https://econtact.ca/12_4/weinel_psychedelic.html

Bass Drum, Saxophone & Laptop

REAL-TIME PSYCHEDELIC PERFORMANCE SOFTWARE

by Jon Weinel

Taking a performance by Z'EV and John Zorn as an inspirational starting point, *Bass Drum, Sax & Laptop* is a piece of software designed with Max/MSP which facilitates improvisational real-time performance for live instruments and electronics. This software and the music produced with it are a continuation of my research regarding compositional techniques that elicit altered states of consciousness. DSP effects are incorporated which process the live instruments, while a sampling module, the "atomizer", produces sound which is mimetic of visual patterns of hallucination. An integral feature of the software is the ability to automate control parameters temporally so that they respond to the live performance. This facilitates a system of interactivity in which the performers respond to the software and vice-versa. The resulting spontaneous interactions and temporally shifting effects are intended to create an analogy between the sounds produced and the complex biological processes which produce dreams and hallucinations. In this article I will discuss the development of the software and its realisation in performance with Sol Nte on saxophone and myself on bass drum.

Concept

Bass Drum, Sax & Laptop

[1. Patch and further documentation available on the author's website (http://www.jonweinel.com).] is a piece of software designed to facilitate an improvised live performance for bass drum and saxophone with real-time audio processing and sound generation. This patch develops my research regarding compositional techniques to elicit altered states of consciousness. "Altered states of consciousness" (ASCs), refers to states of dream, delirium, hallucination and others which fall outside of "normal" conscious experience as defined by Roland Fischer (Aldridge and Fachner 2006). The premise of this research is that features of ASC experiences can be reflected in composition through the production of mimetic sonic material.

[2. "Mimetic" refers to Simon Emmerson's discussion of "mimetic discourse", which describes the signifying potential of sound resulting from referential or extrinsic qualities. See Emmerson 1986.] For example, in previous fixed works I have explored the use of granular time-stretching to create drones which convey distorted time perception, where a single moment seems to last for a longer time than usual (this feature is commonly described in ASC experiences). Extending the tangible length of a sound from its usual finite duration towards one which is flexibly longer signifies the distortions to time perception which may occur in an ASC experience. This is concordant with Smalley's discussion of continuant phases of sound which can achieve dissociation from temporal notions of onset and termination (Smalley 1986). Techniques such as this and others can be used in context to create a psychedelic performance which analogously conveys features of an ASC experience.

Temporal Techniques to Convey ASCs

ASCs can be reflected mimetically through the use of temporally changing audio effects. Changing parameters of DSP effects in time can reflect shifts in conscious perception. This can be achieved in a variety of ways.

Changing spectral properties of the sound source creates shifts in timbre, colouring the sound. This reflects the manner in which colour perception of an object may be perceived as shifting temporally in an ASC experience. Different aspects of the colour of an object may appear more pertinent to the observer in an ASC experience at different points in time. For example, the pink shades of a terracotta pot may be more noticeable at one time, while the orange shades may be more noticeable at another. This can be reflected in visual media by mixing the colour values of an image to bring out different shades which are inherent in the object. A similar process can be used in sound by using temporal implementation of filters or ring modulation, which colour the frequency spectrum and enable analogous shifts in the spectral aspects of the sound source which will be perceived.

A comparable process can be applied to reverberation and room presence. By shifting the amount and quality of reverb which is applied to the source sound, it is possible to reflect changing perceptions of room characteristics. In an ASC experience, at one time a room may appear small and claustrophobic, while at another time it may seem cavernously large. At times the room itself may fade into insignificance if the attention of the observer is focused only upon the objects within it. The room itself has not changed, merely the perception of the observer. These shifts in room perception may be reflected analogously through shifting the parameters of reverberation.

Delay effects can be used to portray the visual trails which are described in hallucinogenic experiences. In an ASC experience, visual trails appear as an echoing of visual phenomena. This creates a trail of repeated iterations of a moving object which follows the original source. Delay effects

achieve this in sound.

