

# Pools, Pixies and Potentials

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## Abstract

Interactive dance works create new dramaturgical challenges, where notions of relationship and inter-relationships may be dynamic, where overall structure and form are malleable and where, the performer often needs to have multiple, parallel awareness's. Composition of a work is challenging in this arena as form, narrative (linear or non-linear) and the consideration of 'interaction' all require careful and simultaneous deliberation. Furthermore, systems that do not use pre-recorded content (music or video), but rely on realtime synthesis of all material in performance, break down the traditional processes of content creation and rehearsal, where constraints are set on material and the work is formed into a known whole, followed by a performance phase. In an interactive system with realtime synthesis, the performance is also the moment of content creation. The authors are addressing these challenges through constructing clusters of potentials with inherent sets of relationships. Pools of potentiality may contain any number of composed foci and become the fundamental dramaturgical device, suggesting paths through the work, and relationships between interactive input and performative outcomes.

## Evolving Practice

In 1984, in the first edition of the journal, *Contemporary Music Review*, the composer Tristan Murail sought to challenge the status quo:

Our conception of music is held prisoner by tradition and by our education. All has been cut into slices, put into categories, classified, limited. There is a conceptual error from the very beginning: the composer does not work with twelve notes, x rhythmic figures, x dynamic markings, all infinitely permutable -- he works with sound and time. The sound has been confused with its representations, and we work with these, with symbols. Since these symbols are limited in number, we quickly come up against the wall. (Murail, 1984)

He continues by arguing that persuing the tradition generates music of incredible complexity 'which in fact no longer represent anything at all, since the music becomes un-performable, or literally inaudible in the sense that there is no correspondence between the music perceived by the listener and that conceived by the composer.' (ibid)

Murail raises two critical points; that musical practice has become so bound in the strictures of the tradition and the symbols used to represent it, that entire generations of composers have forgotten that the fundamental materials are sound and time (Lucier, 1995). He also considers the correspondence between the work representing something, the embedded internationality inherent in such a concept, and the degree to which such intentionality can be perceived by the audience.

Many arguments about the value of contemporary practice are not about the way the composer/musician deals with the fundamental materials, but how their work accords with the traditional symbols of representation. This discussion is relevant in this forum, because some contemporary practitioners of music and dance have moved from representations and symbols, from styles and to focus on the inter- relationships of fundamental of materials – time, sound, space, experience... in realtime interactive systems. When practice is driven by these considerations, the mechanisms of traditional making become in large part obsolete. A choreographer for instance focuses on the experience of presence and relationship, or space and it's transformation, and on the cybernetic causal loops established through realtime interaction. These notions carry forward, as they do in music, to considerations of systems that allow realtime response, evolution and transformation, of distributed relationships, sonifying or visualising those relationships as dynamic morphologies.

I suggest therefore that interactive works require new considerations about fundamental relationships between both dance and music (Birringer, 1999; Emmerson, 1989; Emmerson, 2001; Garnett & Goudeseune, 1999; Hayles, 1996; Norman, 2004; Paine, 2004; Sommerer & Mignonneau, 1998;

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States, 1996; Zurbrugg, 1994). The compositional process becomes one of constructing potentials, where notions of relationship and inter-relationship are dynamic, where overall structure and form are malleable and where, in performance, the performer needs to have multiple and parallel awareness's. Not only is this a challenge to the choreographer/composer, but also to the concept of intention/reception, the communication with an audience.

In the context of dance, Thecla Schiphorst has written widely about the body as interface in immersive environments. In describing the human bodies role as interactive agent, Schiphorst says:

I am interested in thinking what is body in relation to the construction of systems. I can describe the body as being fluid, re-configurable, having multiple intelligences, as being networked, distributed and emerging. ...From my personal history and my own live performance experience I developed the notion of body knowledge and what I call 'first person methodology' and use this as a basis for interface design. (Schiphorst, 2001).

Schiphorst paints a picture of the human body being deeply engaged with the act of interaction on many levels, being intuitive, visceral, corporeal and intelligent while exhibiting parallel processing features.

### Dramaturgy

The dramaturgical challenges inherent in a truly interactive work (ie. The Darker Edge of Night) are the focus of research by the author, in collaboration with dancer Hellen Sky, funded by an Australia Council for the Arts, ArtLab grant in 2007. Indeed the concept of interaction is unclear, being too broadly applied to indicate any one practice with clarity, and is therefore also defined within the project.

