

**Creating Emotionally Aware Performance Environments:  
a phenomenological exploration of inferred and invisible data space**

by

**Richard Mark Povall**

**A thesis submitted to the University of Plymouth**

**In partial fulfilment for the degree of**

**DOCTOR OF PHILOSOPHY**

**Faculty of Arts & Education**

**October 2003**

# Copyright Statement

*The copy of this thesis had been supplied on condition that anyone who consults it is understood to recognise that its copyright rests with its author and that no quotation from the thesis and no information derived from it may be published without the author's prior consent. If the quoted material is to be used purely for academic purposes, then the author hereby waives the above copyright claim.*

**THESIS  
CONTAINS CD  
ROM**

# Table of Contents

Copyright Statement.....	1
Abstract .....	3
Table of Contents.....	4
Table of Figures.....	7
Author's Declaration .....	8
Acknowledgements .....	11
Introduction .....	12
The Research Question .....	15
Content and Design.....	15
Mapping Body Space .....	16
Outline of the Chapters.....	16
A word about the we.....	18
Background to the Research.....	20
Definitions .....	21
Methodologies and Conventions .....	26
Interviewing Artists.....	26
Talking to Performers and Audiences .....	27
Action Research: Developing the Work.....	27
Conventions .....	28
Accessing the audio and video materials.....	28
Finding Answers.....	29
Moving on.....	30
Chapter 1 : A Techno-Aesthetic Frame.....	31
Introduction.....	32
The Techno-Aesthetic Frame.....	32
Seeing the body.....	33
Virtualities, Physicalities .....	35
Virtual Practice.....	37
Char Davies: <i>Osmose</i> .....	37
Paul Sermon: <i>Telematic Dreaming</i> .....	40
Haptic Interfaces.....	43
Thecla Schiphorst: <i>Bodymaps</i> .....	44
Moving On.....	47
Chapter 2 : A Theoretical Frame.....	49
Frames of Reference .....	50
Theorising the Body.....	50
Locating the Body.....	50
Perceiving Space.....	51
Observing: Seeing and Perceiving .....	53
A phenomenological performance system ?.....	56
A mediatized performance space ?.....	57
A feminist performance space ? .....	61
Post-biology (after-life).....	61
Chapter 3 : The Question.....	64
Introduction .....	65
Performance Failures .....	65

Interpreting Literal Space.....	66
The Current Technological Context.....	68
Choreographic Concerns.....	68
The Body Suit.....	70
Video-based systems.....	72
An Ontological Shift.....	74
Invisible machines.....	77
The audience.....	78
Bodies and machines.....	81
Emotional and interior space.....	83
The phenomenological link.....	85
A conscious machine?.....	86
Seeking the subjective.....	88
E-motion sensing.....	89
Emergent poetics.....	90
Moving On.....	91
<b>Chapter 4 : The Research.....</b>	<b>92</b>
Introduction.....	93
Genesis (Enchantment).....	93
Research Methodology.....	94
Dreaming.....	97
The Making Process.....	98
Learning Consciousness.....	100
Fuzzy Logic Systems.....	101
Early Work.....	102
Finding the phenomenal.....	105
Breathing Life.....	107
Miking a moving target (mediatising the space).....	108
The Poetic Environment.....	111
<b>Chapter 5 : The Secret Project.....</b>	<b>113</b>
Introduction.....	114
The Work(s).....	114
The Secret Project.....	115
Sections from The Secret Project.....	117
breath.....	117
The <i>breath</i> script.....	118
lingua.....	122
twice turning.....	127
Sharing Voices.....	133
Chorda.....	136
Seeing Double.....	140
Snow Ghosts.....	141
<b>Chapter 6 : Spinstren.....</b>	<b>144</b>
Outline of the piece.....	145
General discussion of the liminal world.....	146
General discussion of the technologies.....	147
Generating Text.....	148
Soundworlds — moving sound in space.....	153
The phenomenology of the 3D soundworlds.....	159
Supporting the speaking voice.....	160
Moving to performance.....	163

Red Top (The Lost Song) .....	164
Chapter 7 : Reflections & Analyses .....	168
Introduction .....	169
The Early Breakthroughs .....	169
The Composer's Rigid Frame .....	170
Poetic Space .....	171
The Musical World .....	172
The Textual World .....	175
Theatrical Structures .....	176
Technical Evaluation of the Research Outcomes .....	179
Chapter 8 : Some Conclusions .....	181
Emotionally Aware Performance Environments .....	182
Reading the Phenomenal Dancer .....	185
Poetic Space .....	186
Notes .....	188
Appendices .....	195
Appendix 1 : BigEye .....	196
The Software .....	197
The Colour Filter .....	198
The Difference Filter .....	200
Overview of regions .....	201
The Scripting Environment .....	203
Appendix 2 : Sensing Technologies .....	206
Photodiodes or Photoresistors .....	207
Invisible Light .....	208
Physical switches .....	208
Body suit systems .....	210
Appendix 3 : Article from <i>The New York Times</i> .....	213
Appendix 4 : All BigEye scripts (The Secret Project) .....	216
Appendix 5 : Article from <i>animated</i> .....	220
Appendix 6 : Sample of Generated Text .....	223
Appendix 7 : Published Paper .....	225
Appendix 8 : Published Essay .....	232
Appendix 9 : Interview with Bill Seaman .....	237
Interview with Bill Seaman .....	238
Appendix 10 : Interview with Susan Kozel .....	247
Trajèts .....	248
Appendix 11 : Interview with Mark Coniglio .....	258
List of References .....	272
Bibliography .....	277

# Table of Figures

Figure 1-1 from Char Davies' <i>Osmose</i> .....	39
Figure 1-2 from Char Davies' <i>Osmose</i> .....	39
Figure 1-3 from Paul Sermon's <i>Telematic Dreaming</i> .....	41
Figure 1-4 Thecla Schiphorst: <i>Bodymaps</i> (1997) .....	46
Figure 3-1 switch matrix .....	69
Figure 3-2 digital sampling.....	69
Figure 4-1 <i>minimix</i> from <i>Spinstren</i> .....	99
Figure 4-2 Triggering Text.....	104
Figure 5-1 <i>breath</i> from <i>The Secret Project</i> (excerpt).....	120
Figure 5-2 Jools Gilson-Ellis performing <i>lingua</i> from <i>The Secret Project</i> .....	123
Figure 5-3 Mary Nunan performs <i>lingua</i> .....	124
Figure 5-4 moving window for <i>twice turning</i> .....	130
Figure 5-5 audio from <i>twice turning</i> .....	131
Figure 5-6 Cindy Cummings performs <i>twice turning</i> (excerpt).....	135
Figure 5-7 Max Patch <i>Chorda</i> .....	137
Figure 5-8 Max Patch <i>flutegen</i> (subpatch of <i>Chorda</i> ).....	138
Figure 5-9 <i>Chorda</i> from <i>The Secret Project</i> (excerpt) .....	139
Figure 5-10 Snow Ghosts (audio only) .....	141
Figure 6-1 Geometries from <i>Spinstren</i> (excerpt).....	151
Figure 6-2 Carla text.....	152
Figure 6-3 Max patch providing overall systems info .....	153
Figure 6-4 Max patch for spinning sound .....	155
Figure 6-5 spat4~ .....	157
Figure 6-6 Quadpan .....	158
Figure 6-7 Müller-Lyer illusion .....	160
Figure 6-8 Jane Kellaghan performs <i>Today is the Day</i> (excerpt) .....	162
Figure 6-9 <i>Underworld</i> from <i>Spinstren</i> .....	164
Figure 6-10 Max patch for <i>Red Top</i> .....	166
Figure 7-1 Schechner's Performance Quadrilogue.....	176
Figure 7-2 a proposed half/angel quadrilogue.....	177
Figure 7-3 a proposed half/angel quadrilogue.....	178

# Author's Declaration

At no time during the registration for the degree of Doctor of Philosophy has the author been registered for any other University award.

This study was financed with the aid of a fee waiver from the University of Plymouth for the first three years of study. The practical research was funded by The Arts Council of England, The Arts Council (of Ireland), South West Arts, the Esmée Fairbairn Foundation, Oberlin College Conservatory of Music, Middlesex University, and University College, Cork (Ireland).

## Artist / Research Residencies (by invitation)

- Senior Guest Artist, Banff Centre New Media Institute, Canada, September 2000.
- Artist in residence (with half/angel) at the International Multimedia Lab 6, Bore Place, Kent, UK. Produced by Performing Arts Labs (PAL), UK. May 2000
- Co-production residency, Media & Visual Arts Dept., Banff Centre for the Arts, Alberta, Canada. August/September/October 1999.
- Selected artist in residence, körper.technik//body.technology, Berlin. Co-produced by Zentrum Bundesrepublik Deutschland des Internationalen Theaterinstituts e.V. (Berlin), and shinkansen (London) June/July 1999
- Co-production residency, Media & Visual Arts Dept., Banff Centre for the Arts, Alberta, Canada. January 1999.
- Short residency, Firkin Crane Arts Centre, Cork, Ireland, April 1999
- Co-production residency, Media & Visual Arts Dept., Banff Centre for the Arts, Alberta, Canada. August 1998.
- Co-production residency, Media & Visual Arts Dept., Banff Centre for the Arts, Alberta, Canada. March 1998.
- Artist Residency, Firkin Crane Arts Centre, Cork, Ireland. October, 1997.

## Publications

- halving angels: technology's poem (with Gilson-Ellis, J.) in Beardon, C. & Carver, G. (forthcoming) *New visions in performance: the impact of digital technologies* intellect books, Exeter.
- Making Emotional Spaces in The Secret Project: building emotional interactive spaces. In *Consciousness Reframed*. Ed. Roy Ascott. Intellect Press, Exeter (UK). pp 64-68. ISBN 1-84150-041-0
- Chatterbox 4.0: Virtual/Physical Bodies - body, dance, technology. A piece commissioned by ISEA-Forum, a list-serv operated by the Inter Society for the Arts (Québec, Canada), for eventual publication on their website. Moderated by Ghislaine Boddington (UK). March 2000
- A Little Technology is a Dangerous Thing...: chapter in *Moving History/Dancing Cultures: A Dance History Reader*, edited by Ann Dils and Ann Cooper Albright, Wesleyan University Press, Middletown (USA). Forthcoming (Summer 2001). ISBN 0-8195-6464-8
- Das Große Auge (BigEye): Erfahrungen mit einer Software. *Tanzdrama* No. 51 Heft (Germany) February 2000. ISSN 0932-8688
- Secrets & Lies: a Report on The Secret Project. Accepted for future publication in *Digital Creativity Journal*, Swets & Zwetlinger, Lisse, The Netherlands. ISSN 1462-6268
- Technology is with us. Vol. 30, No. 1, Spring 1998 edition of the *Dance Research Journal* (Congress on Research in Dance, Lancaster, Pennsylvania, USA)
- Interactive Performance Technologies: a short commentary. *In Profile*. NZATT, Wellington, New Zealand. January 1998.
- Speculative Sociological, Artistic, and Pedagogical Frameworks for the New Electronic Art Computer Music Journal. Vol. 21:2 Spring 1997 pp 18-25., MIT Press, Boston, MA, USA. ISSN 0148-9267
- Working with CD-ROM as an artists' medium. *Digital Creativity Journal*, University of Plymouth Press, Plymouth, UK. February 1997. ISSN 1462-6268



## Published Conference Papers

- *Metaphors in Movement*. Panel Presentation at IAWIS (Int'l Assoc of Image Word and Sound), Universität Hamburg, Germany. July 2002
- *Living Space; making space aware*. Presented at Living Architecture, a Banff Summit, part of the 2000 Banff New Media Institute. Forthcoming, Leonardo (MIT Press).
- *Making Emotional Spaces in The Secret Project: building emotional interactive spaces*. Consciousness Reframed III, Caiia-Star, University College Newport, Wales. August 2000
- *Postdisciplinary Education: Can we finally follow practice?* Digital Creativity Conference (CADE99), University of Teeside, UK. April 1999.
- *The Seduction of the New: why it's time to stop talking about technology*. Digital Creativity Conference (CADE99), University of Teeside, UK. April 1999.
- *Motion Sensing and Realtime Sound Sampling Performance Systems and their Compositional Implications*, Proceedings, XII Colloquium on Musical Informatics, Italian Association for Musical Informatics, (University of Udine, Diploma Universitario per Operatore dei Beni Culturali (Gorizia), Italia). September 1998.
- *Timara: building a new undergraduate curriculum*, Proceedings, ISEA98terror. InterSociety for the Electronic Arts, 1998 Symposium, Manchester, England.. Web publication, at <http://www.isea98.org/people/povall/timara.html>. September, 1998.
- *Realtime control of audio and video through physical motion: Steim's BigEye*. Proceedings, Journée d'informatique Musicale. Lille, France. July 1997.
- *Body Sampling: realtime interactive motion sensing systems*. Proceedings, 6th Arts & Technology Symposium, Connecticut College, New London, Conn. USA. March 1997

## Performances: (Spinstren and The Secret Project only)

### **Spinstren**

- University of Plymouth, Faculty of Arts & Education. October 29, 2002
- Cork Fringe Festival, ICD @ Firkin Crane, Cork. October 23/24, 2002
- IAWIS (Int'l Assoc of Word, Image & Sound) 2002 Conference, Markthalle, Hamburg, Germany. July 23, 2002
- Exeter Phoenix, April 6/7, 2002
- Granary Theatre Cork. March 30, 2002

### **The Secret Project**

- Project, Dublin. February 2000
- ICD @ Firkin Crane, Cork. April 1999
- The Banff Centre for the Arts, Canada. March 1999

## Workshops and conference presentations

- Responder and evaluator, CellBytes2000, an experiential workshop in dual-stage telematics, held at the Institute for Studies in the Arts, Arizona State University, Tempe (USA), and co-sponsored by the ISA and Rescen (Middlesex University). July 2000.
- Co-moderator, one-day symposium: ENTER NOW - exploring human-computer interaction. Hosted by DA2 Digital Arts Development Agency, at the Arnolfini, Bristol, UK. June 2000.
- *Building the Emotional Composing Machine*. Comparative Music Praxes, Middlesex University, London. May 2000
- *Secret Spaces and Thinking Machines: liminal spaces in The Secret Project*. Liminality and Performance. Brunel University, London. March, 2000.
- *How we Sense Motion: building an emotional sensing environment*. SHIFTS 2000, on Choreography. Chisenhale Dance Space, London February, 2000.
- Keynote lecture presentation, *Exploding all the Paradigms*. Manchester Metropolitan University, December 1999
- chaired discussion panel as the wrap-up of Filtered or Ground, an exploration of the Creative Process. Chisenhale Dancespace, London. November 1999.
- Motion-sensing workshop: Firkin Crane, Cork, Ireland. October 1999

- Panellist on panel session on artistic futures at CROSS FAIR: Dance and New Technologies — Navigating New Constellations (Cross Fair: Tanz und Technologie). Ebertbad Oberhausen, Ebertplatz, Essen, Germany. October 1999
- Weaving Secrets, invited speaker at CROSS FAIR: Dance and New Technologies — Navigating New Constellations (Cross Fair: Tanz und Technologie). Ebertbad Oberhausen, Ebertplatz, Near Essen, Germany. October 1999
- invited artist, körper-technik/body-technology. Produced by shinkansen and ITI (International Theatre Institute). Berlin. June 1999
- *Motion-sensing Technologies and Choreography: The Play of Bodies and Texts in Contemporary Dance Production*. International Association of Word and Image Conference, Scripps College, Los Angeles, Calif. USA. April, 1999.
- Workshop/presentation on motion sensing systems and *The Secret Project*, California Institute for the Arts, CA, USA. March 1999.
- *Exploding all the Paradigms: Interactive Performance Composition*. The Richard Murphy Colloquium on Musicology. Oberlin Conservatory of Music, November, 1998.
- *Working with live sound and image processing in a small-scale interactive performance environment*, a workshop at International Dance & Technology 99 (IDAT99), University of Arizona, Tempe (USA). February 1999.
- *The Secret Project*, a showing of work in progress at International Dance & Technology 99 (IDAT99), University of Arizona, Tempe (USA). February 1999.
- *AM I MOVING OR SPEAKING? Motion-Sensing Systems, Choreography and Writing*. Discipline and Deviance: Genders, Technologies, Machines, Duke University, October 1998.
- *Live Sampling: LiSa*. Small Computers in the Arts Network (SCAN) Conference. Franklin Institute, Philadelphia, USA. November 1997.
- *From mouthplace to live place*. Performance Studies Conference, Atlanta, Georgia, USA. April 1997.
- *CyberGLOO*. Chaired live discussion with artists in Australia via ISDN. Digital Creativity 97, University of Derby, April 1997.
- *Realtime Control of Audio and Video Systems through Physical Motion*. Digital Creativity 97, University of Derby, April 1997.
- *Intermedial/Advanced HTML programming for Artists (workshop)*. Digital Creativity 97, University of Derby, April 1997.
- *mouthplace*, a gallery talk. Triskel Arts Centre, Cork, Ireland. March 1997
- *Music Composition for Multimedia Environments*. University College, Cork, Ireland. March 1997



Signed

Date October 29, 2003

# Acknowledgements

I wish to thank all of those who contributed to and supported my efforts in writing and presenting this thesis.