Finally, sensory derangement can also be simulated through non-realistic use of spatial effects such as Doppler shifting; a sound source can be made to move unrealistically or erratically around the spatial field, as a means to reflect delirium or sonic hallucination.

We may presume that ASCs occur as a result of complex biological interactions. Therefore, the manner in which these shifting effects are used to convey an ASC experience should mimetically reflect the processes of these complex biological interactions. Using shifting DSP effects appropriately to convey an "organic"
[3. Use of the term "organic" in this article refers to mimetic arrangement of sonic material and processes analogous to complex biological interactions.] derangement of the senses is the main principle upon which the *Bass Drum, Sax & Laptop* software is based.

The Atomizer

Bass Drum, Sax & Laptop is preceded by the *Atomizer Live Patch*
[4. Patch and further documentation available on the author's website (http://www.jonweinel.com).], a piece of software which facilitates real-time electroacoustic performance in order to create compositions which reflect ASCs. The focus of the *Atomizer Live Patch* was the development of a specialist technique to reflect visual patterns of hallucination using streams of rhythmic and micro-rhythmic sound. Summarised: rapid rhythmic pulses were placed in circular motion within the auditory spatial field to create sound which is mimetic of the spiral, vortex and pin-point dot patterns of light experienced in psychedelic hallucinations.
[5. The concept of using short rhythmic and micro-rhythmic sound to mimetically convey visual patterns of hallucination is discussed in greater depth in my article "Entoptic Phenomena In Audio," currently unpublished.] This technique is continued in *Bass Drum, Sax & Laptop* with the inclusion of a sampling module known as the "atomizer", which was developed from the previous patch. The atomizer acts as a third method of sound generation which can be triggered by either the bass drum or the saxophone.

Real-time Interaction as Analogous to Organic Process

We may presume that ASCs occur as a result of complex biological interactions: organic processes. Hallucinations can be considered as resulting from a complex interaction between the human sensory system and the imaginative processes of the brain.

[6. This is indicated in Heinrich Klüver's study of mescaline hallucinations, *Mescal and Mechanisms of Hallucinations* (Chicago: University Of Chicago Press, 1966).] Therefore, the manner in which the shifting DSP effects are used to convey an ASC experience should mimetically reflect the organic nature of these processes.

The *Bass Drum, Sax & Laptop* software achieves an organic implementation of shifting DSP effects through a system of interactivity which places the performers in an interactive system with the software. Three agents in this system are involved in an interactive process which happens in real-time: the sax player reacts to the drummer and the laptop, the drummer reacts to the sax player and the laptop, and the laptop reacts to both the drummer and the sax player. The laptop software expands this system of interactivity by manifesting an additional level of interaction between all three agents to produce the temporally shifting DSP processing and the introduction of additional sounds. The focus on spontaneous interaction between the three agents enables *Bass Drum, Sax & Laptop* to further the ASC analogy, because each performance evolves uniquely and organically. In the course of this article I shall demonstrate how this was achieved.

Stimulus

The main inspiration for the choice of instrumentation came from a performance by John Zorn on saxophone with Z'EV on percussion at the Equinox Festival 2009.

[7. YouTube user "shuffleboil" has posted the video "John Zorn and Z'ev duo @ Equinox Festival, London 12.06.09 (http://www.youtube.com/watch?v=zLBG-9nEccY)" (14 June 2009, dur. 4:08) of their 12 June 2009 performance.] Z'EV plays percussive instruments of his own design to create altered consciousness experiences through animist

[8. Animism is a philosophical belief which asserts that animals, rocks, plants and other non-human entities can be considered to have a spirit or soul, as well as humans. Animism is discussed in Z'EV's article "We're the Earth with Spirit, We're the Warth with Soul."] trance drumming. Amongst his percussion was a large bass drum hung like a gong. I do not presume that Z'EV necessarily considers his music as mimetic of visual patterns of hallucination. Nonetheless, the effect which Z'EV achieved in the reflective acoustic environment of the concert hall was similar to the effect I had been aiming for with the atomizer module. Subsequently I borrowed Z'EVs idea and hung a 26-inch marching band bass drum from a gong stand, in order to experiment with similar percussive sounds, the enhanced resonance achieved by the gong mounting, and the meditative physical positioning of the performer which this configuration provides (the performer sits cross-legged on the floor).

