Flux: Live-Acousmatic Performance and Composition

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Abstract

This paper presents research into a new live-acousmatic music composition methodology and sound diffusion performance practice. A primary aim is to investigate correlations between directed spatial distribution or trajectory of sound and introduced variability in timbre, structuring processes and temporal parameters in acousmatic music. The concern for sound exploration and timbral articulation is extended from the creation and collection of sound source, through to the manipulation and transformation of materials, to structuring process and performance. In doing so, a greater degree of variability in timbre, morphology, time and structure is introduced through a new performance practice in addition, and in relation, to variability of spatial articulation in sound diffusion. The research aims to support the composition and performance of a large-scale work and live-acousmatic methodology, resources and techniques. Research will be enabled by the development of a software-based environment that will facilitate the performance of live-acousmatic work, using MaxMSP software. A further outcome is to analyze the interconnectedness of live-acousmatic performance practice and compositional strategies and methodologies and to evaluate the effectiveness and suitability of different sound materials within live-acousmatic work.

Context

This research is intended to support my work as an acousmatic composer, and as an advocate, practitioner and researcher of sound diffusion performance (or interpretation) practice. Throughout, I am concerned with the enacted sound diffusion of fixed-media music in real-time concert performance (using a controlling interface of some kind, but not necessarily faders), and the diffusion of stereo or multichannel works. This has been informed by my work as a member of BEAST (Birmingham Electroacoustic Sound Theatre) from 2000 - 2003, and by work continued since then at the University of Manchester where I have developed the MANTIS computer-based sound diffusion system.

Aims

There are three primary aims to the research project:

1. To create a sound diffusion performance system that cultivates meaningful and dynamic 2-way relationships between the decisions made in sound diffusion performance and the parameters of a work driving those decisions. The system, which could also be thought of as a performance instrument, allows selected aspects of the enacted diffusion to further articulate the materials that have influenced those decisions. Commonly, sound diffusion is an interpretation of a work's internally composed spaces, textural and gestural shapes, spectral occupancy, and structuring processes carried out through spatial articulation within the performance space. The Flux system can further clarify, emphasise or extend those

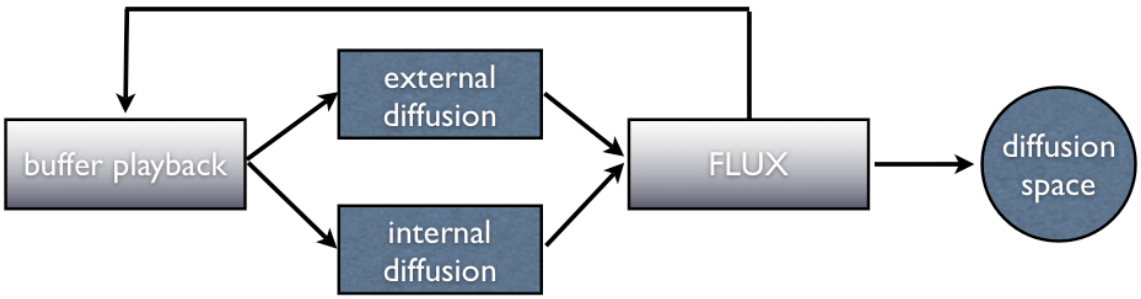
connections. In other words, "how" a fixed-media work is diffused on a given occasion can deliver a unique realization of the piece beyond its spatial articulation. Although not a primary aim, the system can also be used to more dramatically improvise with, or re-compose, fixed material.

2. To find a middle ground between the fixedness of acousmatic music, and live/improvised electroacoustic music, using live sound diffusion as a starting point (what I call “Live-Acousmatic” music and what Adrian Moore refers to as a “fracturing” of the acousmatic).

3. To explore the inter-relatedness of acousmatic music composition and performance, preserving the carefully pre-composed element, but extending the performance practice in meaningful ways with respect to the spectro and spatio-morphologies of a work. Jonty Harrison has asserted that the diffusion of a work is, possibly, the final stage of the bottom-up process of composition in electroacoustic music - this research throws new light on, and weight behind, that assertion.