Techniques being developed to facilitate a consideration of interactive systems as central to the resulting performance work (The Darker Edge of Night) include the notion of constructing potentials, groups of potentials with inherent sets of relationships. These form what we term 'pools of potentiality', each of which may contain any number of composed potentials and become the fundamental dramaturgical device for determining the possible paths through the work, the way in which the potentials inter-relate, and the justification for the relationships between interactive input and performative outcomes. An initial mapping of the number of pools for The Darker Edge of Night can be seen in Figure 1.

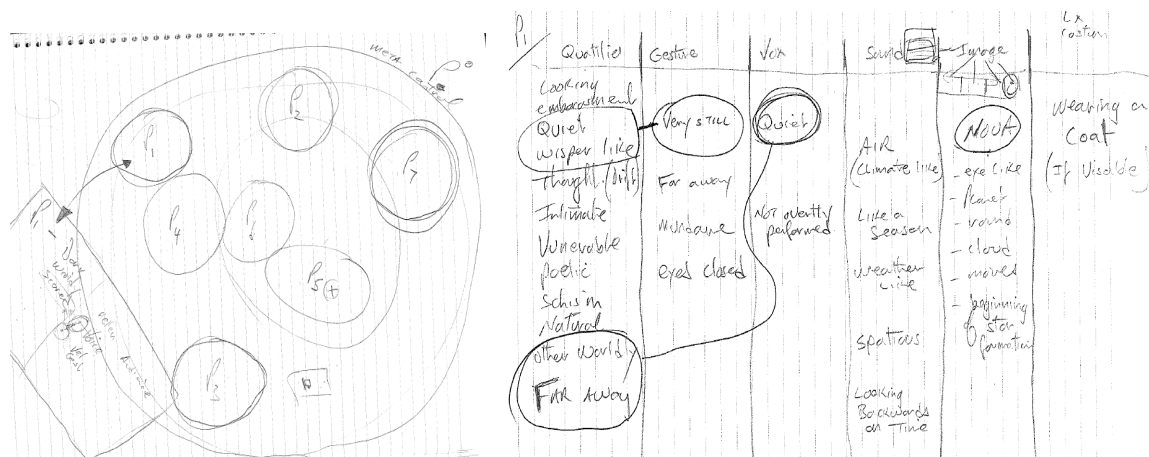


Figure 1 Initial map of 'Pools of Potentiality' for The Darker Edge of Night and some detailed consideration of Potential 1 (P1).

Each of the identified pools contains a number of composed potentials, each detailed as in . Firstly the qualities of that moment are noted. Then they are extended to the resources of the work, in this case, gesture, vocal, vocal, sound, image, lighting and costumes.

These considerations direct the composition process for each of the potentials. They determine aesthetics for each of the works resources at the micro-scale whilst allowing for dynamic transformation of these relationships. The macro-scale considerations address notions of non-linear, dynamic form/structure and the question of intention/reception.

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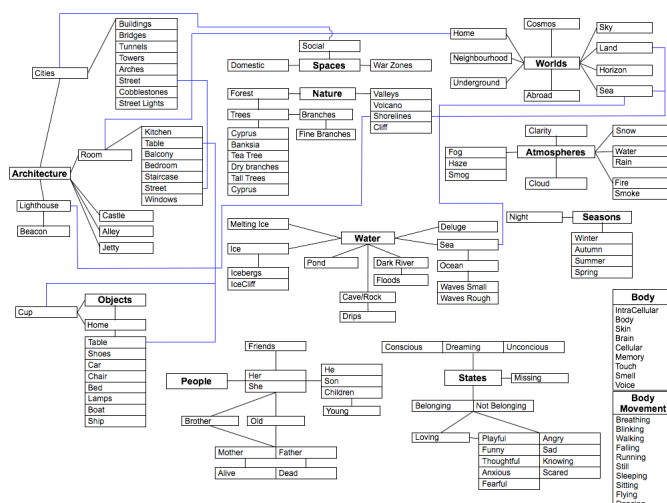


Figure 2 Example data selection tree for Darker Edge of Night

## Precedents

Eberhard Blum discusses Earle Browns musical compositions as ‘fully composed although frequently having “open form” potentials.’ (Blum, 2007)

As a musical score, it can be realised by any number and type of sound producing means. One may begin a realisation at any given point in the score and proceed to any other point therein, interpreting the variations in size and position as musical parameters (frequency, duration, volume, colour/timbre). Brown calls his work a ‘mobile musical piece’ in reference to Alexander Calder’s kinetic sculptures, or mobiles. In Europe, in the late 1950s, the terms ‘musique informelle’ and ‘Aleatorik’ were invented as designations for related works. (ibid)

The dynamic mobility Blum refers to in Brown’s compositions parallels the approach to dramaturgy briefly outlined above. This approach results in a vibrant, transforming work, which focuses on the fundamental qualities of the materials – time, sound, space and experience.

