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The *exstatic* Project- an Experiment in Electroacoustic Presentation

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Abstract

This paper describes the exstatic *project, an exercise in an alternative mode of presentation of electroacoustic music, using a multi-channel sound spatialisation system. First conceived in 1996, exstatic has evolved over the past two years into both a curatorial and a software development project. This paper describes both of these aspects of exstatic.*

Keywords

Electroacoustic, spatialisation, diffusion, stereo field, spatial representation, extended musical form, narrative, exstatic, AudioMulch.

1 Introduction

exstatic is a 'performed installation', made up of two elements. Firstly, it is a body of disparate works drawn broadly from the international contemporary electroacoustic community, where previously unpublished material is given a listening space. Secondly, it is the sonic display of those works by way of a particular mode of presentation within the listening space, where a synthesis of these otherwise unrelated pieces is allowed to unfold.

exstatic extends the radiophonic idea of the cross-fade between tracks by dynamically distributing and juxtaposing up to four otherwise unrelated stereo sources simultaneously within an eight-channel setting. Each stereo sound source is a complete work in itself, and is given its own trajectory in the listening space, independent of the other sources, while preserving its original stereo image.

A total of fifty-three pieces by forty composers were chosen from a total of 106 submissions. These were received after a call for entries conducted through electronic and postal mailing lists, in December 1997. The material chosen represented just on four hours of music from Australia, New Zealand, Japan, Taiwan, Scotland, England, France, Spain, Italy, Germany, Austria, Netherlands, United States, Canada, and Brazil.

The duration of individual items ranges from 39 seconds to over fourteen minutes. Each of these pieces is considered to be a 'module' or element which can be layered with up to three other modules, in much the same way as a DJ mixes tracks in a night club. A module may be excerpted, repeated or played in its entirety during a presentation. Any presentation of exstatic could last between one and two hours, and be considerably different from other performances using the same source material.

2 Conceptual Basis

The presentation of performerless loudspeaker music has a particular problematic in that its sonic output refers to an absence, and it is only through this sense of absence that the illusion of presence can be brought forth. In a similar way to the psychological function of photography, such sonic output refers to the past, that is, a memory or trace of some prior presence, in some other (unknown) place. As such, it signifies *dis*embodiment- the sonic events alluded to in such presentations are disembodied from their sources, even if those sources are themselves fictitious.

Schaeffer's acousmatic listening environment, one that is performerless, and the aesthetic of reduced listening can perhaps be seen as a way of getting around this problem. In reduced listening, one is required to listen to the sound in some sort of infantile mode- as if experiencing sound for the first time- to strip away the sound from its own identity in order to create a new set of relationships between discrete sonic events within a piece and therefore imbue new meaning to the sounds themselves. The composer would follow this aesthetic as well, often stripping the identity away from discrete sound sources through their editing, processing, and reconstruction.

Since the days of musique concrete, audio reproductive fidelity has improved to such an extent that the fictitious space of the stereophonic field has become accepted as a conventional spatial frame within which one can contextualize what one hears. It has produced a kind of spatial grammar within which composers can safely posit their sounds. The elements of the stereo field include the idea of foreground and background, the notion of 'depth', use of reverberation, delay, panning, and even the reproduction of the Doppler effect to characterise trajectories of sound objects within such a space. Accompanying this convention is the assumption that the sounds contained within such a rendered pseudo-space are somehow 'real' and that they 'belong' in such a space.

One can also see that the historical quest for audio reproductive fidelity is related to this idea of a spatial grammar in loudspeaker music.

On cinema sound, Doane comments:

> "Concomitant with the demand for a life-like representation is the desire for 'presence'. .. ...Technical advances in sound recording are aimed at diminishing the noise of the system, concealing the work of the apparatus, and thus reducing the distance perceived between the object and its representation."[1]

Doane's idea of the desire for 'presence', through the transparency of the apparatus could be re-expressed as the desire for the transformation of the 'here-and-now' from the 'there-and-then'.

[1]Doane, Mary Ann (1980). "The Voice in the Cinema: The Articulation of Body and Space." *Yale French Studies,* 'Cinema/Sound' (60), p. 35.