There are historical precedents - the diffusion tools developed at Bourges (IMEB), for example, engage with timbral-based distributions within a diffusion environment. The Flux System extends this approach to other parameters using a profoundly different approach.

Figure 1. Flux System Overview



A simplified overview of the MaxMSP-based system reveals:

1. The composition is played from a dynamically accessible RAM buffer

2. It is diffused either internally using the Flux System’s own computer-based sound diffusion environment with an OSC or MIDI control interface, or using any external diffusion system (computer-based, analog desk, etc)

3. The enacted diffusion is analyzed and translated back into the fluctuation of the playback of the work, while it is transmitted onto the loudspeakers in the diffusion space

Application

What can the system be used to diffuse?

1. Existing acousmatic works

2. Works composed specifically addressing the capabilities of the system

It is fairly widely accepted that acousmatic works vary in their suitability to the application of diffusion practice. Some works are, possibly, better-suited than others. This could be even more so of an issue with the Flux system, depending on how it is used (it *could* be used with great subtlety, diffusing with only a trace of fluctuation!). There are, of course, implications for the choice of sound materials and related compositional decision making (works could be composed that are guided by the same strategies that inform their performance using the system). This is discussed later in the paper with respect to my own work.

Implementation Criteria

There are several criteria that I've set that need to be met in order for the system to be considered a viable performance tool.

1. Maintain/honor the sonic integrity of the pre-composed work. This immediately reveals a contradiction - by its very nature the system can "meddle" with pre-composed material. It is, however, arguable that anytime you diffuse a piece you transform material owing to inherent loudspeaker colouration, room acoustic and amplitude enveloping. I believe that this research is a natural, but not without implications, extension of this. It concurrently stresses the need for the mechanisms of the system itself (ie. the analysis or the means of playback) to not degrade the original material, and for the introduced fluctuation to integrate as seamlessly as possible.

2. In addition to functioning in a "stand-alone" configuration, it should be adaptable as a "front-end" for other diffusion systems/configurations, and be readily disseminated. The system is enitrely MaxMSP-native, and requires no extra 3rd party externals, plug-ins etc.

3. It must be adaptable to multi-channel works . Although early development and testing to-date has used stereo works, the system can be configured for multi-channel work, as well as combined diffusion and automation works like my own 2 + 6 and, more recently, 2 + 8 configurations. (The initial ideas for these were developed with colleagues at the University of Birmingham in 2002). The dynamic and creative strategies this approach has enabled within my research similarly links diffusion interpretation and compositional decision-making.

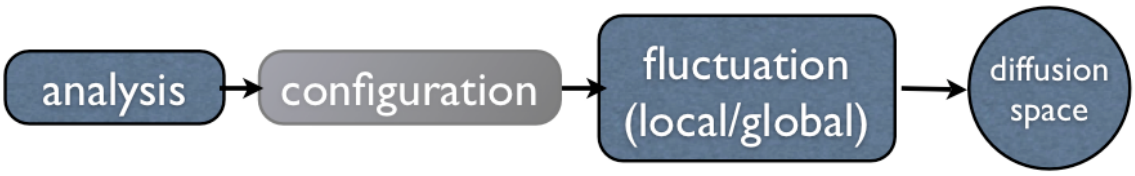
4. The system should demonstrate low latency and high stability.

5. The system should not be interface-dependent. It does not depend on the use of faders - the analysis of the enacted diffusion is based upon the measurement of audio, not control, data.

6. Last, but certainly not least, the outcomes of the performance system must be perceptually meaningful. The fluctuations should make sense with respect to the diffusion, and feel less "imposed".

Flux

Figure 2. Flux Component



The system's Flux component consists of:

1. Analysis of the enacted diffusion
2. Configuration of the analysis data and its' mapping onto fluctuation procedures
3. Fluctuations introduced into the material played back from the buffer
4. Diffusion and Fluctuation transmitted into the diffusion space loudspeakers

Analysis

As mentioned, the analysis of the diffusion is not based on controller data (ie. fader movement) to ensure maximum compatibility with various system configurations. It is based upon measurements of audio amplitude, determining how the material is distributed (ie. discrete spatial occupancy), and how dynamically it is distributed (ie. trajectories), in:

1. 48 channels (though the system is flexible enough to be applicable to smaller (ie. 8ch) or larger systems (ie BEAST system, through double or triple mapping of FLUX outputs))

2. Multiple groups of 8 loudspeakers

3. Corresponding trajectories within groups, and between groups

4. Overall spatial weightings (high/low, front/back, left/right)

All the analysis data is available as a continuously updated stream, and as a thresholding mechanism. The data (amplitude level, dynamic, weighting) can be mapped onto selected fluctuation processes, and can vary these processes in real-time.