In Discussing the preparation for a performance of Earl Brown’s *Four Systems*, Blum comments that:

Freed from the constraints of having to lend form to a dramatic development, I can devote myself in *Four Systems* entirely to the processes of sound production.

Instrumental sound in all of its aspects becomes the major musical event and

durations, registers, volumes, and the physical act of creating sound the objects of my musical interest. Each separate moment in the course of the work is unique unto itself, demanding and receiving full attention. (Blum, 2007)

A further precedent for the concepts being proposed in this paper is an early application of composing potentials in literature, specifically the work of the French collective, Oulipo<sup>1</sup>:

Oulipo (pronounced oo-lee-PO) stands for "Ouvroir de littérature potentielle", which translates roughly as "workshop of potential literature". ... It was founded in 1960 by Raymond Queneau and François Le Lionnais.

The group defines the term 'littérature potentielle' as (rough translation): "the seeking of new structures and patterns which may be used by writers in any way they enjoy".

Constraints are used as a means of triggering ideas and inspiration, most notably Perec's "story-making machine" which he used in the construction of *Life: A User's Manual*. As well as established techniques, such as lipograms (Perec's novel *A Void*) and palindromes, the group devises new techniques, often based on mathematical problems such as the Knight's Tour of the chess-board and permutations. (Wikipedia, 2008)

An example of early interactive literature from the Oulipo, Queneau's *Cent Mille Millions de Poèmes*, can be engaged with online<sup>2</sup> and shares characteristics of the ever popular drawing game where a collective of individuals each draws part of a human picture (an important constraint leading to a common understanding of the object in the making), where by the paper is

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folded into sections so that the final drawing is not revealed until all parties have completed their contribution. Referred to as Picture Consequences, or simply the Fold Game, this game has been networked so that people can play it anonymously online<sup>3</sup>.

Queneau's *Cent Mille Millions de Poèmes* is derived from a set of ten basic sonnets. In his book, published in 1961, they are printed on card with each line on a separated strip, like a heads-bodies-and-legs book. All ten sonnets have the same rhyme scheme and employ the same rhyme sounds. As a result, any line from a sonnet can be combined with any from the other nine, giving 1014 (= 100,000,000,000,000) different poems. Working twenty-four hours a day, it would take some 140,000,000 years to read them all. (Rowe)<sup>4</sup>

A further precedent exists in current approaches to electronic music interfaces. Like Queneau's poems, electronic music algorithms often have multiple variables. When combined in a realtime synthesis engine this can multiply to tens or even hundreds of variables in need of control simultaneously. This is an impossible task without some form of correlation into higher order control patterns. One approach being taken is to develop preset interpolation interfaces such as those available in the Kyma software (Scaletti, 2004)<sup>5</sup> and in AudioMulch (Bencina, 2003)<sup>6</sup>, and audio plugins such as GRM Tools (INA-GRM, 2008)<sup>7</sup> and the INT.LIB for Max/MSP (Larkin, 2007).

Oliver Larkin comments that the design goals for INT.LIB were as follows:

- to allow the control of multiple parameter sets independently from one encapsulated interface
- to abstract the user interface from the max patch
- to facilitate rapid layout of the interpolation space
- to be fast enough to support interpolation of many presets featuring many parameters
- to be easy to understand and use (Larkin, 2007)

Ross Bencina outlines the Metasurface in AudioMulch as,

The Metasurface – a mapping interface supporting interactive design of two-to-many mappings through the placement and interpolation of parameter snapshots on a plane. The Metasurface employs natural neighbour interpolation, a local interpolation method based on Voronoi tessellation, to interpolate between parameter snapshots. (Bencina, 2005)

Such mappings have been applied in the *Darker Edge of Night*, where the bio-data is fed directly to synthesis variables, but these are in turn constrained by a conditional set, relating to an interpolation of preset spaces, in turn associated with a range of preferred aesthetics states. (See Figure 3)