This perspective demonstrates two aspects to the experience of presence- one being temporal, the other spatial. The distance she alludes to is thus a distance in both time and space.

The acousmatic imperative to strip away the identity of a sound's origin has to a large extent been undermined by the development and conventionalisation of the stereophonic field, as well as the reduction of this so-called 'distance' through improvements in audio reproductive fidelity. This conventionalisation of sonic reproductive space, in hand with developments in high fidelity has to some extent allowed the listener to suspend their disbelief, and accept the bogus premise that you could be 'there', or that the sound objects being reproduced might somehow be really 'here'. This allows sound objects to retain their identity, by becoming symbols of their perceived causal events, and to communicate to the listener to some extent their own sense of place.

By equating sonic identity with a sense of place, and placement, one allows the idea of narrative to become a formal structuring device in electroacoustic composition. This is because a fundamental requirement for narrative is the articulation of spatial relations, ordered through time. The unfolding of a story over time can be seen as the 'unpacking' of spatial relations between events over a defined period.[2]

Another requirement of narrative is that the cause of salient events within such a structure do have a set of identities.[3] This can, to some extent, be seen oppose Schaeffer's practice of stripping away a sound's identity. The narrativisation of a sonic space appears to be a common structuring device in recent electroacoustic work, and it has the advantage of appealing to the 'naive' ear, an ear which has perhaps been largely conditioned to such a modality through the pervasive influence of the cinema sound-track.[4]

From this perspective, one could see multi-channel sound diffusion as a way of playing with the convention of stereo space- twisting, distorting, dramatising and exaggerating the space, or the contextual framework within which spatial articulation occurs. It is a way of extruding the rendered space (the stereo field) into the listening space (the auditorium). It also, of course, directly deals with the issue of absence and disembodiment by employing a diffuser as a surrogate performer. [5]

The same can be said of the role of the DJ in techno/ambient presentation, where both the presence of the DJ, and the 'performance' itself (the live mixing and layering of often disparate tracks) might be seen as an attempt to reanimate that which is inanimate and absent. The individual pieces of music become modules for the DJ to order and mix together in as seamless a manner as possible. The identity of any one piece is replaced or overwhelmed by the collective identity of the audience, the DJ, the event itself.

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[2]There may be an inverse relation between the unpacking of spatial relations between discrete elements in a story, and the packaging (non-linear) representation of the flow of time in narrative. This is evident in conventional story telling where techniques such as the flashback and the skipping of large spans of time are common; this is reflected in electroacoustic works, where narrative structure is implicit, such as Ferrari's *Presque Rien*, where the passage of time becomes compressed.

[3]Smalley's idea of the sound as a 'source' and its 'cause' as being inseparable is another way of expressing this idea of identity in sound. The sound is the event, while the perceived cause of that sound is analogous to a protagonist or character within a narrative reading of a work. Sounds can thus be seen as symbols of a more abstract narrative structure.

[4]The first time I heard Webern's Five Pieces (Opus 10), I felt I could 'understand' them because they sounded like film sound-track music; my naive ear could hear them as having a narrative quality.

[5]Often the composer is the diffuser.

exstatic borrows from both the traditions of sound diffusion and the DJ. It combines the idea of juxtaposition of disparate pieces of music to create large scale music forms, where whole pieces a can be used as structural units, with the idea of articulating the spatial framework of the reproducing environment itself, that is, trajectorizing the stereo field which makes up each individual piece. It differs from diffusion by treating the stereo image as a point source, while spatializing this source. This spatialisation method thus acts to preserve the integrity of the original stereo image of each piece, while allowing each stereo field to have its own trajectory.

Through this juxtaposition of often contrasting and potentially contradictory sound-worlds, the possibility of metaphor is created, in much the same way as *montage* causes metaphorical relationships to be perceived between images in cinema. The disparity between the soundtracks might therefore draw upon a cinematic experience and language within the mind of a listener. This layering of the sound material can perhaps be seen as an extension of Schaeffer's imperative of reduced listening, where a discourse is created not only between the listener and the music, but between the different sonic worlds themselves.