Fluctuation

Fluctuations are introduced into the sound material either locally (at individual or groups of loudspeakers) or globally (at the point of buffer playback). All fluctuation parameters can be mapped onto selected diffusion analysis data, creating dynamic relationships between diffusion and process.

Local fluctuations:

1. Spectral articulation (through equalization/filtering)

2. Density build-up (layering and offset)

Global fluctuations:

1. Overall pitch of playback (time-varied transposition)

2. Grain (granulation, splintering, freezing)

3. Temporal (stretching)

4. Form and structure: "capturing" material and re-playing (layering), or interrupting the normal play of a work (manually selecting material or "on the fly"). Material can correspondingly be repeated, varied and montaged based upon particular diffusion conditions.

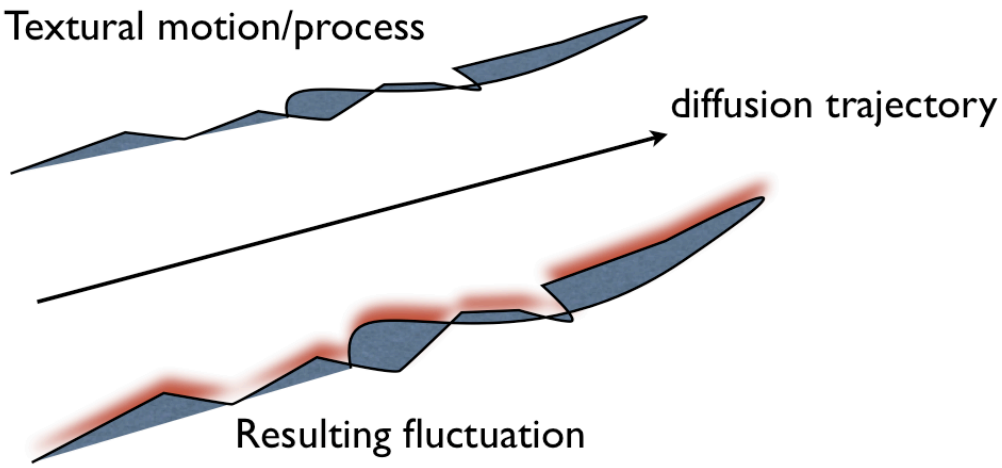
Technique and Practice

How might all of this be applied, performed and experienced in concert diffusion?

The system might be configured so that the level of dynamic variation (trajectory) within a given group of channels introduces increased grain fluctuation (and/or other fluctuations). As a diffusion interpretation is increasingly “high” oriented, pitch might rise (or fall) in response. Amplitude thresholds in selected channels might select, re-play, layer and vary previous (or future) structures of material. It is important to point out that this is all configurable - the interpreter/performer can choose to subtly articulate the parameters of a work, or to drastically intervene vis-à-vis spatial decisions, or anything any between.