The impulse to conduct these performances by exploring free playing is congruous with my comments above regarding live improvisation as analogous to ASCs. It is also relevant to mention free playing by artists such as Ornette Coleman, John Coltrane and The Master Musicians Of Joujouka as influences. The Master Musicians Of Joujouka in particular provide an existing paradigm of free playing which explores ASCs.

One of the aims of the *Bass Drum, Sax & Laptop* project was to explore enhancing appropriate existing performance paradigms through the addition of live electronics. However it is important to note that while the chosen instrumentation was considered suitable, the action of the software on these sounds could equally be applied to alternative instrumentation. The improvisational interaction of two performers and laptop is considered the most essential aspect of this project.

Design

Figure 1. Bass Drum, Saxophone and Laptop user interface. Image © Jon Weinel. (https://econtact.ca/12_4/images/weinel_fig01.gif)

The user interface of the patch is shown in Figure 1. Figure 2 shows the operational concept of the software in the form of a flow chart. I shall proceed by explaining how each of the modules visible in Figure 1 functions.

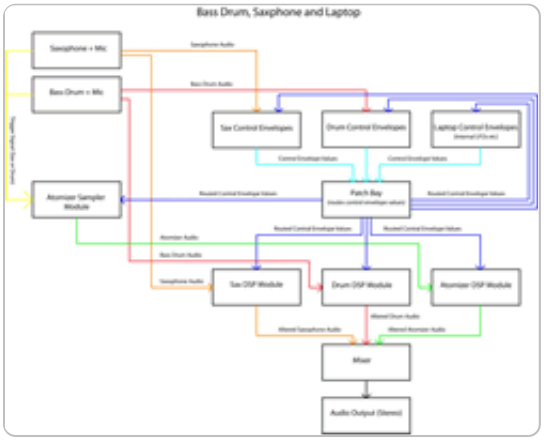

Figure 2. Flowchart showing the operation of Bass Drum, Saxophone and Laptop. Image © Jon Weinel. (https://econtact.ca/12_4/images/weinel_fig02.gif)

Sax Input and Trigger receives audio input from a microphone attached to the saxophone. A trigger is created from amplitude peaks which can be used to trigger the atomizer. This module can also play a pre-recorded sound file (such as a recording of a saxophone), for testing and demonstration purposes.

The **Sax Effects Rack** is a DSP effects rack with Doppler

[9. Doppler shifter implemented from a design by Rajmil Fischman.], ring modulator, filter, delay and reverb. This module processes the sound of the saxophone.

Drum Input and Trigger receives audio input from a microphone placed in front of the bass drum. A trigger is created from amplitude peaks which can be used to trigger the atomizer. This module can also play a pre-recorded sound file (such as a recording of a bass drum), for testing and demonstration purposes.

The **Drum Effects Rack** is a DSP effects rack with Doppler, ring modulator, filter, delay and reverb. This module processes the sound of the drum.

The **Atomizer** is a sampling module that creates rhythmic sounds which reflect visual patterns of hallucination. Several banks of sounds are embedded in the patch. This module can be triggered by either the saxophone or the bass drum. When triggered a sound is played at random from the selected bank as either a loop or a one-shot. The module has a facility to retrigger itself from a single trigger, based on a sequence of definable fixed time values. This allows a single trigger to trigger a cluster of scattered rhythmic sounds. Controls are provided to affect the speed/pitch at which the samples are played, turn looping on/off, set loop end-point, adjust volume, panning and a semi-random pitch bend.

The **Atomizer Effects Rack** is a DSP effects rack with Doppler, ring modulator, filter, delay and reverb. This module processes the sound of the atomizer.