By using dynamic trajectories in exstatic, one can optimise the listening space by exploiting the ear's ability to locate multiple sound sources within the physical space, as well as exploiting the convention of the stereo field. The listener can then focus on particular sound objects or sound scenes within and amongst other objects and scenes, to clarify and enrich the listening experience.

These two methods of trajectorization and juxtaposition may allow a synthesis to occur within the listener, where the movement of the stereo fields can act to embody a presence within the listening space, while juxtaposition creates a continually changing context, and therefore new meaning. It then becomes some sort of 'history' of the present, where 'the present' is expressed in terms of the 'presence' of the conventional stereo field, an indivisible unit that can be layered with other stereo fields, to create a dimension of verticality to the listening experience.

Sound can induce and indicate emotional states, seen in its ability to induce extreme emotional states such as trance. It is primarily expressive, rather than representational. But by spatializing and juxtaposing otherwise irreconcilable sonic worlds within a single space, one might bring about a new and otherwise *unheard* of representation.

3 Project History

The exstatic project has had two incarnations. The first version was for four-channels[6] which used multiple CD playback, controlled through SCSI, whose audio output was 'diffused' through a MIDI-controllable mixing desk (8-in:4-out). The spatialisation of the stereo fields loosely followed the principles outlined by Chowning[7], where each speaker was considered a sonic window through which the stereo field of each piece could be distributed. Both the CD players and the mixing desk were controlled using MAX. Controllable parameters were the width of each of the stereo fields (0 to 180 degrees), and their speeds and directions of rotation around the listening space. The axis of rotation of the stereo image was always the centre point of the speakers.

[6]Front left and right, and rear left and right; quadraphonic configuration.

[7] Chowning, J.M. (1971). The Simulation of Moving Sound Sources. *Journal of the Audio Engineering Society*, 19, 2-6.

A call for entries was sent out over the internet, to various mailing lists, in July 1996, with about seventy responses. Composers were asked to provide 'modules' of electro acoustic music which could be mixed in with other modules by other composers in a dynamic manner. Their brief was simple: any module would be mixed live with other modules during a performance, and possibly only an excerpt of a module might be played: in other words, the music would be recontextualised, and treated as units for a larger, unknown musical form.

In selecting pieces to be included on CD, preference was given to 'non-figurative' music, that is, music whose sound-sources or idioms are not necessarily readily identifiable as 'instrumental' or 'tonal', and whose form is articulated on the more concrete stratum of textural and spectral transformation.

The submissions were itemised according to particular categories and continua: overtly pulsed to pulsed, to unpulsed; static textural to dynamic textural; episodic; 'transitional'; concrete vocal to abstract vocal, sparse to dense. Tracks with any perceived tonality or tempo have were also identified. This approach has ensured the greatest possibility of appropriately complementary material can be mixed together in the most flexible manner, during any performance of exstatic.

The first presentation was in October at a night-club called *Glitch*, in Melbourne, Australia. The second event was part of the *Experimenta* festival of new media arts in November, at the Experimenta 'festival club' lounge, also in Melbourne. The Experimenta season comprised four separate exstatic sessions over one weekend. A third event was commissioned by the Perth Institute for Contemporary Art, for their 'Sound States' mini festival in May 1997. This version was also presented at an outdoor techno rave in the Otways, two hours west of Melbourne, earlier this year.

The main focus of these events was to experience sound immersively, where the music would 'wash' over the audience, who were free to sit down or walk around the space, and participate for as long or as briefly as they liked. The duration of each session ranged between one and two hours.

The second (current) incarnation uses an eight-channel system, developed in conjunction with programmer and composer Ross Bencina, and commissioned by the Next Wave Festival, Melbourne, 1998. This version uses hard disk playback of audio files, with both the playback and dynamic matrixing of the audio achieved through DSP algorithms within the one software environment, AudioMulch. Another call for entries was made for this more elegant version, under the auspices of the Next Wave Festival, in December 1997. The inaugural presentation was installed at the Public Office in May 1998.