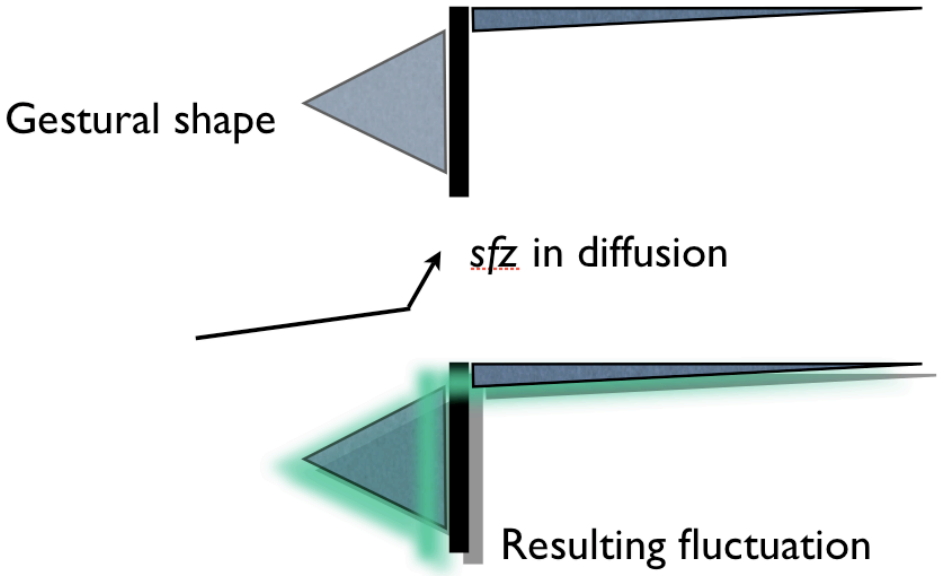
Further illustration by graphic means (demonstrating the interrelated spectromorphologies, enacted diffusion and fluctuation) is useful.

Figure 3. Timbral colouring



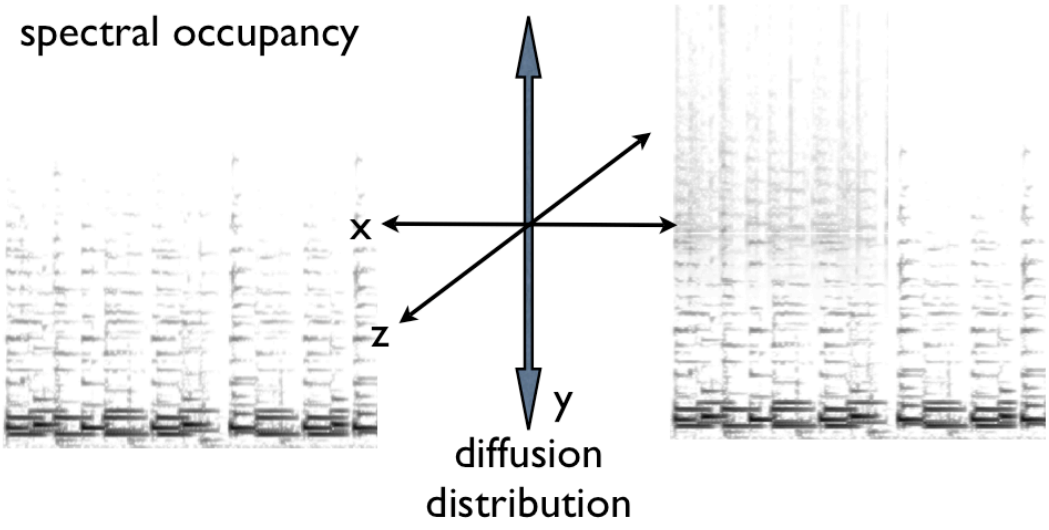
A particular textural motion might lead the performer to make a corresponding spatial trajectory. This in turn can introduce a fluctuation of timbral colouring. Consequently, depending upon how it is diffused, further articulation/accentuation of the textural motion/ process can be introduced.