Visible in the right hand side of the patch are the **Automation/Control Envelope** modules. These create control value envelopes based on various adjustable algorithms derived from the amplitude signal levels and the triggers of the saxophone and bass drum.

The standard *trigger envelopes* use the signal amplitude, and the amplitude at the point of trigger, to create control values which correspond to each instrument. These can be adjusted with offset, invert, attack and decay controls.

The *sax scatter* envelope and *drum scatter* envelopes receive the corresponding instrument triggers. These are used to trigger a sequence of envelopes based on defined time and amplitude values which are set with a graph. This creates a cluster of envelope peaks in a scattered formation dependant on the defined values of the scatter graph. The speed at which the sequence plays can be adjusted, as can attack and decay.

The *sustained playing envelopes* create a ramped control value which ascends when a certain number of triggers are received within a time frame, and descends when a certain amount of time passes without any triggers. Put more simply, sustained playing is switched “on” when it is persistently

triggered as a result of continued playing from the performer, and it is switched "off" when the performer stops playing. This creates a control envelope which reflects prolonged playing on a longer time scale (unlike the other envelopes, which respond on a shorter time scale). Various parameters of this module are adjustable.

Finally there are four LFOs and four "drunk" generators contained within four automation modules. These create automations independently of the instruments. The "drunk" module creates a wandering control value using an algorithm integral to Max/MSP.

The **Patch Bay** provides a means by which any of the automation envelope control values can be assigned to any effect rack parameter for the sax, drum or atomizer, and several other parameters of the patch.

The **Mixer and Audio Output** module mixes and pans the clean and wet signals for the saxophone, bass drum and atomizer. A facility is provided for recording the output as a stereo sound file or a multi-track sound file. The multi-track option allows further mixing of the sonic material after the performance for the creation of fixed recordings. Note that additionally the clean sound files can be extracted and played back through the patch to experiment with different settings (useful for making new presets if extra performers are not available). Demonstration sound files of a bass drum and saxophone performance are embedded in the software.

Presets enable all settings to be saved and recalled. Since there are so many possible combinations of assignments between automated control values and parameters, presets are essential for storing desirable settings and recalling them at a later date.

Performance

The patch was developed in parallel with experimentation of its use in performance. One of the advantages of the patch is the ability to store and recall presets. Over time I was able to identify some types of settings which were more effective than others, and in turn we were able to develop our playing together and with the patch. The 23 February 2010 session which we recorded was the most successful to date, in terms of performance and the presets used. I will examine the results which can be obtained with the system more specifically by looking at some short audio examples from the session recordings.

A short video (Video 1) demonstrates the performance system of *Bass Drum, Saxophone and Laptop* in action, using one of the presets saved from the 23 February 2010 session. Notice the movement of sliders and the red and yellow graphs on the laptop display in this video, which correspond with the instruments to affect the sound, along with the purple graphs which act independently of the performers.

Video 1 (3:00). Recording of the 23 February 2010 session using Jon Weinel's *Bass Drum, Saxophone and Laptop* software. Performed by Jon Weinel (electronics) and Sol Nte (saxophone). (https://econtact.ca/12_4/video/weinel_video.mp4)

The first audio example (Audio 1) demonstrates the atomizer module as it is triggered by the bass drum. In this clip at 0:00 and 0:28 you can hear the atomizer being triggered when the bass drum hits the trigger peak, causing the scattered rhythmic sounds. In this section the drummer is deliberately playing beneath the trigger level for much of the clip, while playing louder hits to trigger the atomizer at certain points.

Audio 1 (0:39). Excerpt of the 23 February 2010 session using Jon Weinel's *Bass Drum, Saxophone and Laptop* software: the Atomizer Module at work. (https://econtact.ca/12_4/audio/weinel_audio01.mp3)

Audio 2 shows the shift in DSP processing of the saxophone toward more extreme effects, as the loudness of playing increases on a sustained basis. Note that at the beginning of the clip very little processing can be heard on the saxophone, but as the clip progresses the amount of delay increases. The delay amount is being controlled by sustained playing of the bass drum. The bass drum control envelopes are also controlling the saxophone reverb: early reflections and Doppler period in this clip.