4.1 The AudioMulch Environment

AudioMulch is a shareware real-time software synthesis and signal processing environment for Windows 95/98 and NT™[8] written by Ross Bencina. The software enables signal-processing networks comprised of various coarse grained signal processing modules ("contraptions" in AudioMulch parlance) to be assembled and auditioned in real-time without an intermediate compile cycle. AudioMulch can be used to process sound from sound files or from real-time

[8] Bencina, R. (1998). "*Oasis Rose* the composition - real-time DSP with AudioMulch", *Proceedings, ACMA* Conference. Canberra: Australasian Computer Music Association. Bencina, R. (1998-1999). AudioMulch web site http://www.audiomulch.com/~rossb/

sound card input, or to synthesize sound internally. The user interface consists of a patcher[9] for routing audio signals and a series of custom editing windows for editing contraption parameters. Recent additions to the AudioMulch environment include: support for up to 16 channels of real-time audio input and output, MIDI control of contraption parameters, synchronisation to an external MIDI clock, and support for third-party VST™ audio processing plugins.

4.2 exstatic Hardware

The hardware used for the performance consisted of an 266MHz Pentium II™ computer running Windows 95™, 64MB RAM, Adaptec 2940UW SCSI card, IBM SCSI 2 Hard Drive, and Frontier Design WaveCenter/Zulu 8 channel audio subsystem. The 8 line outputs of the Zulu ADC were connected to an 8 buss mixer which preamplified the 8 audio feeds before being amplified and sent to 8 separate Tannoy speakers arranged in a circle approximately 12 meters in diameter. There was also a separate stereo mix routed to two subs. It should be noted that the computer system used was barely up to the task and a number of tuning measures including disabling and removing the network card were necessary to achieve stable performance.

4.3 exstatic Software

The requirements of the 1998 Exstatic performance led to the development of two custom AudioMulch contraptions: *FileJockey* and *ExStaticSpat.* *FileJockey* allows simultaneous playback of up to four stereo sound files with individual stereo outputs for each file. *ExStaticSpat* pans a stereo input into speaker feeds for an 8 channel circular speaker array. A pair of sinusoidal oscillators was used to generate Lissajous style trajectories to control spatial location within each *ExStaticSpat* contraption. The patch used for the Ex-Static performance (see figure 1) consisted of a single *FileJockey* and four *ExStaticSpats.* Each of the four stereo-pair outputs of the *FileJockey* was routed to a separate *ExStaticSpat* contraption. The outputs of the four *ExStaticSpats* were then recombined to the 8 sound card outputs.

4.4 File Jockey

The *FileJockey* sound file playback contraption was designed to allow quick selection and combination of up to four stereo sound files. The user selects individual files for playback from a common "pool" of available sound files and assigns them to one of four playback queues. Each playback queue has an individual stereo-pair output and may contain a number of sound files - each with individual punch-in, punch-out, fade-in and fade-out times. The sound files in each queue are played sequentially, with the queue optionally pausing at the end of each sound file. Files can be added or removed from the queues at any time.

4.5 ExStaticSpat

[9] Puckette, M. (1988). "The Patcher," *Proceedings, ICMC*. San Francisco: International Computer Music Association, 420-429.

ExStaticSpat uses a Lissajous figure to control the trajectory of a stereo signal in a 2 dimensional (flat) space. The stereo input is treated as two point sources placed on a line which always remains parallel to the perimeter of the speaker circle and whose center is controlled by the Lissajous trajectory. The location, dimensions, velocity and *x*:*y* rate ratio of the Lissajous trajectory can be adjusted by the user in real-time. The distance between the two point sources can be varied allowing the stereo field to be collapsed into a point source, or at the other extreme, placing the two channels at opposite sides of the circular speaker array. Figure 2 shows two spatial trajectories generated by *ExStaticSpat*.

Spatial positioning was implemented independently for each channel of the stereo input using pair-wise panning between adjacent loudspeakers according to the azimuth of each point source. A scale factor was provided to control the amount of distance-amplitude scaling applied to the trajectory.

After experimentation with various panning methods in the venue (including equal amplitude and linear path), constant distance panning was selected as the most effective panning scheme for use with the azimuth-pan algorithm. This simple spatialisation scheme was effective, although "image sucking" towards the loudspeakers was noticeable, especially when sitting directly on axis to a loudspeaker.