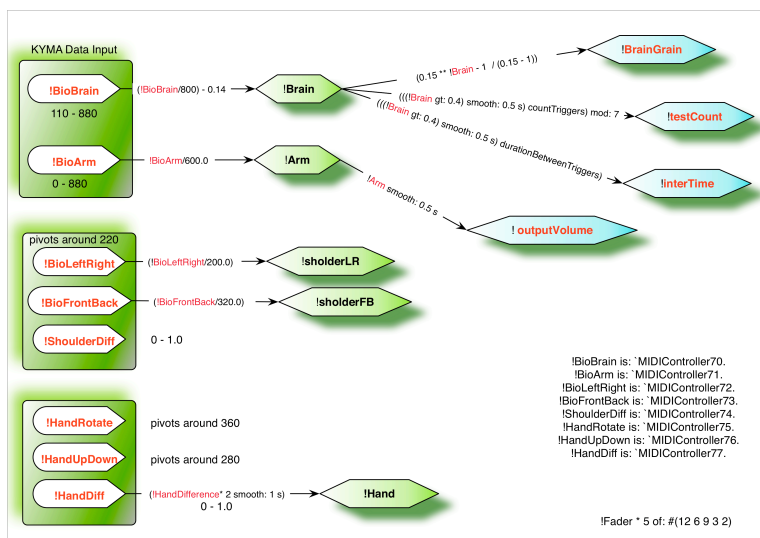


Figure 3 Bio-Data mapping to Sound Synthesis Algorithms in *Darker Edge of Night*

### The feeling of moving,

As outlined above, we started with a vision to design a human computer system, that like our own sensing of the world is complex, sensorially rich and not fixed in time; Where the performer's dance and the performance elements of image sound, light and virtual 'staging' are deeply and intrinsically connected. This is a choreography that attempts to engage all of our senses, and rather like our own imagination and memory is capable of making unexpected leaps between sensations of thoughts,

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experiences, not as a replication but as art, rich in virtual potentials.

We understand already in developing this system that the body is capable of producing all kinds of data, patterns of ever changing data, where the parameters of difference exist as computational potentials. We sought to synaesthetically trans-code those patterns in real time, as fluid states manifest as sound, light, and image. In this system our choreography of body perceives no boundary between the computational potential or that of the performer, rather they create a symbiotic system of exchange. Although there are sets of conditions that are pre-composed, pre-scored imagined or sensed, what occurs in the real time moment to moment dance, is an open dramaturgical system which folds between influence and response.

Our choreography includes not only the composition of the physical body, of the performer moving in space and time, in site, but also the composition of the data produced by her movement as a combinatorial system, generating the real time transformations of the performative elements. In so doing this interplay deepens the performers engagement with the multi-sensory worlds she embodies. Capable now of sensing herself as light, or wind, made audible from breath, her attention is multi-sensory, multi-focal, in the micro moments. The in-between spaces of thoughts and actions form a creative interplay between these scores that is not simply causal or on cue.

The dynamic nature of these relationships invites her curiosity, a playfulness, a risk of unknowing. They can also incite an amplification of states that bring relations into the body, felt as visceral embodiment of the evolving audio-visual environment.

Embodying the system is a complex dance and one that is indicative of our increasingly more interwoven relationship with technology. This responsive system, allows us to think of other non-linear structures as choreographic form where the story is told, no matter of the order, regardless of any dominant performative language.

## **She closes her eyes, looks inside.**

Sensors worn on the performers head (EEG (brainwaves), EOG (eye movements) and facial EMG (muscle movements)), the arm (EMG), the shoulder and hand (angular velocity in two dimensions) are transmitted wirelessly ever two milliseconds to a computer network for realtime sonification and visualisation. Through imaginative software programming, these data patterns make audible the blinking of an eye, the clenching of the jaw, the flexion of the arm and the tilt and spin of the body. A synaesthetic sensing moves her attention between multiple modalities, multiple scores, inputs and outputs - the electro-physical dramaturgy of this expanded choreographic practice are represented as pools of potentials. Additionally the software development has addresses and Open Sound Control framework, so that all data can be shared, making the work extensible, both in terms of local sound and image synthesis, but also in term of telepresence performances.

## **CONCLUSION**

In conclusion; this paper details the ways in which the compositional ideas put forward here are applied in the creation of the work for *The Darker Edge of Night*.