Audio 2 (1:11). More extreme DSP processing. (https://econtact.ca/12_4/audio/weinel_audio02.mp3)

The third example (Audio 3) demonstrates the sounds which can be achieved with the bass drum, where some distortion, ring modulator and reverb are applied. The ring modulator frequency is being controlled by the saxophone, creating organic fluctuations which bounce according to the saxophone playing. Some bleed from the drum into the saxophone microphone also affects this, depending on the physical proximity of the saxophonist to the drummer.

Audio 3 (0:59). Various sounds made by the drum using various effects. (https://econtact.ca/12_4/audio/weinel_audio03.mp3)

In the final example (Audio 4) delay parameters of the saxophone (delay time and delay feedback) are controlled by the internal automation of the patch (LFOs and drunk values). This provides results which are constantly shifting through the performance regardless of human performers, calling for them to respond to the laptop itself as the third agent.

Audio 4 (0:59). Internal controllers affect various aspects of the processing of the acoustic signals.
(https://econtact.ca/12_4/audio/weinel_audio04.mp3)

The February 23 session recordings exhibit a range of what the patch is capable of. The inherent droning qualities of the bass drum are enhanced by the patch to reflect the distorted time perception of ASC experiences. The Doppler effect creates interesting pitch variations on the saxophone, especially in combination with the delay and reverb effects. Scattered rhythmic sounds reflect visual patterns of hallucination. Temporal shifting of effect parameters of the three sound sources further the ASC analogy, as a result of the spontaneous interactions discussed.

Evaluation

The *Bass Drum, Sax & Laptop* software provides a successful means by which to facilitate a real-time performance which reflects altered states of consciousness experiences. This is achieved through the use of the atomizer module to reflect visual patterns of hallucination, and through temporal changes to the DSP effect processing for all sound sources. The analogy with altered states of consciousness is furthered by implementing these sound sources and processes in a system which responds interactively in real time to each of the agents. This places an emphasis upon spontaneity of sound to reflect dreams and hallucinations as complex organic processes.

One of the key benefits of the software is the automation, which enables performers to focus completely on their instrumental performance, while still maintaining dynamic control over the patch. This may be an approach which is of interest to composers working on real-time projects unrelated to altered states of consciousness. The automation models could be improved by adding more ways in which the patch responds to a performance. For example, *Bass Drum, Sax & Laptop* follows signal amplitude and creates triggers from peak amplitudes. The means by which these peaks are identified could be improved by using spectral processes.
[10. This is the process used by the third party object “bonk~” for Max/MSP. Note that at the time of writing this object was incompatible with the Windows operating system and Max 5 setup which the author was using.] Additionally, pitch convolution could be used to create envelopes based on pitch information.

A limitation of the software is that the correlation between the automation and DSP effect parameters does not evolve through the course of the performance, particularly. The sustained playing module was designed to address this problem, however it does so in a quite simplistic way. The sustained

playing module could be improved by adding a greater level of depth and complexity with which it responds to the performers, or by adding complex gestural recognition.

There are other ways in which a more dynamic progression through the performance could be facilitated. A foot switch could allow movement between presets, so that the performer can apply different settings for certain parts of a performance. Alternatively, an extra performer could control the software with a MIDI controller, remixing the performance in real-time. A pre-recorded automation sequence which allows variation based on the control envelopes could be another possibility.

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Biography

Jon Weinel is a composer currently studying a PhD in compositional techniques to elicit altered states of consciousness at Keele University, UK. Within this theme he produces work within the visual and sonic arts, and is currently working on projects which combine live instrumentation with electronics, and ways manipulate hand-drawn artwork digitally. His work has been performed internationally. Jon has also worked on video game hacks and intends to continue exploring the potential of interactive media in the creation of artworks which achieve organic æsthetics. In his spare time he performs experimental DJ sets and produces electronic dance music.
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