Primarily I would like to thank Professor Colin Beardon, who encouraged me to undertake this study in the first place, and who helped me throughout the long five plus year process until his retirement in 2002, just prior to my completing the written thesis. His support and pragmatic approach to the PhD process was helpful, supportive, and morally uplifting throughout. He encouraged me to go on when the process seemed insuperable. I would also like to thank Roberta Mock, who became my Director of Studies in the final phases of the process, and who, along with Stuart Mealing, helped me greatly in the most difficult final writing phase. Roberta's insight as a choreographer was particularly helpful and apposite.

Of equal importance is Jools Gilson-Ellis, with whom I have worked since 1995. Her work is quite extraordinary and has been my source of inspiration since we first began working together. She has made it almost impossible to work with anyone else. I'd also like to thank Cindy Cummings (with the company for both *The Secret Project* and *Spinstren*, and whose musicality and innate understanding of the sensing environments has been quite extraordinary), Jane Kellaghan (*Spinstren*) and Mary Nunan (*The Secret Project*). Equally important has been the support of our Production Manager, Paul McCarthy.

I'd like to thank all those who have helped bring the performance work to fruition, most of all Sara Diamond at the Banff Centre for the Arts, and Mary Brady and Sharon Sheehan at the Institute for Choreography & Dance in Cork. The work could not have been made without their generous support. Banff also supported the performance work financially, as did The Arts Council/An Chomhairle Ealaíon, The Arts Council of England, South West Arts, the Esmée Fairbairn Foundation, University College Cork, Oberlin College Conservatory of Music, and Middlesex University.

Finally, a special thanks to my wife, Nancy Sinclair, whose support has been entirely irreplaceable during this entire process. It never wavered, and there were many times when the work for the PhD subsumed most other parts of my life, which could not have happened had she not stepped into the breach.

Harbourneford 2003

# Introduction

*'...the prosthesis of vision can be at one and the same time instrumental in constructing what is envisioned. To see in the mind's eye is to realise in the material world. The worlds of the double consciousness, supervenient as they are on the processes of the double gaze, become less distinctly separable. The immaterial and material lose their categorical distinction. Cyberception is as much active and constructive, as it is receptive and reflective. As this kind of double technology develops, and it is doing so at an accelerated rate, artists, no less than philosophers and neuroscientists, must increasingly turn their attention to what I will call "techno-qualia", a whole new repertoire of senses, and to a new kind of relationship between the tools of seeing and building.'* (Ascott 1999 p.69)

**T**he practical research undertaken for this thesis — the building of interactive and non-interactive environments for performance — posits a radical re-casting of the performing body in physical and digital space. The choreographic and thematic context of the performance work has forced us<sup>1</sup>, as makers, to ask questions about the nature of digital interactivity which in turn feeds the work theoretically, technically and thematically. A computer views (and attempts to interpret) motion information through a video camera, and, by way of a scripting language, converts that information into MIDI<sup>2</sup> data. As the research has developed, our company has been able to design environments which respond *sensitively* to particular artistic / performance demands. I propose to show in this research that it is possible to design an interactive system that is part of a phenomenological performance space, a mechanical system with an ontological heart. This represents a significant shift in thinking from existing systems, is at the heart of the research developments and is what I consider to be one of the primary outcomes of this research, outcomes that are original and contribute to the body of knowledge in this area. The phenomenal system allows me to use technology in a poetic way, where the poetic aesthetic is dominant — it responds to the phenomenal dancer, rather than merely to the ‘physico-chemical’ (Merleau-Ponty 1964 pp.10-11) dancer. Other artists whose work attempts phenomenological approaches to working with technology and the human body are referenced throughout the writing.

The interactive systems I create do not explore a re-definition of actor/audience, nor choice/play as a navigational exercise, nor the competitiveness of the game. They are instead about redefining the relationship between the observer (the computer) and the observed (the performer), between the performer and choreographer, between the sonic space and the physical, between the virtualised and the actualised, between spoken/sound gesture and physical gesture — all within what is a fairly traditional, aesthetically uncompromised performance context.

What is radical in the practical research undertaken here is the attempt to build a series of interactive performance environments that are able to respond not just to the empirical information, but to intuit phenomenological information. I am attempting to design a motion-sensing system that can look at the sensuality of a movement rather than merely at the mechanics of a movement, a system that 'gives visible existence to what profane vision believes to be invisible' (Merleau-Ponty 1964 p.166). Perhaps, to use Seaman's phrase, I am designing a system with 'emergent meaning' (Seaman interview: cf Appendix II) — certainly one with an emergent poetic.

In *Spinstren* I work with a three-dimensional soundspace that can manipulate the audience's perception of physical space, what might be described as a 'musical psychoacoustics' (Jourdain 1997 p. xiii). The intent in manipulating space in this way is to provide an ontological shift in the performance space that unsettles and unseats the audience. This kind of unsettling — almost impossible to maintain, but of central importance to the development of a poetic aesthetic — becomes the dramaturgical lynchpin of the performance work.

How do these technologies and the interactive environments they are helping create, contribute to, or change, the 'gestural narrative' (Pavis 1982 p. 134) of the work? If indeed it is possible for a computer to sense and interact phenomenally with a moving body, is this something that is communicated to the audience, or does it even need to be communicated — what difference does it make to the final work? Does this represent a disruption of the phenomenal site, or an enhancement of it?

Poetic text is a fundamental component of the work — indeed it could be said to be the fundamental component of the work. *This thesis is not literary in its focus, nor can it adequately investigate many of the theoretical discourses that arise from a more linguistic approach to analysing this work.* Nevertheless, the text (see definition, below) remains fundamental, and will be explored for the vitally important role it plays aesthetically and structurally.

## **The Research Question**

---

Is it possible to create an interactive performance environment that has emotional awareness? Can a technology without consciousness be said to behave or respond phenomenally, and what are the ontological implications behind such a question? What is the role of the poetic in this context?

## **Content and Design**

---

This is not a broad study of performance and technology. It explores a very specific subset of the field which involves bodyscapes, dreamscapes, and a new phenomenological design for an interactive system. The body/technology sphere is broad, bringing into play many fields of theoretical discourse. For practical purposes, I have limited the study to the specific areas directly relevant to my research questions, most particularly the

phenomenological and ontological aspects of the interactive performing space, and the ways in which I am using particular technologies in a poetic way.

## Mapping Body Space

Most interactive performance systems (alternatively referred to as *motion-sensing systems*) are based on a mechanistic approach that objectively maps the body in space. In attempting to map, or be aware of *phenomenological space*, I question this basic premise. Should what I am calling emotionally aware systems look only at objective data streams, or is there some other way to look at the data coming from our motion-sensing systems? Is there a liminal place — a space between the internal and the external — that we can draw on when attempting to work with phenomenological information? How does phenomenological theory affect our thinking here, and how do we deal with perception without apparent consciousness? Can there, then, be *invisible data* and can those data be sensed or interpreted in some way? These questions are of central importance to the thesis, and grow directly out of the primary research questions.

## Outline of the Chapters

---

Chapter 1 looks at the technical and aesthetic frame for this research. It explores emerging relationships between technology and the body and looks briefly at practice in Virtual Reality systems.

Chapter 2 explores the general theoretical framework for the research, and outlines the theoretical approaches that are the most, and the least useful in considering this work. I



heavily reference two of the primary works of Maurice Merleau-Ponty (*The Primacy of Perception* (1964), and *The Phenomenology of Perception* (1962), not because the primary texts (Husserl, Heidegger, et al) are not important, nor because nothing has been written on phenomenology since the mid-sixties, but because I find a particular resonance and applicability of the *language* the Merleau-Ponty uses. The phenomenological discourse is, of course, not his alone, but these two source texts seem particularly apropos.

Chapter 3 examines the central question of the research. It looks in some depth at existing technologies and other interactive systems that have formed the body-technology debate, and at the theoretical implications behind those systems. It begins to explore how this research is attempting to look at the problems with a fresh eye and how the work is new in its technical and aesthetic approaches to the interactive performance system. The chapter looks in particular at the connection between body and machine, and speculates on the capture of subjective information and on the nature of the stage as a phenomenological space.

Chapter 4 explores the early research work, and its immediate context. It looks at early failures as well as successes, and explores the technical context in some detail.

Chapters 5 and 6 describe the performance work, and look at both the making of the work and the final artefacts themselves. The aim of these chapters is to study the making process of the work, looking as much at how a particular decision was arrived at as the decision itself. There is some discussion about the role of the audience in this work.

Chapter 5 concentrates on *The Secret Project*, Chapter 6 on *Spinstren*.

Chapter 7 provides some analytical reflection on the performance outcomes, and reflects on the success or otherwise of the experiments represented in the performance work, looking in particular at such things as the musical (sonic) world, the textual world, and evaluating theatrical and technical techniques and outcomes.

Chapter 8 is a final summing up of the research, including a précis of the entire research period. What was learned and achieved during this time? Are there answers to the research questions?

## **A word about the *we***

---

Throughout this thesis, I will often use the first person plural. Although clear distinctions can be made about what represents my research within this body of work, it is nevertheless a body of work that has been made collaboratively with choreographer and writer Jools Gilson-Ellis, my co-director in our company, *halfangel*, and with the company as a whole. *halfangel* has been making work since 1995, encompassing performance, installation, and screen-based media. Our two most recent major performance works, *The Secret Project* (1999) and *Spinstren* (2002) are the practical outcomes from this period of research, and they are explored in depth. The company is based in Devon, England, and Cork, Ireland. We usually work with three performers, one of whom is Jools — all three are usually choreographers in their own right. It is a professional company, employing professional performers and crew, and receiving funding from governmental and non-governmental sources including The Arts Council/An Chomhairle Ealaíon

(Ireland), and Arts Council England. The company's work has been shown in ten countries since 1997, and has been critically well-received (see Appendices 4 and 5).

The nature of the work makes collaborative action research essential, even though there are times when I am working alone, and my input into the whole is discrete, just as Jools' input is also discrete. In the end, however, none of the discrete parts can exist as a whole until a collaborative making process takes place, first between the two of us, and then with the company as a whole.

In *The Secret Project* this collaborative process took place over a three-year period, beginning at STEIM<sup>3</sup> in the Netherlands, in 1996, and continuing in a number of residencies at the Banff Centre for the Arts<sup>4</sup> in Canada. For *Spinstren* the collaborative period was much shorter, less than a year in total. Sometimes it is difficult to separate out when I am working alone and when I am working collaboratively, and the open, closely collaborative mutuality of the making process is essential to the outcome of the research.

This is *not* a thesis about collaboration, however, so it will be discussed only when appropriate to the working methodologies undertaken in this research. Much broader discussions of collaborative process exist elsewhere. Nevertheless, more details on the collaborative methodology will emerge in Chapters 4 and 5, as well as later in this Introduction.

## Background to the Research

---

This research did not come out of nowhere. I began working with interactive systems in a performance context as early as 1991, when such systems were quite primitive. I was fortunate to receive an invitation to undertake a performance project at the University of Arizona's Institute for Studies in the Arts, which was one of the world's leading centres for research into performance-based motion sensing systems. At that time, they were working on a system that ultimately became known as *The Intelligent Stage*, which is referred to on numerous occasions throughout this thesis. Based on powerful Silicon Graphics machines, their systems surpassed anything that was being developed elsewhere — the only true rivals were a system based on a 512K Amiga called *Mandala*, which had probably 1000<sup>th</sup> the processing power of the SGI machine, and David Rokeby's *Very Nervous System* (VNS), which although perhaps the most evolved of all was not readily available to other users (Rokeby has subsequently made his system available commercially, and it now exists in a software-only form (*SoftVNS*) which I have begun using in my most recent research. At the same time work was underway at STEIM to develop *BigEye*. Both of these systems will be referred to, particularly the latter which formed the software backbone of much of my research.

Almost all these systems (except perhaps VNS) were quite primitive, their responses unsubtle and mechanistic. This was partially a function of the lack of power within the relevant hardware, but also a failure of imagination on the part of those working with and developing the hardware and software. It is worth noting at this early stage that VNS is the only system developed by a practicing artist primarily for his own use, although all the systems mentioned here were developed with significant artist input.

At the ISA I made a piece with composer John Mitchell called *The Last Garden*. This piece is explored in an article in *Leonardo Music Journal* (Povall 1994).

## Definitions

---

There are a number of terms used in this thesis whose meanings are often blurred or unclear in their general usage. I would like to clarify how I am using them in this thesis:

- affective* So-called *affective computing* is a general term for technologies that have a *direct link to the body*. The term *affective* is distinguished from its psychological counterpart, *effective*. ‘An “affective” response is one in which the stimulus has made some definite change *in the organism*’ (Lundin 1967 p.150). These technologies are, by definition, interactive technologies. Recent usage has become quite particular, and implies some psycho-physical aspect of interaction. A system that responds to bio-medical stimuli could be described as being an *affective system*.
- dance-theatre* A general term used in this instance to describe choreographically-centred work that has a strong narrative or textual element. Sometimes referred to as physical theatre, or even new-narrative dance (Banes 1994).
- emotional technology* If affective computing is concerned with the body, then perhaps emotional computing is concerned with the mind. It is a phenomenological system rather than an objective, or a purely

'physico-chemical' system (Merleau-Ponty 1964 p.10-11); it tries to look beyond the surface to the not-seen.

*environment*

Here, this word means, or implies, *a collection of elements that combine to make a performance interactive*. For example, a particular programme (or set of programmes) using the live sensing system, and producing a live sound world, is what I call an *environment*. It is a *live environment* which performers inhabit, where they become primary interactors. It is a term often used by those developing interactive performance systems. The environment is made up of the system (the software and hardware), the performers, the lighting and other stage technologies, and so on.

*improvisation*

Without exception when I refer to improvisation within the context of the interactive performance work, I am referring to a structured form of improvisation that is much closer to choreographed movement than it is to free forms of improvisation. This form of improvisation uses a developed choreographic language, but leaves open, always, the ability to explore in the moment, to be spontaneous, to react genuinely within the environment, but always within a defined set of parameters and skillsets. Most important, the improvisation gives the work a necessarily 'precarious' (Blom 1988 p.119) edge.

*interactive, interactivity*

Except where otherwise specifically noted, I use the word *interactivity* to talk about a particular combination of technologies and live performance. The performance environments we are building are *interactive* in the sense that I am using sensing systems to *analyse the movement of the dancers on stage*, the output of

which is used to drive other systems, such as sound synthesis systems and soundfile playback. The work all takes place in a theatrical setting. (This is not true of all the company's work, but is true of the performance projects that are the core of this research.) Here, the dancers are the *primary interactors*. I also use the word *interactive* to describe, for example, many of the sound environments for *Spinstren*. These are interactive environments in the sense that *I am generating the sound in realtime, and can control many of its parameters in realtime*. Here, I am the *primary interactor*. Following Rowe (1993 pp.7-8) both these systems are performance-driven, both transformative and generative, and use an instrument paradigm.