Figure 4. Increasing density



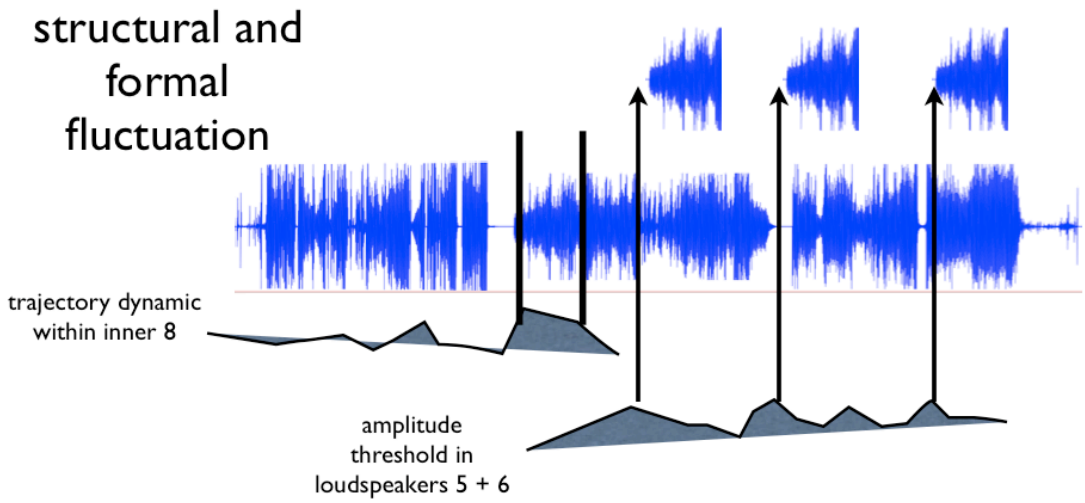
In another instance, the weight or density of a gestural event might be increased: I might introduce a *sforzando* spatial articulation in loudspeakers 1 and 2 in response to the gesture, not only increasing the amplitude, but increasing the density through delay and transposition layering, as the amplitude or dynamic in these loudspeakers reaches a set threshold and introduces the density fluctuation.

Figure 5. Spectrally "extending" a work in 3-dimensional space



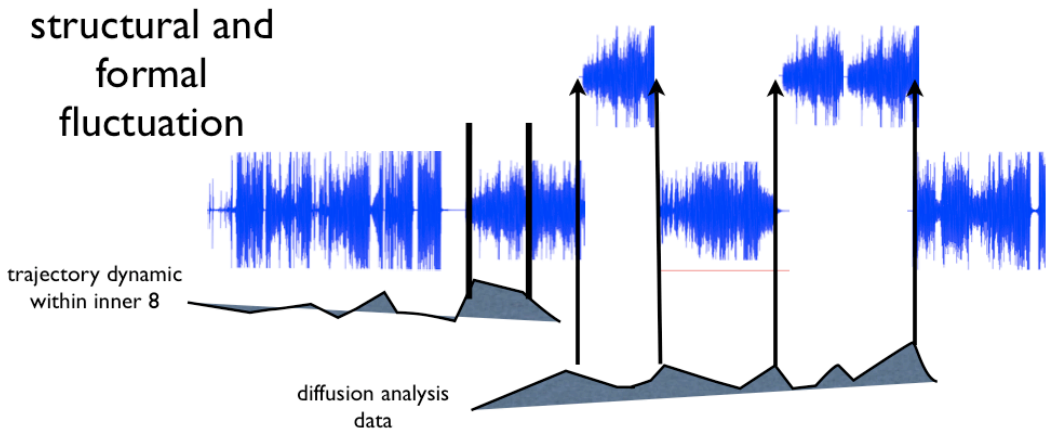
Using the vertical framing of a diffusion space, a high frequency band might be extended or reinforced under certain diffusion conditions, at loudspeakers that are placed at higher elevations. The system also analyses the horizontal and depth planes, allowing for 3-dimensional spectral tweaking in concert diffusion.

