprocal relationship between the new instrument and creative practice, not just how well it supports existing practices, which are implicitly assumed to be static.” (Johnston and Ferguson 2016) Since “real-time operation is in fact better suited to performance and improvisation than to genuine composition” (Risset 1999), over time Neill has incorporated more improvisation into his performances. By populating pre-composed rhythmic and harmonic structures with spontaneous musical material played acoustically, a dialogue is created between the acoustic and electronic elements of each piece. The multi-timbral quality of the mutantrumpet’s acoustic sound adds to the complexity of the sonic exchange. The emergent melodic and harmonic patterns that unfold from the improvisational process often become primary material in the compositions. Jordà and Keith have both discussed the importance of improvisational approaches in performance with new instruments.

The performer is not in control of everything; some external, unpredictable forces, no matter what their real origin or strength are, affect the system, and the output is the result of this permanent struggle. Whether surprise and dialogue is encouraged through randomness, by ungraspable complexity or by the machine’s embedded knowledge, independently of the degree of unpredictability they possess, at their best, these new instruments often shift the centre of the performer’s attention from the lower-level details to the higher-level processes that produce these details. The musician performs control strategies instead of performing data and the instrument leans towards more intricate responses to performer stimuli. (Jordà 2007)

Improvisation has particular value for the single-performer-and-computer model, as external musical influence in the form of either collaborators or instrumental input is absent. This can run the risk of developing a ‘closed circuit’ in which the performer bears complete responsibility for navigating a fixed musical space. By developing a more reciprocal interchange between human agents and performance software, the concept of performance in contemporary electronic music is expanded from a reliance on pre-built arrangements, loops, and structures, to one that incorporates elements of real-time music creation—focussing on creative interaction, improvisation, and immediacy. (Keith 2010)

The combination of composition and improvisation is reflected in the video component of *Horizontal* as well. While the same images are always associated with specific sections of the music, the variations of the resulting video are different each time the work is performed depending on a complex series of interactions between the physical performance and software. “The only way to find things out about what happens when complex objects such as media systems interact is to carry out such interactions – it has to be done live, with no control sample.” (Fuller 2005) In designing the video, limiting the scope of the controlled parameters is very important in order to keep the shifts of color, movement and dimensionality within a subtle range that is implied by the paintings. The articulation of the images is as important to the overall performance as the musical decisions, and the multiplicity creates unexpected results. “Multiplicity is induced by two processes: the instantiation of particular compositional elements and the establishment of transversal relations between them. The media ecology is synthesized by the broke-up combination of parts.” (Fuller 2005)

Like many of Neill’s projects, *Horizontal* demonstrates strong influences from popular music. This is another example of the notion of hybridity that is central to Neill’s artistic output. A former student of minimalist La Monte Young and a long time denizen of New York City’s downtown music scene, Neill has always embraced popular music along with avant-garde ideas and practices. “Following on minimalism’s ground breaking innovations, postmodernism gave 1980s art-music composers license to utilize popular culture elements and techniques as never before.” (Neill 2002). As described by Keith, “recent years have shown little discernible increase in the relationship between computer music research and more popular music forms, a number of intrepid live coders notwithstanding.” (Keith 2010) *Horizontal* is the latest example of Neill’s artistic project, which is aimed at bridging the gaps between new musical instrument design and popular culture. “Ben Neill is using a schizophrenic trumpet to create art music for the people.” (Berry 1997)

## Additional Information

Examples of the music and video:

Video: <https://youtu.be/IWI2TsBzR9c>

Album: <https://open.spotify.com/album/0RQZdGgXHNo4rD0Zoc792j>

Mutantrumpet demonstration video: <https://www.youtube.com/watch?v=umBVBu6nFbl>

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