#### *interactor*

There are numerous words used for someone who is interacting with an interactive system, none of which has yet become the accepted norm. This stems from the desire to break the dichotomy between audience/viewer and active participant. Other words include *immersent*, *viewer*, etc. (cf Seaman interview text, Schiphorst 1997, Davies 1999, et al). I always refer to those who are interacting as *interactors*. In the case of performance, this seems less problematic, and I often use the words *interactor* and *performer* interchangeably.

#### *liminal*

This is a word used primarily by anthropologists and ethnographers to talk about *in-between* states, such as trance states or the moment of transcendence from childhood to adulthood (or more usually, boyhood to manhood). Usage has spread and is often used in a spiritual or metaphysical context to describe something that is indescribable in empirical terms. I use

it also to describe the ‘spaces between things’ (Merleau-Ponty 1964 p.15). Some of these states, or perhaps all of them, could also be described as phenomenal — the phenomenological nature of these performance spaces will be explored in some depth.

*magic realism*

This is a term typically used to describe a particular genre of fictive narrative that combines the real and the fantastical (cf Mullan 1999, Leeper 2003, et al). Such authors as Salmon Rushdie and Gabriel Garcia Marquez have been described as *magic realist*. This particular combination of the grounded world of the real and the fantasy world of the fairy tale applies to *halfangel*'s work, and critics have used the term *magic realist* to describe our work.

*poetic*

This is an all-encompassing term that refers not just to a poetic text, but to a “poetic” aesthetic — the combination of lighting, set, costume, spoken text, and music that goes to build the pieces. The term poetics has many definitions, but perhaps the most pertinent here is that from The New Century Dictionary: ‘*possessing the qualities or the charm of poetry*’ (Emery & Brewster, 1927)

*radical*

I use this term on occasion in reference to a re-thinking of the relationship between body and machine. I am not using the word in its political sense (cf Kershaw 1999 et al), but in its literal meaning of ‘going to the root’ or ‘fundamental’ (Allen 1990 p.987).

*sensitive, sensitivity*

A word often used in body-technology discourses, it has quite a specific meaning, and one that is of central importance to this research. A *sensitive* system is one that can be said to respond with a degree of subtlety and sensitivity to human motion.



*soundworld, soundscape* I tend to use these terms instead of sound score or composition.

Particularly as much of the sound is immersive (*Spinstren*, for example, uses a 6-channel sound system to achieve this), I prefer the term *soundworld* or *soundscape* to describe how the environment *sounds*. In this context, music and sound are, once again, an environment that is *inhabited* (by both performance and audience) rather than a flat plane to be viewed or listened to passively.

*system*

A *system* is a subset of an *environment*. Usually in this thesis it is used to refer to the combination of camera, computer, software, and sound-producing devices that go to make up the heart of the environment. Without the system, the environment wouldn't exist. There are however other systems at play: lighting systems, performing systems, the theatre itself. All of these are working together to create the performance environment.

*text*

**unless specified otherwise** the word "text" refers to spoken or written (poetic) text, and not to its broader usage, when it could be referring to any aspect of the performance or even the systems in use.

## Interviewing Artists

As part of the research for this thesis, I interviewed four artists in some depth. They are: Bill Seaman, Susan Kozel, Mark Coniglio, and Jools Gilson-Ellis. Some of them are engaged solely in screen-based or installation-based work, others in performance, and others in hybrid forms—all, however, centre their work in the body. I make no differentiation here between these various forms and formats. In each case, these are artist-scholars whose work is as well theorised as it is practised. Each works with interactive systems, and have a particular interest in the emotional aspect of the body's interaction with the computer environment. Each, however, is very different. The interviews are reproduced almost in full in Appendices 9, 10, and 11 (except for Gilson-Ellis). However, the material is also seeded throughout the thesis, often in large chunks of quotation (larger than I would normally use in this particular context when quoting the words of others). I felt it was important to preserve their actual words — their *language* — because the words are so reflective of their attitude to the work they make and the interactions between body and machine that they are exploring.

I felt it important to refer directly to the work of practising artists and to use their words and work to illustrate directly some of the issues at hand. In this way, they further contextualise the new techniques developed for this body of research, and provide an framework additional to the theoretical. Practitioners are thinkers, too, and their words in the context of this thesis are often quite revelatory.

There are, of course, many artists whose work is in or of the body who are not represented here. In particular, I should mention Stelarc, the Australian performance artist whose work with the body and electronic extensions to the body was pioneering,

and Orlan whose experimental performance research based in body manipulation and surgical alteration has also been considered landmark. I do not explore this work in detail because I believe it stands entirely in opposition to the other artists (and myself) talked about here. This is work that *opposes* the body, the soul — a technocratic approach to the body that sits at odds with the metaphysical and spiritual approach of the artists whose work I represent here. It is work that attacks, attaches, manipulates, stretches, harms the body, a direct marking of the body by technological means. This is not to suggest that the work of Stelarc and Orlan and others is not of great importance and significance, but that its core is quite different to the work presented here.

## Talking to Performers and Audiences

This thesis does *not* include empirical research carried out with either performers and others who have experienced our performance environments, or with audiences who have experienced the work. This is not to suggest that such research is not valid or interesting, but that it is highly specialised research that it is well beyond the scope of this thesis. Nevertheless, I did conduct informal interviews with both performers/participants and audience members, and we have also held question/answer sessions after a number of our performances. Comments based on those anecdotal interactions are seeded throughout the thesis.

## Action Research: Developing the Work

The methodologies at play in developing the performance work is necessarily complex and collaborative. For a more detailed exposition of the action research methods used, see Chapter 4.

## Conventions

Wherever a direct quotation is used, it is differentiated by the way it looks:

*A textual quotation from another author looks like this, using the italicised Gill Sans font in blue-grey. The text of the quotation is single-spaced and is indented 2cm.*

An interview quotation looks like this. The text is not as far indented (1 cm), and is brown instead of blue-grey. It also uses the same Gill Sans font as the regular body of the text.

When a programming excerpt is used, it is shown in Courier font, also indented 2cm.

## Accessing the audio and video materials

The thesis is a media-rich document designed to be read on-screen, with full access to audio and video materials embedded in the document. However, there is also a CD-Rom containing all the audio/video materials attached to the bound thesis.

To look at the contents of the CD-Rom, you must have QuickTime installed. This is available as a free download from [www.apple.com/quicktime](http://www.apple.com/quicktime) for PC (Windows) or Apple Mac.

On each occasion when a Figure is available on the CD-Rom the following will appear next to the caption:



**CD-Rom: Fig n-n**

## Finding Answers

---

In attempting to describe how this research is new and contributory to the field of body-technology performance systems, it seems quite important to explore the shortcomings of existing systems, as well as looking at both historical and theoretical contexts for the work, which forms the content of Chapters 1 and 2.

The research is based in the practice. The practice research was not goal-orientated, nor set up to prove a hypothesis true or false. Instead, the work, and the thinking behind it, grew quite organically from the early stumblings in the lab at STEIM to the full-blown performance events described here. The theoretical underpinning of the work also evolved over time, and has become clearer only after some considerable reflection.

One of the key emergent questions seems to be concerned with machine consciousness. If consciousness is a fundamental property of a phenomenal system (Merleau-Ponty 1964 pp. 58-59) then can a computer system ever be described as behaving “phenomenally” or being “emotionally aware”?

*‘[A man] stung by a mosquito does not need to look for the place where he has been stung. He finds it straight away, because for him there is no question of locating it in relation to axes or coordinates in objective space, but of researching with his phenomenal hand a certain spot on his phenomenal body... The whole operation takes place in the domain of the phenomenal; it does not run through the objective world, and only the spectator can believe that the sting is perceived, that the hand moves in objective space.’ (Merleau-Ponty 1964 pp. 105-106)*

What happens if the computer is stung by a mosquito? More pertinently, what happens if the computer observes the body that is stung by a mosquito? Can it have any understanding of the phenomenal domain or the physicality (the “ouch”) of the sting? On

its own, this seems less than unlikely, but is it possible to *imbue* the system with a phenomenal understanding? If so, can the machine be said be conscious? or is this simply anthropomorphism?

Computer vision systems are, by definition, objective, empirical. Human systems are not:

*'post-Newtonian natural science...assures us that all events are accessible to objective measurement and are causally related to one another by mechanical links...We have come to value analysis at the expense of synthesis.'* (Leach 1979 p. 93)

Can we ask our computer systems to attempt to synthesise the data they are receiving?

## **Moving on**

---

The next chapter outlines the techno-aesthetic framework from which this work has arisen, attempting to provide a technical as well as an aesthetic context for the research.

# Chapter 1 :

## A Techno-Aesthetic Frame

*'One of the things that needs to be left behind...is too much reliance on reason and mind. When our reasoning [has] ...soul, [it] has more imagination; it's more poetic in style. It's not going toward solutions to problems. It's not objectified, or quantified...(Gablik 1997 p.392) ...The only way you can really find a solution to the question that you have is to reach a point where your questions dissolve' (Gablik 1997 p.389)*

# Introduction

---

It is not particularly appropriate to this thesis to provide a detailed historical overview of technology in performance, a strand of work which has had an increasingly profound — and an increasingly sophisticated — impact upon performance and the theatrical arts in general. It is a huge field of study with huge implications. I will touch on some of the more recent innovations and general discourse, as it seems most appropriate to the focus of the thesis. Some technical overviews are provided in Appendices 1 and 2.

## The Techno-Aesthetic Frame

---

*'The elevator pretended to be what it was not. Number Eleven passed for longevous. Passed for healthy so well that Arbo Elevator Co.'s quality control could not see its duplicity, so well that the building contractors could not see the routine ease of its assembly coeval doom. So well that Lila Mae Watson of the Department of Elevator Inspectors, who is never wrong, did not see it. Did it know? After all of Fulton's anthropomorphism: did the machine know itself? Possessed the usual spectrum of elevator emotion, yes, but did it have articulate self-awareness? Erlich, the mad Frenchman, of course, posited such but he never gets invited to conferences and his monographs wilt on the shelves of his relatives' libraries. Did it decide to pass [her inspection]? To lie and betray itself?' (Whitehead 1999 p.229)*

This thesis requires an understanding of motion sensing systems — *what they sense, how they sense, and to what end they sense*. One of the primary dissatisfactions with the human/machine interface has been that it typically seems to lack any kind of intuition — any kind of fluidity or warmth, any awareness of the phenomenology of the moving body or the performance gesture. Machines are dumb, and as Beardon reminds us, we have no problem 'distinguish[ing] people from machines' (1999, p.273). Ascott refers to *moist*



computing, or *moistmedia*, which, 'at its most efficacious...combines, within the artistic domain, the perennial wisdom of shamans and Gnostics with contemporary insights of scientists, engineers, and philosophers' (Ascott 1999 p.4). Leach suggests that, when we stick our body with a pin, 'we can measure the pin, the yelp, the jump and the biochemical reaction, but the pain is only a subjective inference' (1979, p.93). Pain is a phenomenal notion, then. Are there interactive systems that can sense pain? Can we build a phenomenological sensing system? Is it merely sensing the phenomenal space of performance, or can the system itself become part of the phenomenal gestalt?

## Seeing the body

By the late 1970s, as computers began to work increasingly with images rather than text or machine language (ie low-level programmer's code), and with animation (ie with simulated motion), it became apparent that any attempts to model physical motion without any reference to actual physical motion were woefully inadequate. Early experiments to create systems that could mimic the human body in motion placed markers on key moving parts of the body that the computer was able to "see", and able to re-process and map data onto an animated figure. The aim in this work was not so much to represent the body in an entirely accurate way, but to grasp some of the fluidity — the constantly changing and complex interaction that takes place between the fleshly muscles and bony structures in our body with every single movement we make — of the moving human body. The choreographer Twyla Tharp was involved in some of this early research, most notably at New York University (NYU), and was the first to make a performance (*The Catherine Wheel*, 1981) using virtual moving figures as well as live dancers. This work in motion capture, as it is known, continues — it is used frequently in the making of commercial animated feature films. It is still the most successful way to

bring a naturalistic kinaesthetic sense to an animated figure, although animation programmers and animators have learned a great deal about bodily fluidity and kinaesthetics.

This technology is not so much about interactivity as it is about mapping human fluidity onto machine hardness. It became an important aspect of a movement to open up the human/machine interface to the vagaries and uncertainties of the human mind/body, and to create computer environments that were called “interactive”. Ironically, perhaps, one of the primary centres of research in the 1980s and ‘90s was virtual reality (VR), in which machines were being asked to create a “reality” that was entirely generated by programmer’s code and phosphor pixels. It was this area of research that led to many of the advanced human/machine interface devices we know today — although their relevance seems increasingly slight. The grand VR experiment, it seems, has failed as a form of interactivity (artistically, at any rate). Here is a technology where the interactor (or, to use Char Davies’ title, the *immersent* [Davies 1999]), apparently rules, yet which lives on only in advanced video gaming machines/software and in killing machines. Many of the non-traditional input devices (joystick, glove, goggles, 3D shutter glasses, etc) have survived only in this genre. Its failure, I believe, was its lack of ability to make the *immersent* *emote*, to engage users in an ontological sense. All too often, the worlds being created were uninteresting, mechanical, and graphically, aurally and sensually primitive. It was ‘anticlimactic before it had begun, tinged with disappointment in advance of the event’ (Plant 1998 p.30). Perhaps, too, its failure sprang from the diminution of the social nature of an audience that is so centrally important to live performance. The interaction was one-to-one (or in the case of MUDs and MOOs, one-to-group), but never one-to-many, never creating the kind of shared experience that live performance inevitably does.

There are exceptions of course...

## Virtualities, Physicalities

---

'You know, when you're making a virtual world, they can be very cold. They can be very cold and very intensive. So the question was how can I bring the warmth, the feeling, emotive qualities which I had a pretty clear grasp on [in the] video [pieces] and bring those across to this very different rhizomatic space or not-totally non-hierarchic space because literally one can navigate anywhere. It's not modular — it's paradoxically modular, you know, it's this notion of complementarity — something can be a wave or a particle depending on how you're looking at it. You have these modules but then once they're placed in the environment they become completely environmentally read or understood.

We were talking about virtual space and that there was a lot of negative hype about it. I mean, basically I think it's an authored...it's a new kind of authorship and that you create of it what you bring to it. So there's huge potential. It's not easy, yet, I mean, it's still very difficult to bring those things because it's...how do you make something emotive. But you have to approach it with a different mindset, that's it's an environment, an overall environment that people can move through in any different way.' (Bill Seaman: Interview text)

The *discourse* about virtuality still very much continues, with a sophistication and relevance that far outweighs an otherwise troubled technology. I believe VR failed to reach its audience because of a lack of emotional/spiritual/metaphysical (call it what you will) connection to the user (the interactor). As recently as 1999, Lisa Blackman was telling us that 'virtual space is the place where the digital revolution is happening' (Blackman 1999 p.132), but only two years later there was a tarnish not only on the shiny surfaces of virtual space but perhaps on the "digital revolution" itself. What is required is a different approach.

Char Davies and Bill Seaman have both made artificial worlds that are dream-like, that connect to the psyche rather than the adrenalin: '[Davies'] *Éphémère*...utilises an embodying user interface in the form of a vest that tracks the participant's breath and balance, enabling him to move through the work by breathing. A head mount is used...to evoke a sense of spatial envelopment. This strategy serves to implicate the immersant within the space and grounds the work in interior processes of the physical body' (Gigliotti 2002). It is the notion of linking a body/machine interface to breathing as a navigational device that makes *Éphémère* so extraordinary — that takes it outside the realm of the (lack of) imagination of so much VR, that traditionally utilised head-tracking devices, eye-tracking devices, gloves, and other paraphernalia simply to obtain a x-y-z vector in order to place (position) the immersant within the virtual world. So-called *flying* technique, by which the interactor is able to move through the virtual space, was achieved (usually) by head-tracking and by a data glove or joystick. None of these interface devices can begin to create the kind of inner connection and immersion that the simple act of breathing can. An earlier work, *Osmose*, whilst not utilising the sophisticated breath-sensing jacket of *Éphémère*, is nevertheless profoundly different from that of her peers:

*'In Osmose, the reconstructed body is made possible by the absence of physical metaphors. With no metaphorical hands in front of your face, you become intensely aware of your entire being despite of the fact that you have no physical form.'* (Jones [no date given] online)

This difference, I believe, is why reported audience responses to Davies' work (see Gigliotti 2002 p.65) was so much stronger and powerful than the typical reaction to a virtual experience.<sup>5</sup>

Motion sensing systems within the world of performance also tended to map only mechanistic data (or perhaps we can say that they have tended to map data mechanistically). This idea is explored in much greater depth elsewhere in this thesis, but

perhaps the most central point is that these are ultimately *aesthetic* choices, not technical ones. This thesis will show that it is possible to use off-the-shelf technologies to look at phenomenal information (in a phenomenal manner) rather than purely empirical information.