## **Acknowledgements**

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## **REFERENCES**

- Bencina, R. (2003). Audiomulch: Interactive Music Studio. Retrieved 26 June, 2008, from <http://www.audiomulch.com>
- Bencina, R. (2005). *The Metasurface – Applying Natural Neighbour Interpolation to Two to Many*. Paper presented at the International Conference on New Interfaces for Musical Expression (NIME05), Vancouver, BC, Canada.
- Birringer, J. H. (1999). Contemporary Performance/Technology. *Theatre Journal*, 51(4), 361-381.
- Blum, E. (2007). Remarks re: Four Systems. *Contemporary music review*, 26(3/4), 367 - 369.
- Emmerson, S. (1989). Composing strategies and pedagogy. *contemporary music review*, 3(1), 133-144.
- Emmerson, S. (2001). From Dance! to "Dance": Distance and Digits. *Computer Music Journal*, 25(1), 13-20.
- Garnett, G. & Goudeseune, C. (1999). *Performance Factors in Control of High-Dimensional Spaces*. Paper

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- presented at the Proceedings of the 1999 International Computer Music Conference, San Francisco.
- Hayles, N. K. (1996). Embodied virtuality: or how to put bodies back into the picture. In Moser, Mary Ann & D. MacLeod (Eds.), *Immersed in Technology: art and virtual environments*. (pp. 1-28). Cambridge, MA: MIT Press.
- INA-GRM. (2008). GRM Tools. Retrieved 26 June, 2008, from <http://www.grmtools.org/index.html>
- Larkin, O. (2007). *INT.LIB – A Graphical Preset Interpolator For Max Msp*. Paper presented at the International Computer Music Conference, Copenhagen.
- Lucier, A. (1995). *Reflections, Interviews, Scores, Writings*. Köln: MusikTexte.
- Murail, T. (1984). Spectra and pixies. *Contemporary music review*, 1, 157-170.
- Norman, D. A. (2004). *Emotional Design*. New York: Basic Books.
- Paine, G. (2004). *Gesture and Musical Interaction: Interactive engagement through dynamic morphology*. Paper presented at the New Interfaces for Musical Expression, 2004, Hamamatsu.
- Rowe, B. Queneau's Peams. Retrieved 26 June, 2008, from [http://www.bevrowe.info/Queneau/QueneauHome\\_v2.html](http://www.bevrowe.info/Queneau/QueneauHome_v2.html)
- Scaletti, C. (2004). *Kyma X Revealed: Secrets of the Kyma Sound Design Language*. Champaign, Illinois: Symbolic Sound.
- Scalleti, C., & Hebel, K. (2007). Kyma (Version 10.1) [Computer software]. Champaign, Illinois, USA: Symbolic Sound.
- Schiporst, T. (2001). *Body, interface, navigation sense and the state space*. Paper presented at the The Art of programming : Sonic Acts 2001, Amsterdam.
- Sommerer, C. & Mignonneau, L. (1998). Art as a Living System. In C. Sommerer & L. Mignonneau (Eds.), *Art @ Science*. (pp. 148-161). Wien: Springer-Verlag.
- States, B. 1.-. (1996). Performance as Metaphor. *Theatre Journal*, 48(1), 2-26.
- Wikipedia. (2008). Oulipo. Retrieved 28 June, 2008, from <http://en.wikipedia.org/w/index.php?title=Special:Cite&page=Oulipo&id=220118396>
- Zurbrugg, N. (Ed.). (1994). *Electronic Arts in Australia. Vol. 8, No.1 Continuum*. Australia: The Australian Journal of Media & Culture.

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<sup>1</sup> See <http://www.ouliipo.net/> (viewed 28/06/08)

<sup>2</sup> See <http://www.bevrowe.info/Poems/QueneauRandom.html> (viewed 28/06/08)

<sup>3</sup> See [http://masscat.afraid.org/foldgame\\_pages/foldgame.php](http://masscat.afraid.org/foldgame_pages/foldgame.php) (viewed 28/06/08)

<sup>5</sup> See <http://www.symbolicsound.com/cgi-bin/bin/view/Company/KymaX1Released> (viewed 28/06/08)

<sup>6</sup> See <http://www.audiomulch.com/> (viewed 28/06/08)

<sup>7</sup> See <http://www.grmtools.org/> (viewed 28/06/08)