Figure 6. Flux and Form



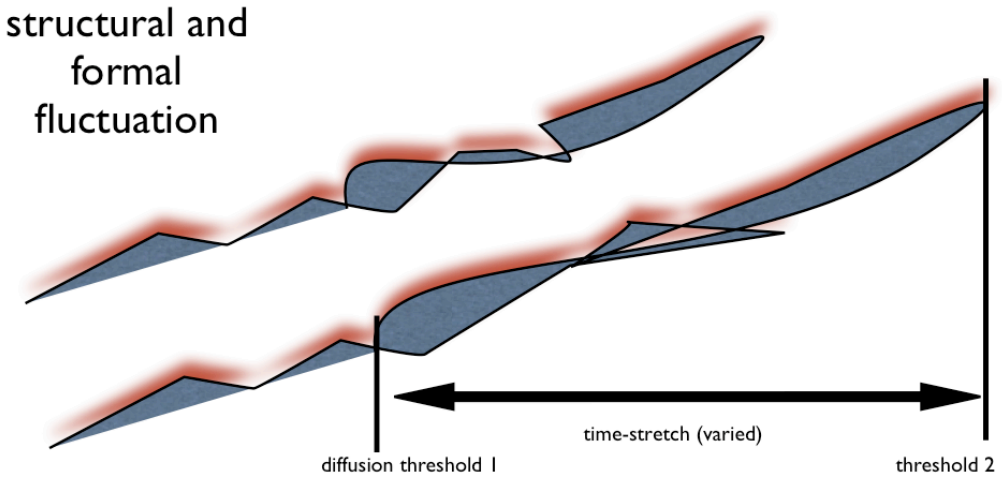
Structural and formal fluctuation can be affected through the re-layering of selections of material, according to set thresholds of trajectory dynamic or amplitude in selected loudspeakers (this is all happening in real-time, during a diffusion performance, though there is the option to manually configure selections in advance so that selections of material are more precisely specified). As with all fluctuations, this is not limited to linkage with the dynamic of the diffusion. Any analysis parameter can be mapped onto the process.

Figure 7. Open Form



More drastic fracturing of the acousmatic can be affected through configurations that interrupt, repeat and re-order material. Of course, the repetitions themselves are diffused and thus open to additional fluctuation/variation, and multiple layers can be configured - the environment can thus be used to re-compose if desired, though this is not the primary intent of the research. This capability allows the performer to engage with open form and encourages works to be composed with this potential in mind.

Figure 8. Stretch



A third temporal fluctuation is more immediately and viscerally affected through the application of granular and pitch-varying processes. This, in effect, allows the interpreter to "grab" material spatially, and freeze, hold, vary and explore it with additional fluctuation until "releasing" it back into the diffusion space.

Configuration of fluctuation and analysis data is dependent upon the nature of the piece, the composer/performer/interpreter intentions, personal taste and, naturally, rehearsal and practice time. Application can range from the subtle, to the complex and creative, and to the extreme. Configuration so that given analysis data is mapped onto multiple fluctuations can be quite effective [ie. mapping freeze and pitch fluctuation in close relation], as can mapping the analysis data from one pair or group of loudspeakers onto the fluctuations introduced onto another [creating, in effect, a spatial shadowing, reflection or afterimage].

Composition

My own recent acousmatic works have largely been developed from mechanical and metallic sound materials, and elaborated upon those sounds worlds in related contexts. These works include *Cyclo* (2003), *Styal* (2004) and *Ting* (2006). Work on the Flux system has provoked a decision to explore rather different material in current compositional work. Recordings of river ice fracturing and shattering, snow and ice melting, forest materials in motion and burning, and flowing water sounds are the basis .The qualities of these materials suggest contrasting kinesis, fluctuation, fluidity and stasis. This is intentional - reflecting the nature of the non-fixed nature of the research. Structuring processes will similarly reflect this.

Implications and Conclusions

Each given diffusion interpretation can create a very unique realization of a piece (re-shaping might be extremely subtle, or bordering on re-composition, depending on intent). In this sense, and in keeping with the conviction that acousmatic works are only fully realised when diffused, the Flux system further integrates the composition and performance of acousmatic work.

The risks are clear. Like traditional diffusion practice, there is the chance that a diffusion interpretation that is not well-planned, or that is executed poorly, will work against a piece. Depending on how the Flux system is implemented, the risk of this could be higher, particularly with regard to structuring and formal issues. But I will argue that this is not

necessarily such a worrying implication. All performance practice carries huge risk of error or misinterpretation. A Flux-based diffusion will require practice, fluency and rehearsal time. It is widely agreed that adequate rehearsal time is frequently problematic in the electroacoustic discipline, but the prevalence of dedicated diffusion research and performance spaces/ studios is growing. Perhaps a maturation of diffusion practice is dependent upon this. Let us re-examine diffusion practice as one which, depending upon how it is implemented, really is on par with other praxes.

The inaugural implementation of Flux system will take place at the Launch Festival marking the opening of the University of Manchester's new research centre for electroacoustic composition, performance and sound art, 2 - 4 November 2007.

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