## Virtual Practice

The artists I interviewed as part of my research are all making work using technology *engaging the phenomenal body*. Here Susan Kozel talks about her work *Trajéts*. Note the language, particularly its physicality — how the body has remained paramount and not become submerged in the technological (technocratic?) space:

*‘...but what we would like is for [the interactors (audience)] to have a sense of their environment as being kinetic and shifting and have a sense of them being affected by and also in turn effecting a multi-layered kinetic structure. And then of course to have a different sense of the visual pull, er, of the quite abstracted imagery so they feel a sense of dropping, feel a sense of weight, weight was important. It was important that some of the imagery feel like they have a lift...a sort of heady feeling so they feel they’re more rooted to the ground. Does some imagery make them want to move fast?, make them want to move slow?’ (Kozel, interview text)*

This kind of language of the performance world is all too often lacking in techno-spaces.

It may be instructive to look at the two works by Char Davies, mentioned above.

## Char Davies: *Osmose*

*‘For a long time, I have been interested in conveying a sense of being enveloped in an all-encompassing, all-surrounding space, a subjective embodied experience that is very different from the Cartesian notion of*

*absolute, empty, abstract, xyz space. As an artist, I am interested in recreating a sense of lived, felt space that encircles one with an enveloping horizon and presses closely upon the skin, a sensuous space, subjectively, bodily perceived.'* (Davies, quoted in Gigliotti 2002 p.64)

Here are all the key words we are interested in: enveloping, skin, sensuous, subjective, bodily, and so on. Unlike so much technocratic or technology-dominated work, this work is indeed of the body. Although the interactor is wearing goggles, interaction is sensed not by head movement or eye movement, but through the phenomenal (unconscious) acts of breathing and balance. Davies believes that the head-mounted display is (still) the only way to create 'immersive space' (Gigliotti 2002 p.66). Like those artists and researchers working with dance-based interaction systems, she wanted to get away from the 'I'm doing this to that' (Gigliotti 2002 p.66) mentality that dominated most VR and performance systems. As a feminist, she also believes that such literal hierarchies emphasise and represent the patriarchal. As well as using breathing and balance as primary controllers, perhaps the defining aspect of her visual creation is its extraordinary use of transparency, which gives a great sense of depth to her work, and allows the interactor not just to see through object, but to float through them in virtual space. Of this, she says

*'It's another strategy for subverting the dominant visual aesthetic in VR and 3-D computer graphics which strives for ever greater photo realism or what I call hard-edged-objects-in-empty-space, reinforcing the Cartesian divide between dominating subject and passive object.'* (Gigliotti 2002. p.67)

Although Davies herself does not refer to her work in spiritual terms, those who experience it are frequently profoundly moved by the experience. This is a mark of work that touches, that has soul. She tell us

*'Believe it or not, the head curator at one museum declared afterwards that she was not afraid of dying, that being in Osmose had taken away her fear of death. Other people have told me that afterwards they had sat down and wept. Most of those who told me this were men, interestingly enough, from some sense of nostalgia and loss that they could not articulate. Another participant wrote to me that she had for*

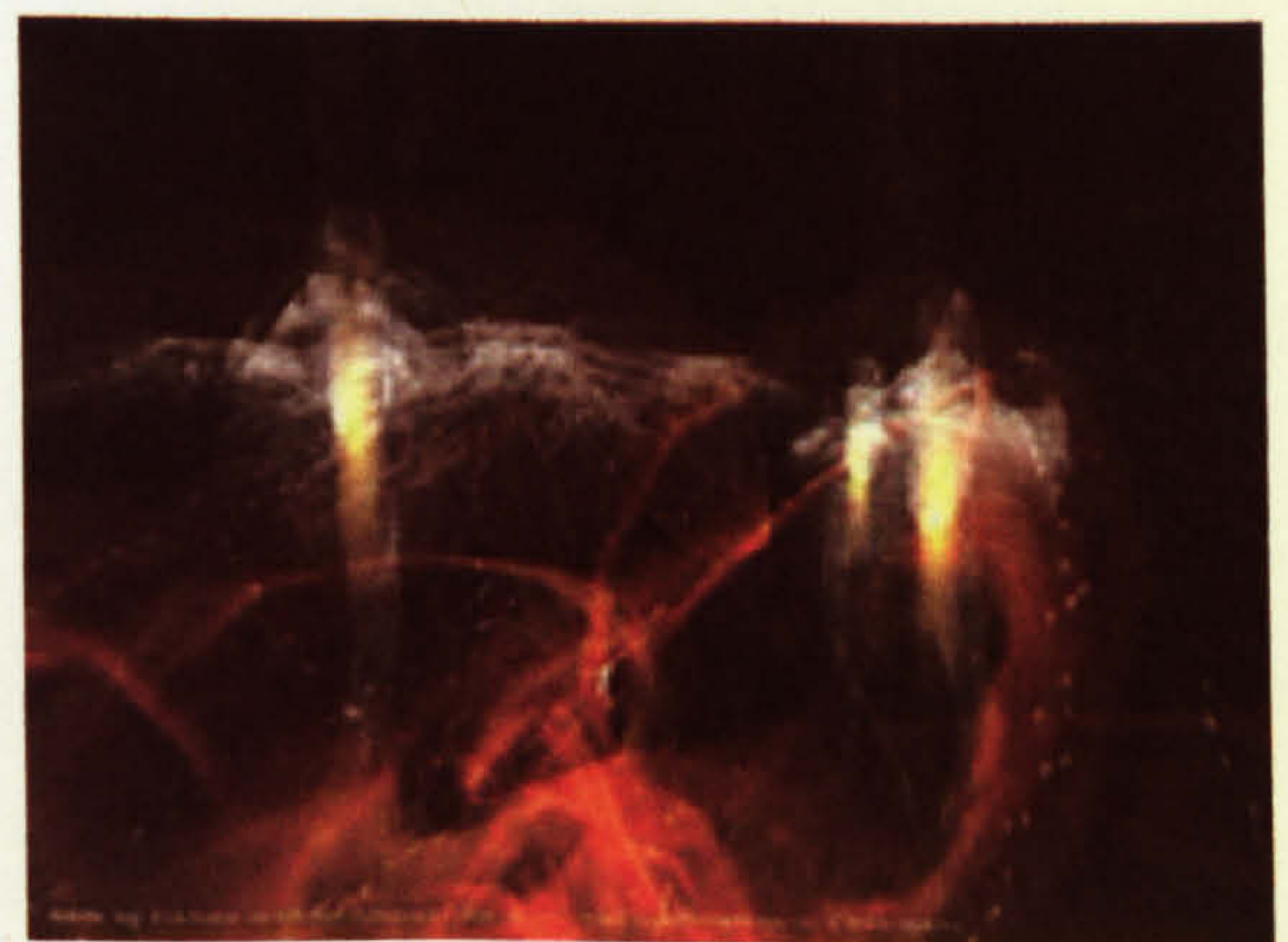
*the first time experienced her body as the site of her own consciousness occupying space.*' (Davies, quoted in Gigliotti 2002. p.67)

The work, she says, is not about spirituality, but about consciousness, perception and experience. The imagery is that of a painter (the tradition from which she started), beautiful, mystical, transparent, and filled with a sense of desire or yearning. Although many of the images are other-worldly, they have a remarkable and powerful humanity or worldliness about them that most photo-realistic work does not. Attempts to represent the real often fail because they are not real enough. Unsurprisingly, Davies is not intensely bound to the hardware — she has said that she is only too aware of the military roots and essential nature of much high technology, particularly VR applications of that technology. 'I do not welcome a technologically-engulfing, disembodied, cyborgian future', which she refers to as a 'testosterone dream' of which 'she wants no part' (Gigliotti 2002 p.67).



**Figure 1-1 from Char Davies'**

**Osmose**



**Figure 1-2 from Char Davies'**

**Osmose**

Hanson describes the *Osmose* experience:

*'You are floating inside an abstract lattice not unlike the skeletal wireframe models familiar from 3-D graphics. You have no visible body at all in the space in front of you, but hear a soundscape of human voices swirling around you as you navigate forward and backward by leaning your body accordingly. Soon the Cartesian gridlines melt away as a forest clearing centring around a great old oak tree appears.'* (2001 p.129)

Most pertinent, this is work that is *embodied* and this *despite* the fact that you have no visible body within the environment (perhaps indeed it is *because* you have no visible body). The experience of the interactor is entirely a phenomenological one. There is little time or energy for thinking about the navigation of the virtual world — we float, breath, and organically find routes through these worlds. This is far away from notions of flying in the hard architectures of so many VR environments where the gaming mentality makes navigation a challenge, not a pleasure.

## Paul Sermon: Telematic Dreaming

*Telematic Dreaming* (1992) is a work that connects two bodies together telematically. If VR lit up the 1980s, then Telematics were the hot-spot of the nineties. Telematic art, in which an artwork took place in some sense or another in one or more sites that were physically remote, was the centre of much attention. Much of it, at least in my limited experience<sup>6</sup>, failed to touch me simply because of the remoteness. Bodies have little sense of one another when they are supposedly linking through technologies that can neither feel nor respond — there can be no phenomenological link. Like so much early VR, the quality of the imagery was often poor (simply because of technical limitations), and the hyped-up language of remote physical connection failed miserably to live up to its claims. Once again, there are notable exceptions. Stelarc, for example, wired his



prosthethically-enhanced body so that individual muscles could be activated if a particular node was pinged through the internet. In this case, he became almost a marionette — but there was at least some clearly visceral response to a particular action, however crude. Mostly, any attempt at imaginary physical connection simply didn't work simply because the remoteness — the distance — was perceived to be too great.

Seaman says this:

'[In the 70s and 80s] there were all these metaphors of the prosthetic which I think was a wrong kind of approach. You don't want to cut off your body to extend the body. And now we're more intelligent about [knowing that] the body is in this dynamic relationship with the environment and now the environment can be global or however you want that environment to be. So you can have an extension as opposed to a prosthesis with this negative reading to it. Where the full sensual capacity of the body, which we don't even entirely understand at this point, I believe, can be used as opposed to thinking that we need to make these surrogate sensors. I don't believe we've even begun to understand the complexity of how our sensual systems are working.'  
(Interview text)



**Figure I-3 from Paul Sermon's *Telematic Dreaming***

*Telematic Dreaming*, which I saw at a conference in Rotterdam in 1996, is a useful case study. In the installation (typically linked from within the same building by wire so that there is no perceptible time-lag) a performer is lying on a bed with a camera above her. At the remote end, there is also a bed, upon which is projected the image from the other site. The interactor lies on the bed, next to the projected image, and because there is a realtime two-way visual connection, can interact with her. In an interview at the Ars Electronica Centre in Linz (January 1997), the artist said:

*'Telematic Dreaming' raises and addresses many questions, but above all, it is the question of consciousness that interests me most. The visual image of the bodily form on a bed allows the user's consciousness to race back and forth between the cause and effect of their remote and local body form. It is a means of extending consciousness through a technological extension of the body'. (Sermon 1997 online)*

Although a feminist critique of this piece may be troubled by the genderised and sexualised space the bed implies. Sermon says that 'the psychological complexity of the object dissolves the geographical distance and technology involved' (Sermon 1997 online). What he means by that is that the physicality, the embodied nature of the projected images and our interaction with them overrides our more typical mechanistic concerns about how telematic installations operate when we're in them. One of the original performers in *Telematic Dreaming* was Susan Kozel, who tells us that

*'...human interaction was reduced to its simplest essence: touch, trust, vulnerability. Movement usually began in a hesitant way with hand contact taking on excessive importance. The impact of slow and small movement became enormous. Great care and concentration was required to make intricate web patterns with the fingers of a stranger, or to cause one fleshly finger meet up with one video finger.'* (Kozel 1995 p.2)

This is indicative, I think. There is a shyness, a hesitation, a sensitivity on the part of these two interacting bodies. This in itself suggests a conscious connection between them, suggests a phenomenal touching even though the bodies are physically remote. Some

people fled, others simply stared but could not bring themselves to take part — there was an embarrassment factor strongly in play. Of her experience of spending four weeks as the primary performer in the piece, Kozel goes on to tell us

*'For a time I worried that by being drawn into tender and intimate interchanges with dozens of strangers who got on the bed I would be desensitizing myself to the detriment of relations with my real loved ones, exhausting myself, rendering myself mechanical or cynical.'* (Kozel 1995 p.3)

This is an extraordinary thing to say. It suggests an embodiment so strong that she is concerned about a permanent scarring of the psyche. Such experiences are rare, and particularly so within the coldness of the technocratic. That this work was relatively early in the history of telematics, which makes it all the more extraordinary.

My own research quickly discovered the phenomenal, the feeling body, and attempted to place it at the core of the research, so that there is an embodiment in the technology, a sense of touching something that is not there. This will be explored later.

## Haptic Interfaces

Finally, it's worth noting here that there is another way, although it is not particularly relevant to performance because it involves the spectator directly as an interactor. This is the haptic interface, which by definition is an interface that involves physical touch.

While the goggles and gloves of the old VR systems metaphorically involve touch, they are concerned with *virtual* touch and not actual touch. In most interactive installations or other artworks that directly involve the spectator, the connection to the work is functional, cursory, often simply mechanical. The haptic interface opens up a new

possibility — an ecstatic connection to the work. In her work *Bodymaps*, Thecla

Schiphorst refers to this simply as *the caress*:

*'The body lays breathing. The viewer entering the gallery space, moves closer to the container, enters the field of consciousness of the body, where the body's image becomes aware of the viewer's gaze and physical presence. The body stirs, the image shivers. The viewer/voyeur becomes participant, strokes the image of the body or presses the image of the container, places herself at the boundary. The viewer's action, the viewer's gesture, or even the viewer's presence may: drown the body, reveal the body, mark the body, disintegrate, embalm, arouse the body....'*

*This interaction imbeds a relationship to sensuality and anarchy through its need for the caress. It suggests the power of the state of the dreaming body and places our relationships: acted, unconscious, mute, in reference to the contained body.'* (Schiphorst 1999 p.1)

## Thecla Schiphorst: *Bodymaps*

I experienced Schiphorst's work *Bodymaps* when it was shown at the Walker Arts Centre in Columbus, Ohio, in 1999. Part of a large exhibition of interactive installations<sup>7</sup>, this work stood out as by far the most engaging on physical and emotional levels.<sup>8</sup> Her work is exclusively connected to the physical body and to mind, and she often uses the word *caress* instead of simply *touch*. She refers to 'affective space' (Schiphorst 1997 p.2) as an opposition to 'gestural pragmatics', which she suggests are the objective data of gesture.