4.6 Future Directions

One shortcoming of the 1998 system was the lack of sophistication of the spatial trajectories. A more elaborate scheme for automating trajectories would enhance the system considerably. The ability to combine a variety of trajectory types including cyclic, broken, and linear trajectories, as well as static planes and points is required to begin to articulate a useable vocabulary of spatially layered stereo fields.

At present a new suite of AudioMulch spatialisation contraptions utilising Ambisonic[10] encoding are under development. These will enable spatial trajectory and localisation information to be composed independently of speaker topology, and provide more effective spatial reproduction than the present amplitude panning system. Computer processing speeds have increased to the point where it is possible to conceive of an AudioMulch based multi-channel diffusion system where sound file playback and spatialisation are combined with signal processing operations such as granulation and spectral warping to create a dynamically improvised spatio-sonic experience.

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[10] Gerzon, M. 1985. Ambisonics in Multichannel Broadcasting and Video, *Journal of the Audio Engineering Society*. 33/11, 859-871.

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6 Note

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7 Figures

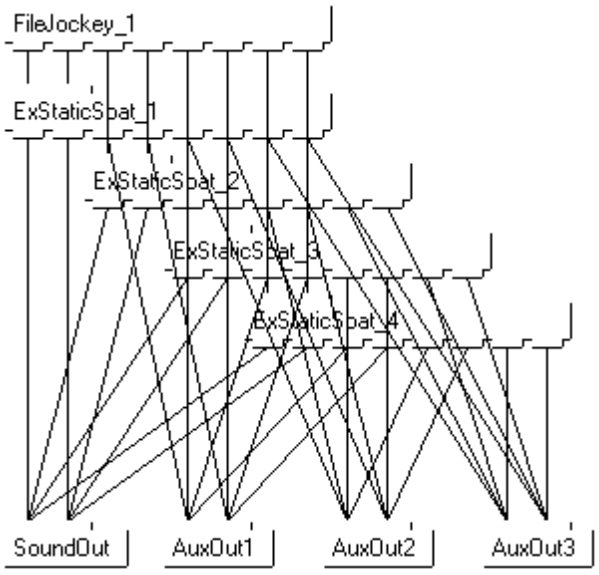

Figure 1. ***AudioMulch patch used in the exstatic performance.***

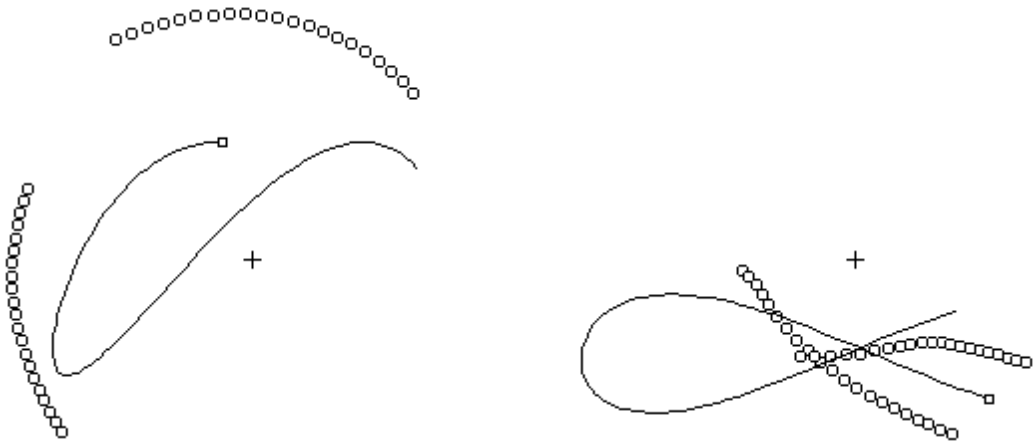

Figure 2. ***Two possible ExStaticSpat spatial trajectories over a short elapsed time frame. The crosshairs mark the center of the speaker array. The unbroken line is the Lissajous trajectory. The circular trails mark the recent left and right stereo point source trajectories.***