The touch-surface in *Bodymaps* is a white table — a white velvet table. This is the projection surface, but it is also the surface the interactor touches, strokes, caresses, in order to interact with the work. The extraordinary physical sensation on first contact remains with you throughout the experience<sup>9</sup>. We are so accustomed to hard surfaces in relation to using technology, that to touch — to caress — a velvet surface and to be asked to *stroke* it is a shocking, subversive, but entirely compelling suggestion. Any

touching act immediately becomes a caress as we are seduced by the unexpected and rich feel of the velvet surface. We want to interact with this installation — it draws us in, captures and holds us. It is emotionally arresting and almost breathtaking in its seductive richness. The table, we are told can be read as ‘a table, bed, river bottom, altar, vault, operating table, casket, cave, well, chamber, Cartesian cell: a container through which touch and gesture transforms place and boundary’ (Schiphorst 1999). It is the notion of transformation of space that is crucial to the understanding of the installation. Because we are so emotionally engaged by it, we are taken to these places because we can almost feel them — our desire wills us to inhabit these spaces, even if they are not there. This is the power of the imagery and soundworld, but it is also the careful attention to the kind of gesture (caress) required from the interactor. The action of stroking the velvet table elicits an understanding of the kinds of gesture the installation demands.

The installation is not merely static if it is not touched. It invites. We are pulled into this space through the eroticism and emotional power of the imagery: the stirring and shivering of the female body pulls us into her space. This is no virtual experience — touch and sensation seem remarkably real. In the never-ending search for words to describe those who interact in interactive installation environments, Schiphorst refers to the viewer/voyeur. This is an interesting choice because on one level it denies the invitation to caress, and even the artist’s claim that ‘viewer/voyeur becomes participant’ (Schiphorst 1999). As voyeur we may be seduced, even aroused, but as viewer we feel alienated, shut out. This does not seem to be the case.

Through the power of the caress we enter a dreamworld, a liminal space between the real and the imagined which evoke desire and distress in equal measure. Schiphorst says:

*‘Dance and body training includes notions of imaging the “extraordinary” body, experiencing and knowing one’s physical self in non-linguistic ways, and developing language and practices to express*

*this knowledge. It also includes directing awareness towards linking or connecting relationships between ones own parts (limbs, sensory systems, proprioceptive systems, mind, imagination) in order to practice and rehearse our own highly technical physical body.*

*Computing Science training includes notions of elegance and appreciation of mathematical or algorithmic construction and form, and tends to literally represent the body borrowing from medical mappings or often in Computer Graphics from mass cultural clichés of representation.’ (Schiphorst 1999)*

She goes on to tell us that it is the intersection of these two worlds that are her primary motivation and excitement in the work she is making. She has found a way *between* the hard space of the technology and the soft space of the body, between representations of movement and movement itself. This is liminal space, and it is another key to the discussion. It ties closely to my own investigations into the phenomenology of the performing body, and the ontology of the performed (performing?) environment.



**Figure 1-4 Thecla Schiphorst: Bodymaps (1997)**

In this installation, I wept. This is not a typical reaction when engaging in technology-based installations. *Bodymaps* solves the failure to ignite an emotional response in so much other “interactive” work, whether installation-based, screen-based, or performance-based. This general lack, however, has led consequently to a failure of aesthetic criticism. Critical writing has either been entirely dismissive or puzzled, or has been, as Blackman calls it, ‘technocriticism’. Technocriticism makes a best effort to look at the systems and how they are operating, but fails to question how they are functioning artistically and aesthetically. Critical discourse needs to go beyond this — in a way, it needs to travel backwards and concentrate on using aesthetic judgements to assess the nature of technology-based work. The question is not (or should not be) whether the technology worked, but whether the piece itself works on an aesthetic level rather than on a technical one.

## Moving On

---

The use of technology, and technological media, has had a profound impact on art practice, not least in a problematising of the real and the virtual body. Notions of the digital and the virtual underlie a not insignificant proportion of contemporary artmaking, and the larger discourse around these ideas remains as engaged as it was in the 1980s. The merging of technospace and bodyspace has become increasingly sophisticated, even it is sometimes remains a troubled merging.

This is relevant to my research because I am also attempting to merge technospace and bodyspace, to question ways in which we “see” the body (or, more particularly, ways in

which a computer can see the movement of a body), and how the hardness of the technological can be subsumed into a poetic performing space.

The next chapter introduces some of the theoretical discourses surrounding my research.



## Chapter 2 : A Theoretical Frame

*'Once the distinction has been established between the body in motion and movement, there is no movement without a moving body, no movement without an objective landmark, and no absolute movement.'* (Merleau-Ponty 1964 p.268) . *'...We must therefore avoid saying that our body is in space or in time. It inhabits space and time. If my hand traces a complicated path through the air, I do not need, in order to know its final position, to add together all movements made in the same direction and subtract those made in the opposite direction.'* (Merleau-Ponty 1964 p.140)

## Frames of Reference

---

Even though my primary discipline as an artist can be said to be within the realm of music composition (from a historical perspective, if nothing else) in that I primarily make sound, the theoretical frame for this thesis is not that typically used when analysing music composition, or music composition systems. The tools used by the music theorist are not particularly useful in this instance because they are primarily structural and analytical, 'attending exclusively to music's formal properties, its affinity to mathematics' (Chanan 1994 p.81), and concentrating almost exclusively on the musical score, which in this case doesn't exist. Instead we must turn to theoretical explorations of human/machine relationships, consciousness and the phenomenal, liminality, and contemporary performance and the human body.

## Theorising the Body

---

*'...the body, normally, is never in question: our bodies are beyond question, or perhaps beneath question — they are simply, unquestionably there.'* (Sacks 1985 pp.42-43)

## Locating the Body

In the early 1900s, Serrington (1906, 1940<sup>10</sup>) had identified exteroception (our sense of where our body is located in space), interoception (our sense of how our body is *feeling*), and proprioception as useful modes of inquiry in locating the body in space, and locating bodily sense. Proprioception gives us the essential *sense of ourself*.

*'The Taoists urge us to contact our inner physical organs, to "see" our liver, the "smell" our lungs, and "taste" our heart. By this, they mean something quite simple. They mean not to lose the acute sensitivity to our bodies, the simplest kind of awareness like kinaesthetic body*

*movement, organic discomfort, and proprioceptive activities like breathing, balance, and shifting weight.’ (Heim 1993 p.81)*

This is different from a Freudian or Jungian sense of self (or unconscious, particularly the Jungian unconscious) and suggests that the body has a constant ontological awareness of where it is and how it is operating in relation to itself and the world. Our sense of being in the world is fundamental to our conscious and unconscious existence. Through an unknown physical or psychological trauma, Sacks (1985 p,44) cites the case of The Disembodied Lady, whose proprioceptive mechanism has broken down: ‘Something awful’s happened...I can’t feel my body. I feel disembodied.’ Merleau-Ponty (1964 p.100) tells us that if he is holding his pipe in his closed hand, he knows instinctively (or, rather, phenomenally) where the pipe is not by analysing its relationship to the other parts of his body and his connection to the ground, but simply through a phenomenal awareness. He describes this as (emphasis original) ‘*a spatiality of situation*’ (Merleau-Ponty 1964 p.100). Torgavnich describes this as ‘the impulse towards merging’ (Torgovnich 1996 p.4), moments when the sensual self merges with objective reality as an invisible, phenomenal act.

## Perceiving Space

Chapter 3 addresses at some length the technical concerns in building a motion-sensing system. In brief, however, what such a system is attempting to do (whatever the technology involved) is to attempt to observe and analyse the movement of a single performer or a group of performers, and to convert that information into something audibly or visibly meaningful. At its most literal (and uninteresting), this might mean that when the dancer’s left arm moves upwards, a sound towards the left of the stage goes up

in pitch. The approach taken historically has been the literal analysis of movement in space, ie the recognition of a moving object in x-y space — a literal mapping. 'A computer construes [the world] by means of key features and schematic relationships. The scheme might be identified...without the reality being grasped at all' (Sacks 1986 p.14). So, we know that this mapping is not necessarily useful, or, at best, just a small part of the overall picture. Merleau-Ponty suggests that

*'Science is and always has been that admirably active, ingenious, and bold way of thinking whose fundamental bias is to treat everything as though it were an object-in-general — as though it meant nothing to us...'* (1964 p.159)

Whilst it may be argued that this is the *only* way a computer, as a non-conscious entity, can see movement, it also suggests that this kind of surface (literal) analysis is not enough. For a detailed discussion of whether intelligence or consciousness can reside in the machine, see Narayanan 1999 et al.

The phenomenal performer herself brings a complex rendering of the performance text:

*'A dancer's movements are at once thoughtless (determined by the music/choreography: objectified) and thoughtful (determined by a listening to the music/choreography: subjectified). Performance, in short, is by necessity a matter of technique; it is about the body in the mind, the mind in the body.'* (Kemp 1996 p.156)

Within half/angel's performance environments, the performer is a conscious agent — necessarily so because the environments demand a conscious interaction in order to function. But if the performer is a conscious agent, must the system itself also attain some level of understanding of the phenomenology of the performance space? This is not cognition, for the computer is not in any sense a cognitive system (it does not have intelligence, it is not a *thinking* system): does it, however, imply a consciousness in the camera's gaze?

## Observing: Seeing and Perceiving

---

If Kershaw reminds us that ‘the old binary oppositions between, for example...politics and aesthetics, or the real and the imaginary, are [now] deeply problematised’ (Kershaw 1996 p.134), then can we also say that notions of left and right and up and down are similarly problematised and that they are, at best, only perceived qualities? If a person wears a pair of glasses whose lenses invert everything the wearer sees, several things happen. On Day 1, the world seems to be upside down; by Day 2, the world appears normal, but the wearer *feels* as though he is upside down; by Day 7, everything feels entirely normal: the wearer has no problem locating objects in space and grasping and moving them from side to side or up and down — the perceived space seems entirely normal — left and right and up and down are all in their “proper” place. Once he stops wearing the glasses, things return to “normal” within a day. This clearly suggests that our perception of space is not at all empirical, but is entirely phenomenal, not fixed but highly fluid (Merleau-Ponty 1964 pp.245-7).

This is obviously important when designing a system whose task is to observe a moving body in space — would it not be much more useful if the system has some sort of phenomenological sense of the space? Qualities such as ‘upness’ or ‘leftness’ can be interpreted as *qualities* rather than as literal marks on a x-y-z plot. For example, a quick movement to the right (or an *apparent* quick movement to the right seen through the sensor’s lens) can be seen as a quality of quickness (speed) or rightness, and contextualised based on recently received information. (For some more thoughts on this, see ‘Fuzzy Logic’ below.) The interpretation of this data can be phenomenological in the sense that we may very well choose to ignore the actual position in space and look only at the quality of the upness or leftness or speed/acceleration. Ultimately, we cease to care *very much about position* and care primarily about quality. Is this Ascott’s ‘techno-qualia’

(1999 p.69) ? So we are beginning to look at not just *how*, but *why* the object is moving in the way that it is moving. This is an ontological and phenomenological approach, not an objective, empirical one.

Jones reminds us that 'subjectivity consists in information gained through perception and reflection on that information' (1999 p.7). In the same volume of essays, Tomasula states that

*'...the epistemology we live with [now] is not directed at revealing God's hand, nor mechanical cause and effect, but to reconstructing that which is hidden, that which is said to be between the lines'* (1999 p. 115)

The notion is studying movement that is not there — what is 'between the lines' — is central to this thesis, just as Novak proposes that we can feel objects that are not there (Novak date unknown [online]). We are asking the (rationalist) computer to behave with phenomenological sense.

I am proposing that there is more useful information to be gathered in phenomenal space than in empirical space alone. Looking at a phenomenology of movement should produce more interesting, more humanly comfortable, results than using a more empiric approach. I also, however, like to think of my observation of movement as a liminal observation — I am looking not just at the physical phenomenon, but at a liminal condition that is not-movement. It is the space between movement and stillness.

Although liminality is well-defined in the ethnographic world, where it represents a state of *in-between*, trance states and states of being between boundaries, such as that between childhood and adulthood, attempts to move this discussion into the contemporary artworld have been fruitful, if fraught. The world of the liminal takes us into a twilight: of

fairies and myths and goddesses and sacred places and the *genius locii*. It is a comfortable place, for me, that questions the actualised and the physicalised.

*The sacred orgy has been suppressed, and is now replaced by compulsive, uncathartic, unshared shopping and spectator sport. Poetry has been replaced by the catalogue - whether of facts or of consumer goods. Rites of passage and ritual ordeals have been supplanted by curricular examinations. Reverence for the natural world has been usurped by religion and art. We now treat each other as producers and consumers, rather than integral parts of nature, and so we are alienated from that which has become our past, our "collective unconscious." ' (Weir 1996 [online]).*

The condition of liminality traditionally implies a license for transgression, an escape from the formalised, rule-driven world of day-to-day existence. As part of his rite of passage into the adult world, an adolescent might spend time away from the community, will kill for the first time: acts that transgress or contravene or challenge the rules of his childhood. The notion of working in liminal space allows me to escape the literal and rational, and instead interpret movement in an entirely different way.

*'Peter Pan...as the translator of the real and the imaginary...is the operator of flight. He mediates the between and the among while inaugurating the other, the third, the dissolved self... Persistently seeking the adventure of the moment his ecstasies are sporadic, incorporeal and fleeting but also languid, extended and intense...It is Peter, the strange little boy who has broken through (Barrie 1992, p.18) to become the foreign cartographer of the unknown land. His technique is that of the caress. He consoles, he arouses, he sends out joyful, playful, energetic reverberations that glide along the night, sprinkling, drawing and thwarting his luring demeanor. He places his trace on the map, it is a map that must be produced, constructed, a map that is always detachable, connectable, reversible, modifiable, and has multiple entryways and exits and its own lines.'* (Deleuze & Guattari 1988 p.21)

I feel very sympathetic to the notion of mapping an unknown land. The artists cited in Chapters 1 and 3, and others making work with similar intentions, have discovered and defined liminal and phenomenal spaces in their work, and are content to hover between dreamworlds and realworlds, working with dataspace that are as disembodied as they

are embodied. There is a sense of 'the dissolved self' in our work, a leaning towards the ecstatic.

## A phenomenological performance system ?

Computers, of course, are not conscious — or, at least, they do not exhibit evidence of consciousness. Lanier usefully points out that 'consciousness is the thing we share that we don't share objectively. We only experience it subjectively, but that does not mean it does not exist' (Lanier, date unknown [online]). Computers can't do this.

In asking a computer to "see" the phenomenal moving body, as we've already explored, it is clear that simply mapping the mechanics of motion is not enough. A camera, particularly a fixed one, *must* be an empirical machine — how could it be otherwise? The camera sees 'a picture of the human organism as a physical system undergoing stimuli which [are] themselves identified by their physico-chemical properties' (Merleau-Ponty 1964 p.10). Merleau-Ponty goes on to explain that this approach established 'an objective science of subjectivity. [However] ...it is also inevitable that this attempt should fail.' (1964 p.11).

'We have always two universes of discourse — call them "physical" and "phenomenal", or what you will — one dealing with questions of quantitative and formal structure, the other with those qualities that constitute the "world".' (Sacks 1986 p.121) This being so, our task then is to create a system that in some way has an understanding of the phenomenal body in motion. But this becomes paradoxical. Without consciousness, Husserl has argued we can see nothing:



*'Husserl argued that consciousness is always consciousness of something, as it is on our perception of objects, rather than on the objects per se, that our conception of ourselves and our world is founded' (Iser, quoted in Counsell 2001 p.179)*

Must we then attempt to introduce a form of consciousness to the technological environment? As it doesn't (cannot?) exist within the machine itself, then we must introduce it, overlay it, fake it... The question of whether the computer can have any agency at all in this context or, if not, where the primary agency lies will be explored in more detail later.

## A mediatized performance space ?

In creating a performance space so heavily reliant on technology, is there a tendency to overwhelm the poetic aesthetic we are trying to attain? It's perhaps ironic that audience feedback we have received tends to centre not on the interactive environments (which are largely sound-based) but on the fact that the dancer's speaking voices are amplified. The comment is rarely specifically about the amplification of the voice itself, but about the fact that the dancers are wearing headset microphones. Here, the technology intrudes into the finely-tuned aesthetic of the visual space of performance. We latterly choose to refer to our work as *visual theatre*<sup>11</sup>: we are trying to make work where every visual moment counts. It is significant that most of the negative responses are to do with the visual intrusion of the microphones, and not the fact that the voices of the performers are amplified.

The amplified voices, and other aspects of our performance spaces could be said to be mediatized, following Auslander, and it may be useful to spend some time deconstructing this. Firstly, the auratic world of half/angel's performances takes place in amplified space.

We use electronic sound sources and amplified voices. This is even more essentialised in *Spinstren* because there we are making a three-dimensional aural space. Secondly, there is video in the performances. At the moment the content of the video is far removed from the moving body — video and live performance never compete. (That may change in the future as we move towards further integration of the video.) Thirdly, the performers are (sometimes) immersed in the technoetic<sup>12</sup> (Ascott 1999) space of the interactive environment. This is never intended to be technocratic in nature — to the contrary, we do everything possible to make the technology as invisible as possible. It is not part of the overall aesthetic, in terms of performance and staging, although, of course, its *lack of presence*, and what the technology is actually doing, contribute significantly to the overall aesthetic.

In the 1930s, Benjamin's influential essay (Benjamin 1968 [1936]), *The Work of Art in the Age of Mechanical Reproduction* talked about the *loss of the aura* in mechanically reproduced artworks. The original (authentic), he argued, contains an aura that is fundamental to it, and which is lost once the original is reproduced. In the case of performance, the liveness is paramount, and presence and aura are lost as soon as an attempt to record, or reproduce a performance is made. This is highly problematic within postmodern thought and practice, and particularly so within the context of our own work where, it could be argued, everything is "live" even when it is mechanically or electronically reproduced.

Auslander explored Benjamin's position through the lens of the late 1990s, where technologised spaces have become the norm. According to his definition, half/angel's performances are mediatised events:

*'...as soon as electric amplification is used, one might say that an event is mediatized. What we actually hear is the vibration of a speaker, a reproduction by technological means of a sound picked up by a microphone, not the original (live) acoustic event.'* (Auslander 1999 p.24)

His essential argument is that contemporary audiences are so immersed in electronic media, that '...audiences now expect live performance to resemble mediatized ones' (Auslander 1999 p.25), and that '...whatever distinction we may have supposed there to be between live and mediatized events is collapsing because live events are becoming more and more identical with mediatized ones' (Auslander 1999 p.32). He argues that mediatized performance has become so ubiquitous that the live event has become depreciated, and that, in order to succeed with a modern audience, 'the perceptual experience of the live [must be made] as much as possible like that of the mediatized, even in cases where the live event provides its own brand of proximity' (Auslander 1999 p.36). Proximity, he argues, turning Benjamin (1968 pp.30-31) on his head, is a benefit of mediatized space, allowing audiences more intimate access to the live.

*'...the very presence of the microphone and the performers' manipulations of it [in rock and roll performance] are paradoxical markers of the performance's status as live and immediate. Far from suppressing the apparatus of reproduction, as a performer such as Madonna may be said to be attempting when she uses a headset mike not clearly visible to the audience...these performers emphasize that the apparatus of reproduction is a constitutive element of their liveness. In short, they perform the inscription of mediatization within the immediate.'* (Auslander 1999 pp.53-54)

The ontology of the performer's space, the 'authentic', and of the technospace are no longer different. This argues against Phelan's stance, as one of the most persistent voices reclaiming value for the live, that 'the only life of performance is in the present' (Phelan in Auslander 1999 p.39), and he makes the case that I would make for our own work<sup>13</sup> that when the live space and the technologised space begin to merge within one another, any distinctions between these two ontological spaces are no longer valid. Neither exist separately, yet they co-exist. Can we then talk about this work, where the technologised and live become confused and unclear? More on this later.

*'...as a juxtaposition of the live and the digital, a shifting among realms?  
My feeling is that the answer is no, that we now experience such work*

*as a fusion, not a con-fusion, of realms, a fusion that we see as taking place within a digital environment that incorporates the live elements as part of its raw material. Rather than a conversation among distinct media, the production presents the assimilation of varied materials to the cultural dominant. In this sense, Dance + Virtual = Virtual.'* (Auslander 1999 p.38)

I can't agree with the notion that 'Dance + Virtual = Virtual' (and therefore I am troubled by much of Auslander's argument), although I'm not quite prepared to say that 'Dance + Virtual = Dance'. He does later suggest that what is 'a seemingly secure opposition [between the live and the virtual] is now a site of anxiety' (Auslander 1999 p.39), which would seem to undermine the certainty of his statement above. He further undermines his argument by suggesting that

*'Live performance places us in the presence of the performers, other human beings with whom we desire unity and can imagine achieving it, because they are there, in front of us. Yet live performance also inevitably frustrates that desire since its very occurrence presupposed a gap between performer and spectator.'* (Auslander 1999 p.57)

Here, we need to go back to Benjamin's notion that distance is the progenitor of aura. Indeed, live performance, particularly theatrical live performance still persists, despite all of Auslander's suggestions that live performance has little or no cultural currency, primarily because of the 'gap between performer and spectator'. Auslander even admits that live performance has 'far more symbolic capital...than mediatized [performance] (1999 p. 59), even though he 'suspects this is a very temporary condition.' (Auslander 1999 p.59).

What effect do our interactive environments have on the presence of the performer/performance? I would argue that distance (from the spectator) is *increased* and that aura (presence) is *enhanced*.

## A feminist performance space ?

Gilson-Ellis has provided us with a detailed examination of *The Secret Project* in relation to feminist theory, particularly the work of Irigaray and Cixous. She proposes the notion of the 'os-text', which 'incorporates the uttering mouth (the "os"), the kissing (osculation) of words into being, and the oscillation between writing and speaking' (Gilson-Ellis 2001 p.1). Certainly it can be argued that half/angel's work is involved in the 'telling and narrating of postmodern sexuality' (Chisholm in Grosz 1995 p.19), and certainly its 'gestural narrative' (Pavis 1982 p.134) is by, for and about women. In this sense, the work can be said to be essentially feminist.

More than that, however, the technologies themselves might be said to take a feminist stance on their world, if a feminist position might be said to be more open to the readings of the body, more conscious, more phenomenological (see Haraway 1991, among others). It is simplistic and too binary-oppositional to suggest that certain readings of the body are 'male' and some 'female' in their intention — I am not going as far as that, but I am suggesting that the feminine focus of the work, and the female-orientated approach to the making and building of the environments give all of this work an underlying feminist stance.

## Post-biology (after-life)

A final theoretical strand that is of use to us posits the absolute (ultimate?) negation of the live body (not just its subsumption).

The general theoretical discourse surrounding virtual space is now addressing emergent notions of a collective consciousness, and exploring a putative post-biological future. In the late 1990s, there was much furious debate about notions of the merging of the physical body with the silicon machine — a supposition, going far beyond any notion of universal mediatization, that we will inevitably be subsumed by the machine and enter a larger consciousness in which we no longer require physical bodies. Perhaps this is Jung's collective unconscious made (not-)flesh? For me, the discourse speaks entirely of a negation of the physical body, the exact opposite of the kind of privileging of the physical that I am proposing in this thesis. Char Davies has this to say:

*'Some people in the burgeoning cyberculture imagine that one day we, as a species, will escape the confines of mortal bodies by merging ourselves with silicon. In this context, Éphémère can be viewed as an attempt to reaffirm our limitations, our mortality, our dependency on ageing bodies and an earth that will, for those of use now living, absorb our bones, dreams of cyberculture notwithstanding.'* (Davies 1999 p.198)

Ascott posits the networked mind, about the use of the machine as, at first, an escape from physical confines, but then later an *enhancement* of the physical. In his more recent writing, he talks of 'technoetics' and of 'moist computing'. He talks provocatively about 'Nature II' and our 'developing Edge-life' which will be 'located at the convergence of the digital, biological, and spiritual' (all Ascott 1999). He says this shift will

*'...enable us to return to the archaic relationship with the invisible processes and patterns of living systems, reading the secret language or both flora and fauna'* (Ascott 1999 p.4)

While I'm entirely sure that Ascott is *not* referring to the kind of traditional performance work that is the topic of this discussion, there is nevertheless great resonance here, particularly in the sense of an ontological shift in the relationship between performers and machines. He goes on to say:

*'Moistmedia, at its most efficacious...combines, within the artistic domain, the perennial wisdom of shamans and Gnostics with contemporary insights of scientists, engineers, and philosophers. (1999 p.5)*

This kind of neo-religiosity will make some squirm, but for me it reaffirms the intention in my own research to explore spaces that are not entirely physical, not entirely rational, and are phenomenological and ontological in their emphasis and being-space. I have a discomfort with empiricism and with notions of “accuracy” in motion-sensing — something that is anathema to many of those involved as technical developers in the dance-technology world.

## Chapter 3 : The Question

*'In ancient times, the term interface sparked awe and mystery. The ancient Greeks spoke reverently of prosopon or a face facing another face. Two opposite faces make up a mutual relationship. One face reacts to the other, and the other face reacts to the other's reaction, and the other reacts to that reaction, and so on ad infinitum. The relationship then lives on as a third thing, or state of being. The ancient term prosopon once glowed with mystic wonder.'* (Heim 1993 p.78)



## Introduction

---

**T**his chapter explores the research question, looking specifically at the context of body-technologies, how the systems work (or don't work) and what it might mean to introduce notions of the liminal and the phenomenological. Has it been tried before? Are there any artists whose work is particularly apropos?

## Performance Failures

---

The vast majority of so-called dance-technology pieces seem to fail to inspire. I know this simply by observing audiences and their responses at many many performance events over the past ten years. At times I have felt irritation and even outrage, largely because of the grandiose claims made by some in their programme notes. I have seen audiences underwhelmed by overwhelming amounts of technology. Rarely have I heard an audience gasp in wonder or seen an audience gaze in awe. After peaking in the late 1990s, this area of work seemed to hit a brick wall. The dance-tech label came to be seen as a stylistic label (much as “electronic music” had a couple of decades earlier) — a label that was largely negative in its connotation. How did this come about?

The primary problem seemed to be that most of the pieces I saw in ten years of watching this kind of work were made to show off the technology — the particular piece of software or hardware involved was the driving force behind the work, and, more importantly, that technology was typically also still under development. The work had been made at the last moment with an immature technology that none of the participants truly understood. The examples of longstanding technologies being allowed to mature in the hands of highly experienced professional makers are few and far between<sup>14</sup> — a

problem not solely associated with dance-technology, but with the digital art domain in general. This is not to suggest that powerful, aesthetically rich work cannot be made with experimental technologies, but that it rarely appears to be so.

This is work, in fact, that requires careful and painstaking and lengthy gestation times.

Rarely is that made available, particularly when the centre of attention is a new technology that is barely operating, or highly unstable. Rarely is the time available within the world of professional dance where time pressures and the pressure to turn out a certain number of new works each year is excessive.

## **Interpreting Literal Space**

---

All the motion-sensing systems I have looked at are primarily based on positional information, on a 2-dimensional flat plane<sup>15</sup>: input data is based around the x-axis and the y-axis. It is relatively trivial, from a technical perspective, to track these two dimensions in relation to a moving object. Compare this to other notions of virtual space, such as Novak's proposed *liquid architecture*, for example, and his idea of the 'persistence of sensuality and desire in relation to surface' (Stone 1997 p.66) and 'disembodied proximity' (Novak date unknown [online])). Unlike the more typical mechanistic approach to virtual space, he suggests that we are capable of feeling, physically, that which is not there because of information embedded in our experience and in our psyches. This is key, and is precisely the phenomenological approach to motion sensing that I am proposing in this thesis.

Almost the flip-side of this suggestion, but equally key, is Seaman's suggestion that virtual physics can be almost anything you want it to be, as long as it has some inherent logic. He talks about physics being turned on its head in virtual space, what he calls *E-phany Physics*:

'In the last year I've coined this new term which I call E-phany Physics...The idea is that in virtual space you can author a kind of physics and author a kind of feedback which can be a very emotive thing. Instead of knocking something [down], it could fall up or whatever you authored the response to be, it could be like that. And I started re-looking at all of my video work as E-phany Physics in that I slow things down or via the sound I manipulate the way you're understanding what you're looking at. That was a really interesting shift.'  
(Seaman: interview text)

While many systems can provide information about where an individual body is in space (and, by keeping track of its own history) in relative space (or, it could be argued, space-time), very few programmers question the value of this information. Clearly if the tracking system is used primarily to navigate around a virtual world, then x-y information does the trick. However, we have already learnt that in phenomenological terms this information is largely irrelevant or, at least, not very interesting on its own. Rarely can one break the rules of the up/down-ness and left/right-ness of our human existence, however, and it is left to more imaginative minds to create more imaginative ways of navigating space.

All too often, virtual worlds, whose creation is highly programmer-intensive, are created by programmers, and it is here that Seaman and others are breaking the rules — rules of physical space that are in fact entirely unnecessary in virtual space<sup>16</sup>. The failure of imagination is hardly a great surprise — the primary parameters are technological (or technocratic) rather than aesthetic. This is not, of course, to suggest that programmers have no imagination. Typically (stereotypically?), however, their primary concerns are in *making the code work*, albeit elegantly<sup>17</sup>, not in questioning properties of virtual space or in probing the ontology of their systems.

## **The Current Technological Context**

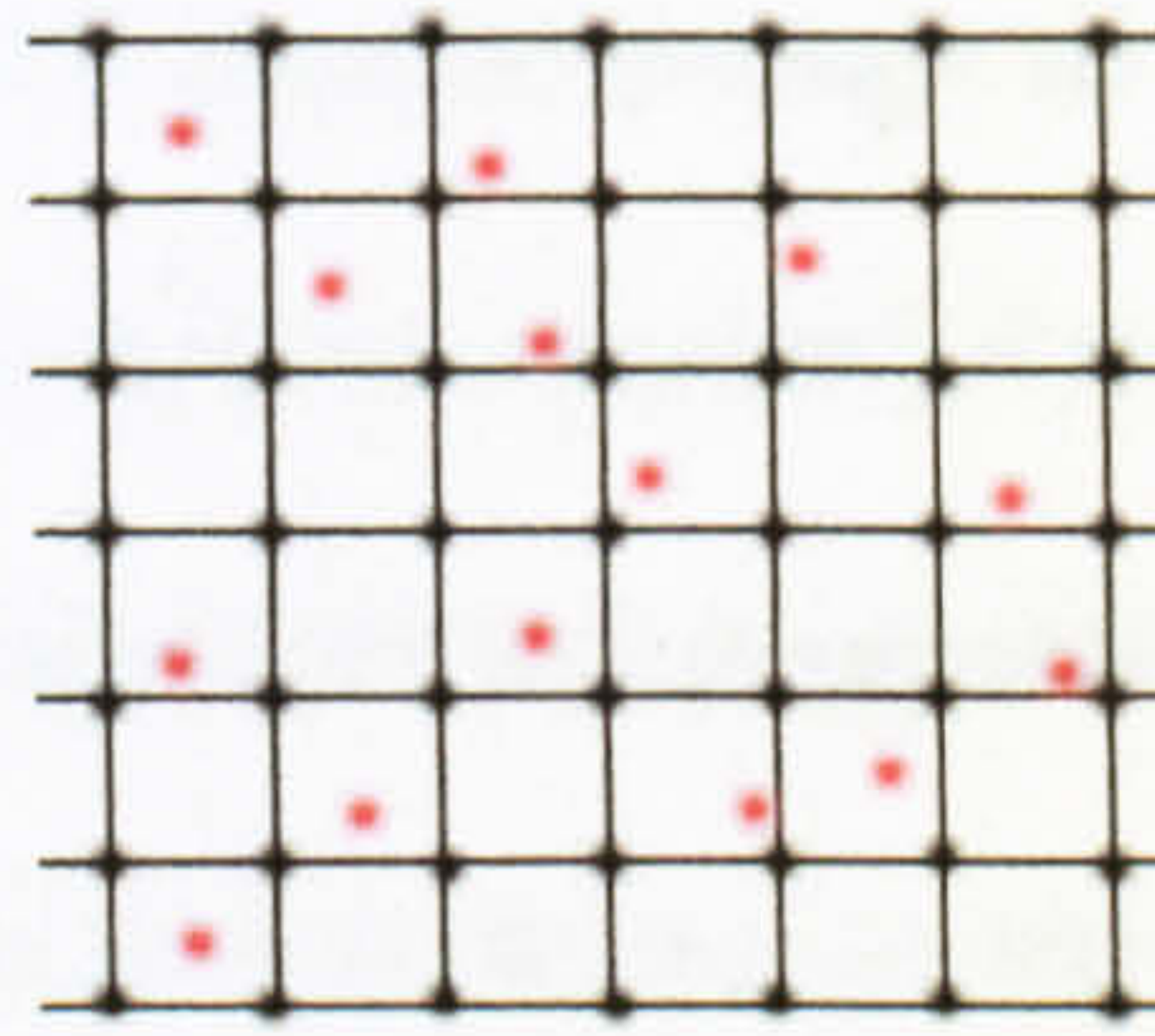
---

There are a number of different approaches to sensing a moving body in space. These are outlined in Appendix 2, and can be distilled into the following approaches:

Photoresisters/Photodiodes; Invisible Light (Infrared and ultrasonic); Physical switches (pressure mats, etc.); Body Suit systems (gloves, bodysuits); and video-based (sometimes called Computer Vision) systems. Only the video-based systems are ultimately relevant to the discussion at hand because this is the technology I ultimately chose to use in my research. I made this decision after trying out most other of the other types of system and rejecting them for a variety of reasons.

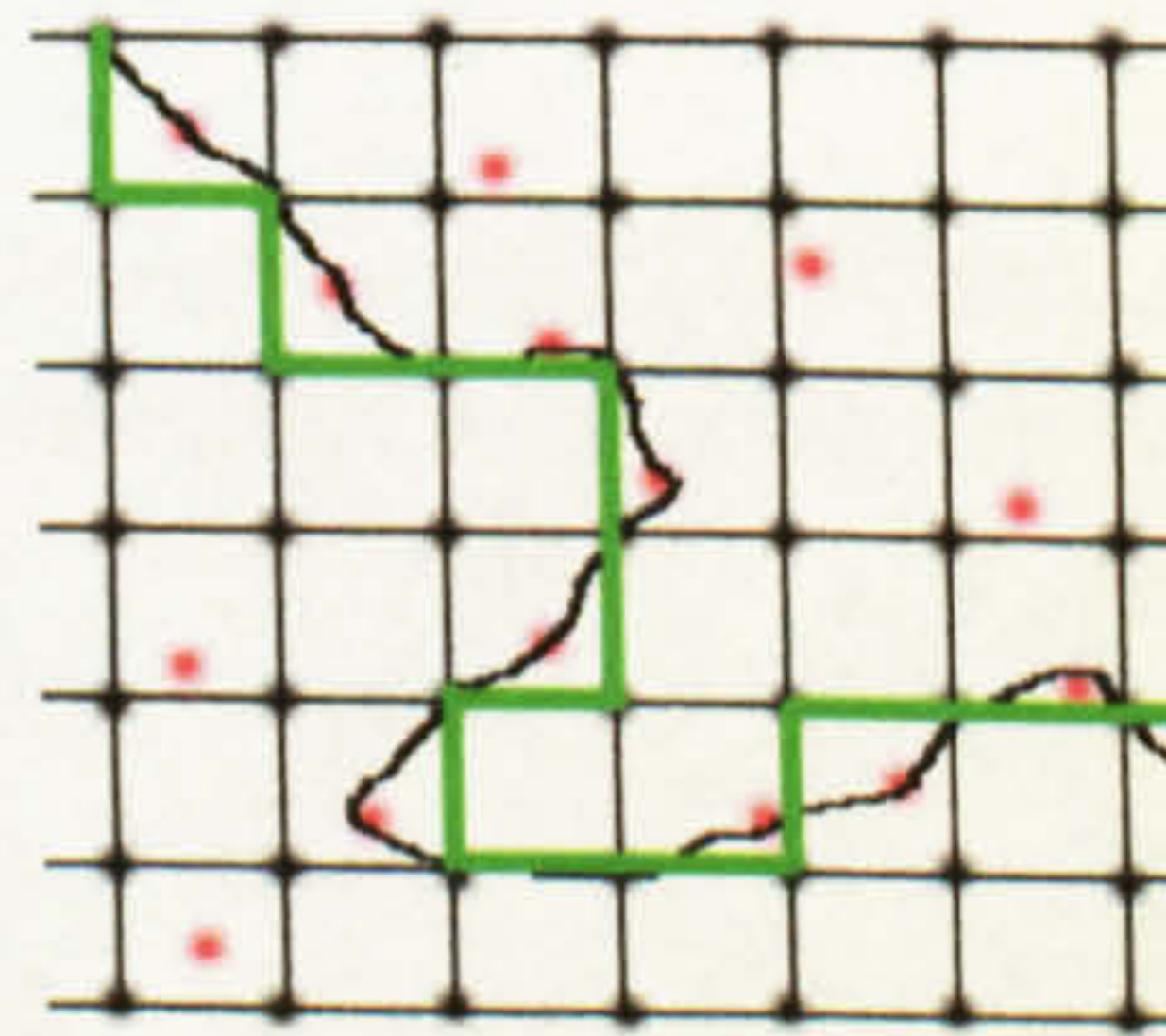
## **Choreographic Concerns**

Whilst it might be argued that the various technologies referred to in Appendix 2 do not fetter the performer, this is not really the case. The switch-based systems are ultra-concrete — they only provide information when they are physically activated — they deal in coarsely-grained actuality. Unless there is a very fine matrix of such switches (an impracticality in most instances) then only the coarsest of information about the moving body is gathered, and the performer's movement limited to where the switches are placed.



**Figure 3-1 switch matrix**

Here, the switch matrix is represented by the black dots, which in turn represent the surface of a stage. If footfall happens on a black dot, then information will be sent to the system. If, however, footfall does *not* fall on a black dot (represented by the red dots), then no information will be sent to the system. Outside the switches, no information can exist.



**Figure 3-2 digital sampling**

This is the ultimate dilemma of all digital systems, which can only represent data discretely. In a digital number, there is no in-between (eg it is either 0 or 1, or 00010 or 00011). In Figure 3-2 the digital resolution is too small: the grey line represents the actual path travelled; the green line represents the digital representation of the path travelled — they are remarkably far apart. Theoretically, a system with a resolution of infinity (in other words, where the black dots of Figure 3-2 are infinitesimally close together) will exactly mirror reality (begging the question, for the moment, of what reality is) but will, at best, only map the pathway of the dancer's feet. In practice, the

question is whether our systems are capable enough to bring the black dots close enough together so that reality can at least be represented, if not mirrored. Theoretically, the answer is most certainly yes, but practical and pragmatic (eg cost) concerns prevail to make it near-to impossible, or simply too clumsy to be adopted.

Any movement built for these kind of environments is often completely and artificially dominated by the location of the switches. Indeed, any choreography whose primary concern is hitting particular positional targets *to the exclusion of all other concerns* is going to look strange and unconvincing.

## The Body Suit

Mark Coniglio:

'From a mover's perspective it was really thrilling to feel this sense of being bigger than your body. We talked about that a long time ago — we want to make the dancers bigger than their bodies...Somehow she felt her limbs extended all the way out to the corners of the space because she was controlling these other things. Every performer who tries it has this feeling...there's just this magic. It's very basic, and it's part of the appeal of technology in general...When you first put on this device, suddenly things that you never thought of as being possible are suddenly possible. And, it's *tactile*. And that's the other thing, I mean, it's not intellectual, it's tactile. You move your body, and you see or you hear a response. That kind of bodily connection is even stronger than just an intellectual one.' (Interview text)

The body suit is another kind of physical interface, in this case worn by the dancer.

Usually such systems are wireless, so the dance is not fettered in any way, other than by what bulk exists in the sensing mechanisms and electronics built into the body suit.

Coniglio's implementation of the body suit is highly intelligent and successful, primarily because it grew from what it means to be a dancer, as he says above. In a body suit the information gathered is very different, because the position information is *relative* to other

parts of the body — and it is therefore able to make a strong representation of the body.

Most important of all:

**'It's just so clear...and it means a lot to the performer to perform with it.'**  
(Interview text)

Coniglio talks about the difference between the dancer's experience when wearing a suit, as opposed to her experience when trying to trigger laser beams — a switch system (see above).

**'One of the problems with the laser beams, which work fine, but there's no feedback, you don't always know exactly where they are — we've often resorted to putting tape down on the floor, so they know where the beams are because they're invisible...But the tactile part of it is very important. And that's part of why MIDIDancer [the body suit] really works — for the dancer and for the audience. They can see that arm bend, I mean, that's a part of what you look at when you're looking at a dancer, you look at the actual composite shape of their body, and if that composite shape of their body is reinforced by the media that's around it then it starts to make sense.'** (Interview text)

Generally speaking, the data gathered is a good representation of the moving body, and Coniglio's work, in particular, uses this to great effect. Unfortunately, he is the *only* creative proponent of these systems. Others have been designed, notably by Yamaha in Japan, but they have rarely been used by choreographers, and certainly not in-depth. Coniglio proves the rule that working with a single technology (albeit one he has continued to develop over time) over an extended period of time delivers a depth and subtlety to the work that is otherwise not present.

These systems should be differentiated from the video-based systems I use (see below) because they are qualitatively different. Each of them relies on a direct physical act — opening or closing a switch, breaking a beam, or bending a tension-sensing device built into a suit. The video-based systems, on the other hand, are entirely invisible to the performer, and, more importantly, are, in effect, a single large sensor that covers the entire stage. It is much easier for the performer simply to forget about them altogether,

at least in terms of physical restraint — the performer can begin to interact with the *environment*, not with the *device*. She is listening to, and is proprioceptively aware of the output, rather than being physically aware of the device.

Despite Coniglio's contention that the suit is 'just so clear' and that performer's enjoy working with the system, I would suggest that it is fundamentally flawed because it does not problematise the literal body data it is receiving. The system is highly empirical and therefore not likely to sense the phenomenological performance space.

## Video-based systems

What is a video-based system? It is a system in which one or more cameras are pointed towards the performance space, with their signal fed directly or indirectly into a computer, which is in turn able to analyse the content of the video image according to set of rules. Once the analysis has been obtained, the available data can be mapped onto another parameter, such as sound — what Lovell refers to as the *transformation process* (Lovell 2001). This is often referred to incorrectly as image processing, but is referred to more aptly by Lovell, as *image understanding* (Lovell 2001).

Why video? There are a number of significant advantages of using a video camera as the primary sensing device, the most important of which is that the performer is not physically connected to the device. Complete freedom of movement is very important to choreographers and performers alike, and these video-based systems have the capability of making systems that leave the performer completely unburdened by the system itself. Video is also flexible in its viewpoint. Using a video camera, it becomes possible to move not just the point of view, but also the scope of view in the middle of the piece. In *The*



*Secret Project*, for example, one section of the piece uses the camera in a zoomed-in position that provides a close-up of the performer so that it can gather very detailed information; at other parts of the piece the camera is zoomed as wide as possible and sees the entire stage at one time, ensuring that there are no dead spots within the sensing world. In this sense, the gaze can change — something that cannot be said of any of the other systems.

More importantly, it also becomes possible to design a system in which the performers do not have to 'aim' for a particular place. With the switch or beam systems, performers must hit the switch or beam with great accuracy before their movement can be 'sensed'. Wearing a body suit, it is possible to match a particular shape pre-programmed into a computer — a sophisticated form of switch, but one that is highly constraining on the performer, and which is likely, at the least, to limit the movement vocabulary in an undesirable way. With a video-based system, it becomes possible to design a system in which there are no switches, virtual or otherwise, that need to be hit in order for the system to work.

This means that video-based systems are much more capable of creating an environment — of allowing the performer to feel immersed, rather than constantly striving to 'find' the sensor. Kozel, talking about her early experimentation with the video-based system for *Contours* says:

'We were fortunate enough to have some time at ZKM, and that was a fantastic experience because using the good projector and having the floor as a wonderful projection surface, it created a totally immersive feeling. And so for me that was like swimming, and it was like being in water, light that was water and it was incredibly powerful and very very magical. And that was where it was like swimming in water with another being. And that was when we discovered some of the most important dynamics like if you moved faster the image would appear more brightly; if you moved slower you could get just the fingertips, just the top of the head; if you rolled and Kirk froze the image you could get the image in mid-roll, and then once you released the image, the

image, it's as if it would leap and catch up with you. So there would be a skidding across the floor...' (Interview text)

In *Contours* a live image of the suspended dancer is projected onto herself, using a variety of techniques. This is a system that we might argue has phenomenological awareness — a sense of the phenomenal body — because it creates a space that the performer can *inhabit*, can 'swim in', much as she inhabits her own body. Even the liquidness of that choice of word is revelatory.

Most importantly, video-based systems place little to no restriction on the movement language itself. There is one notable exception to this rule. In a two dimensional video system, the camera is, of course, seeing a flat two-dimensional image. Therefore, if a dancer is standing parallel to the camera, and moves his or her hand or arm directly in front of the body, then it is unlikely that this movement will be seen at all by the camera. If the performer then turns 90° to the camera, then that same movement will be seen very clearly. This is a major drawback, and one that can cause some confusion to performers and audience alike.

## An Ontological Shift

As I mentioned in the Introduction, I have chosen to work with the words of some practising artists because of the language they choose to use when thinking and talking about the systems they are using. Susan Kozel talks again below about *Contours* (1997, made with systems designer, Kirk Woolford). It is worth noting her use of words like 'travelling', 'connection', 'negotiation', 'shift', 'losing connection', 'falling', 'spilling', and so on:

'...but what I wanted to do for the second section which is the middle portion of the travelling in the space was to have the harness slung in such a way that our toes could still touch the ground, but only just. So you were in a harness but you also had connection with the floor. The movement negotiation was that shift between being in contact with the floor and losing that contact with the floor. So it was all about destabilising and inverting and falling and spilling and then stopping. And the spinning, if you got yourself quite off balance, the spinning was unexpected so you didn't have a sense of whether you would fall to the left or to the right.' (Susan Kozel: interview text)

Compare this to the language used to describe *Songs for the Living/Dance for the Dead* a piece made in 1999 by choreographer Mata Sakka and composer/systems designer Russell

Pinkston:

*'The [MIDI Dance Floor] was designed and built at the Department of Music of The University of Texas at Austin. It is capable of transmitting precise position coordinates and continuous pressure information in the form of standard MIDI messages. The surface consists of 128 24-inch Force Sensing Resistors (FSRs) which are fastened to four 4' X 16' strips of material and placed beneath a standard Marley Dance Floor. ...Used in conjunction with an "intelligent" external MIDI processing system, it permits one or more dancers to control and/or affect both music and lighting by the nature of their movements and by their precise position(s) on the surface.'*

*'[The Music] is controlled by software written in MAX, which interprets signals coming from a touch-sensitive dance floor and reacts to them in various ways, generating and/or controlling both music and video images. At times, the dancers' movements produce specific individual sounds and/or short musical passages, giving her complete control over the timing and expression of the music. At other times, their movements trigger short video sequences and/or extended pre-composed sections of music, after which they can dance freely, temporarily having no responsibility for controlling playback'. (online at [http://www.music.columbia.edu/fest99/events/all\\_round.html](http://www.music.columbia.edu/fest99/events/all_round.html))'*

Admittedly this is intended to be a technical description of a particular sensing system (the MIDI Dance Floor), but the essence of the language is so different, with words and phrases such as 'precise position co-ordinates', 'continuous pressure information', 'precise position on the surface', 'specific', 'responsibility', and so on.

The ontology of these two systems is entirely different. In the second example, there is almost an oppositional stance between performer and system, and it is clear just from the

language used that the performers have to be *in precise locations* in order to make the system 'work'. The first example, however, is quite different. Here are two systems (the harness and the sensing environment) co-operating to *enhance* as well as to drive the choreographic language. The dancers are inhabiting the interactive environment, and are suspended in harnesses — so in this case, *both* technologies are affecting the choreography. Ideas of balance and spinning become central not just to the choreographic language, but to the technical language of suspension and interaction. This is very clear when you see the performance. Moreover, this is a much more phenomenological approach to what movement is. As a performer, Kozel is inhabiting the space of the installation, not simply trying to trigger something. Her relationship to it is an ecstatic one:

*'A defining trait of ecstasy is its immediacy... Ecstasy happens to ourselves. It is a momentary transformation of the knower, not merely a transformation of the knower's experience (although exceptional experience is often required to bring ecstasy on).'* (Jourdain 1997 p.328)

This is an *entirely* different experience than trying to move in order to hit a series of targets in space. It seems to have its own ontological state that belongs to the bodies inhabiting it. Kozel talks about the experience of moving within the system, of learning it:

*'The initial stage was what I think is always the case with interactive software — you have to understand it through your eyes. You have to know, if I do this, what's it doing. And then, that stage is rapidly replaced by a bodily comprehension, obviously still accessed and facilitated through the visual but it's then bodily and that's when the interesting movement comes out, and that's when you develop a relationship with the image you're creating.'* (interview text)

This is a phenomenal site, the very notion of 'bodily comprehension' can be phenomenal in nature. It is a world away from the more mechanistic approaches to building interactive systems where the technology is in the driving seat, not the performer.

Gilson-Ellis talks about this in her artist's statement for *The Secret Project*:

*'In this work, we make spaces for entanglement. These are precisely designed to be imprecise [my emphasis]. Their textures are composed from choreographic fragments, made to conjure sound / text from its motion in particular ways. This practice demands that I am alive to every moment of performance; I weave with pools of choreography, utterance, and recorded text / sound. What I trigger with my motion affects what I say / sound / how I move again. Listening, speaking and moving become a related series of energies. I push at language to tell you what this is.'* (Gilson-Ellis unpublished)

## Invisible machines

---

An almost equal benefit of the video-based systems is that the audience is also unhampered by the video camera. The camera is not visible to them (or if it is, it is either not noticed, or is just assumed to be a documentation camera) — it falls below the visibility threshold of the audience's attention, the so-called 'disattendance convention' (Elam 2001 p.89). This makes the technology *essentially invisible* to an audience — so much so that *half/angel* no longer talks about the technology in their programme materials, and the audience does not necessarily know that these technologies are in operation. The technology has, in fact, become entirely transparent to the audience. Upon walking into the performance space, audience members are confronted by an entirely empty stage — no set, wide open to the back wall (where possible), and no visible technology. This is important for the simple reason that we want our audience to experience the work, to concentrate on the dance and on the content, the ideas within the work — not to have centred their 'horizon of expectation' (Elam 2001 pp.94-95) on the technology. If the technology becomes visible or overt, or if it becomes the focal point of any pre-show discussion or programme notes, then that is what the audience is watching, regardless of the content of the work. If the technology fails, then the whole

work falls down for this audience; if it works well, then it is the aesthetic whole of the performance that has pleased them, not the success or failure of a particular technology.

## The audience

What, then, is the audience's position in relation to all of this? How important is it that they understand what's going on with the technology? If the audience is not told specifically about the interactive nature of the piece, how will they understand what is happening? To what extent does it matter whether or not they understand what is happening, or even *whether* it is happening? Is the audience's understanding an intuited rather than a rational one? Do audiences sense what is happening — or have they become part of the ontology of the performance space, innately understanding what is happening phenomenologically?

I asked Susan Kozel how important she felt it was that audiences understand what is happening:

'I'm still negotiating that. I used to take a really hard line a few years ago I just thought I'm not going to tell them anything and if they want to find out they'll just have to figure it out for themselves. And then I realised that was probably a little unfair on both the work and performers and the audience. So now I think that it needs to be judged, it almost needs to be judged based on each piece but also based on each location. We've performed in quite a large range of locations...and each audience was slightly different. I feel that I don't like explaining everything right up front because there's got to be a bit of a magic. But equally sometimes an audience wants to know what causes A which causes B which causes C before they'll even let themselves get drawn in. For me the challenge is to create a piece that's sensual enough, is enticing enough so that they might suspend this rational need to know until a point when they can, you know, grab your elbow and say hold on, how does this work?' (interview text)

Mark Coniglio's response to the same question was somewhat more unequivocal:

'The thing is, with an audience, if you're sitting there with a guitar player and he's like riffing and doing his thing and you can see his fingers move and hitting the strings, you know he's making the music. When Dawn [Stoppiello] is

moving through the space and hitting these laser beams, and, you know, in this piece there's a musical thing that...there are these musical notes that change and lights come up and fade out, and it still isn't totally clear to them, even though it seems like it ought to be fairly obvious, although the other component is that there is a video happening live as well as a background, and she's being superimposed on that. And that's another interesting thing, you know, because now we have multiple media happening at the same time, and whenever you have video, people are transfixed by it. So actually to draw their attention down to the laser beams, to understand what's going on, I have a hard time doing it because their eyes are just riveted to the video. So really this is another issue. Really we're using multiple instruments at the same time, and so for them to understand the whole picture is very difficult because it's a complicated instrument. And so it's just because it's beyond their experience. But I think somehow giving them some sense she is actually making this happen — it's like a jazz performance, it's just adding this element of liveness. But on the other hand...it just absolutely doesn't matter because if the dancing moves them, if the music moves them, if the video content that's going with it moves them, then it works.

I guess the main thing for me is that I would like to be able to reveal that she's playing the stuff live, if possible, without making it the focus of the piece. Because the thing is I'm trying to introduce them to an instrument that they don't know and don't understand, and this is a piece of art, so you can only go so far, and if they don't get it, they don't get it.' (interview text)

There has been no formal attempt in this thesis to study audience reaction to the work. However, it is inevitable that anecdotal information will reach us, and we have often in the past had question/answer sessions after a performance which help provide us with such information. Of my primary research questions, I come back to two important statements: i) that the interactive performance environment comprises a number of elements, of which technology is only one, and that ii) the dominant aesthetic in the piece is the poetic (not the technical). The question most frequently asked of us is to what extent it matters whether the audience is aware of the technology underlying the piece. Many respond that the audience cannot possibly "understand" the work without this knowledge. Elam talks about this:

*The spectator's cognitive hold on the theatrical frame, his knowledge of texts, textual laws and conventions, together with his general cultural preparation and the influence of critics, friends, and so forth, make up what is known in the aesthetics of reception as the horizon of expectations ...whereby the "aesthetic distance" created by the performance — through its innovations, modifying future expectations — is measured. (Elam 2001 pp.94-95)*

This 'horizon of expectations' is the essential point here. The audience's response to this work seems to be a phenomenal one. They are aware of the rich contribution made by the technology only if that contribution is meaningful to the overall aesthetic experience. No audience member will ask about (or even think about) how the lighting designer has created a particular effect — the other technologies at play (however experimental) should be equally unimportant. If a sensing system, or any sonic or visual element is used successfully, then its contribution to the whole is integral — the piece without such technologies would be significantly diminished both aesthetically and qualitatively. We shift the horizon of expectations if there is too much discussion beforehand about the systems in play or the technological aims of the piece. We ask the audience to be looking at the mechanics of the piece, to attempt to view it empirically and with detachment, which by implication means that they will miss or ignore the magical moment of performance, the theatrical experience. All too often we as artists do not trust our audience to respond competently to this work — we are afraid of letting it speak, and in believing in the 'audience competence' (Elam 2001 p.95). Coniglio talked about this:

'We don't put it in the programme notes anymore, anything about the technology, and it's odd you know because we have this Board of Directors, and we've had some relatively intense discussions because they're saying "you've got to put it in because no one gets it" and I just told them I can't do it...' (Interview text)

half/angel took the decision some time ago to trust in our audience's phenomenal sense of the work (indeed, it might be suggested that these systems are not functioning well if the audience is not part of the ontology of the whole, and phenomenally involved in what is happening). We want them to be moved by the work itself, without having to worry about specific aspects of the technology. We choose therefore simply not to make any reference to it.



## Bodies and machines

---

*'...Our capacity to go beyond the machine rests upon our power to assimilate the machine. Until we have absorbed the lessons of objectivity, impersonality, neutrality, the lessons of the mechanical realm, we cannot go further in our development toward the more richly organic, the more profoundly human.'* Mumford (1934)

This prescient statement from Lewis Mumford takes us to the heart of the debate about motion sensing. The desire to make systems “profoundly human” has become something of a Holy Grail to programmers and systems designers alike. This question is part of a much larger debate on the moistness of affective computing systems (to borrow from Ascott): whether we can, and are willing to design systems that make mistakes, that are messy and fluid, that can transcend the sensibility of the machine.

*'The boundary is very permeable between tool and myth, instrument and concept, historical systems of social relations and historical anatomies of possible bodies, including objects of knowledge. Indeed, myth and tool mutually constitute each other.'* (Haraway 1991 p.151)

Haraway questions the perceived lack of permeability of the machine structure. My aim in this research is to design systems that leak, whose membranes are porous, and that are able to gain understandings that go beyond the hard logic of the machine.

In my interview with her, Susan Kozel talks about the membrane of the machine:

*'The initial stage was what I think is always the case with interactive software — you have to understand it through your eyes. You have to know, if I do this, what's it doing. And then, that stage is rapidly replaced by a bodily comprehension, obviously still accessed and facilitated through the visual but it's then bodily and that's when the interesting movement comes out, and that's when you develop a relationship with the image you're creating. And then of course discover things like you're projecting down onto the floor [so] you can project onto yourself, so you can end up playing across touch, the image ends up touching you or if you're dancing with another dancer...you can touch each other by having your image project onto the other person. And you can also*

create rather hybrid imagery by joining your bodies — contact improvisation under the software, under the cameras is quite interesting because you generate, again, a lapping of two bodies.’ (interview text)

Here there is an interaction between body and machine — and some kind of mutual understanding. She talks about *hybrid images*, by which she actually means the melding of body image and machine image — they become inseparable, or, at least, the membrane between the two becomes semi-permeable. This is Torgovnich’s ‘merging’ (1996 p.4), not just between body and machine, but between conscious and unconscious.

Kozel continues, talking about the third section of *Contours*:

‘...what ...the computer tried to do is send out a grid, vertical and horizontal lines that were repeatedly drawn that would lock into what it saw was moving the most quickly. And then if that hand that was moving the most quickly was travelling in space, say, from left to right, the software had enough intelligence to think that perhaps it was going to carry on moving from left to right. So if the movement was initiated it assumed it would carry on, which meant that the image would then, if you played it right, the imagery would leave your body and then you could snap it back into another position. So if you sent your right arm moving out to the right and then froze that arm and had your left hand do a burst of movement the computer would have to snap back and catch the left. So there was a bit more, almost elasticity, a bit more play involved with that. And of course as you moved, you’re in the harness, you had a sense that it was this weird shift in dynamic...There were times when I felt like I was being carved and when I didn’t understand the software very well...it was quite an aggressive one because it’s, it’s a repeating grid, like crosshairs in a rifle, and it did make you feel quite vulnerable because you’re there in a harness, you can’t really control your movement that well and you’ve this software just repeatedly carving you up. So the challenge then was to be still enough so that the grid would disappear — because if it didn’t detect movement it would just quieten down for a while — and then how could you control it? So then, how do you bring it back into existence? Can you do it with just a toe or does it have to be a foot? Can it be an elbow?...’ (interview text)

She is talking about a system that feels very sensitive, very immersive, to the performers; but she is also talking about a system that can “carve you up”, a system with which there is an emotional as well as a physical interaction. She is talking about a system that is phenomenologically powerful, upsetting, disorientating, and behaving as though there is a conscious link with the performer who inhabits it.

This, too is what I discovered in my early research with Jools. When we first began to control the voice with the body (see next chapter) she described it as a 'form of dismemberment', like 'having her molecules re-arranged'. It was at that stage that I felt we were on to something.

In my systems, I too am part of its ontological space: I inhabit the systems just as much as the performers do: I tweak, I rescue, I operate, and (very occasionally) I fake. I am not particularly concerned with building systems that are 'perfect', that run themselves beautifully if somewhat mechanically. Instead, I'm designing live systems that are precarious and that sometimes need help. I too become part of the whole, something I will explore later in Chapters 5 and 6.

These systems have 'a status quite outside what can be explained by the physical laws of the world.' (Jones 1999 p.6) because human agency and consciousness are central to their functioning.

## **Emotional and interior space**

---

So, is it possible to design a human/machine interface that is conscious, that has its own being? Rather than trying to design a machine that can mimic the human brain, with all the impossibilities of defining human consciousness implicit in that notion, is it not instead

possible to design a computer system that is so sensitive to human-ness, to emotional being, that it is *de facto* intelligent? Or, perhaps, is *emotionally aware*?

My research has led me to believe that this can be done with a relatively simple system — one that can, despite its simplicity, begin to appear to have a sense of *why* a human is doing what it is doing, rather than simply *what* it is doing. Rather than attempting to build a system that is objectively human-like, I have attempted instead to design a system that is subjectively human-like — a system that has a phenomenological sense of the data it acquires, and is therefore capable of imputing gaps in that data. I use the word *impute* advisedly, and in contrast to *interpolate*, a computing technique that has for decades been used to mimic an analogue response. I am not aiming to interpolate (ie fill in) gaps in the data, but am instead aiming to guess or suggest what might be about to happen, or what just happened. Any sensing environment is not data-neutral — if it is not receiving the kind of information for which it was designed, then it will not function. A system that is phenomenologically aware cannot function if it is not properly inhabited.

The relative simplicity of the interface is actually not insignificant. I would suggest that the ultra-accurate movement-data-gathering systems such as the ones emerging from the MIT Media Lab and other such research centres around the globe are ultra-complex systems that are extremely clever, but which have no innate understanding<sup>18</sup> of the data they are gathering. In looking at the work of the Affective Computing Group at the Media Lab, they say:

*'Current efforts that use physiological sensing are focusing on:  
GSR (Galvanic Skin Response),  
EKG (Electrocardiogram),  
EMG (Electromyogram),  
BVP (Blood Volume Pressure),  
Respiration, and  
Temperature'*

(online at [http://affect.media.mit.edu/AC\\_research/recognizing.html](http://affect.media.mit.edu/AC_research/recognizing.html))

This is a large number of data streams, but we have already learnt about this kind of data, they are unlikely in the end to serve their purpose, which is to attempt to understand the affective state of the person in question. It is terribly easy, as a researcher, to become subsumed by the goal itself whilst forgetting, or disregarding, what the end product of the research might be used for. Indeed, in many academic circles, this is regarded as *sine qua non*. In developing highly accurate systems to sense and analyse a moving body, rarely does the end goal include a notion of what to do with this data, or even how to develop evaluative mechanisms for assessing its usefulness. It is only when placed in an active context that the systems can be developed meaningfully. A typical response to our work from programmers working in the field is ‘wow — how can you do all that with so little information?’. We already know the relative importance of empirical data about the moving body, and how little it tells us. Clearly, what has become important is the search for the phenomenal body and the gestalt of the environment.

## The phenomenological link

A confusion of gesture between mover and machine is remarkable and extraordinary, what Gilson-Ellis describes as a *corporeal confusion*. When the system is working well, there is no clear, literal, obvious connection between performer and machine, but instead a phenomenal connection that an audience senses phenomenally rather than sees or knows. When the system involves triggering spoken text (which ours usually do) then *there is no difference between moving and speaking* — both are of the flesh, and both gestures become intermingled, become confused, become ‘merged’.

To function well, both of the systems — the body system(s) and the machine system — must be listening to one another, and must be responsive, be attuned to one another, must be in a shared ontological space. As a live operator I am part of this link because I constantly tweak the system to keep it properly connected to the movement; in the same way, the performers can nudge themselves back into the connection should they lose it for a moment. The live connection is what creates the work *in the moment*, and it is this live act that gives the work its edge, its uniqueness. Without that moment-to-moment sense of connection between what is seen as physical movement and what is heard as sound, the whole hypothesis of the work collapses. Kozel talked about this:

‘At one point, as ever, the software is late in arriving...or something...and I decided to do what I don’t normally do, which is to try to prepare movement in advance based on working with the music [which is not interactive] and understanding what it was about. And, of course, it didn’t work. It didn’t work because, because it was disconnected. And we didn’t know why we were then in the software. For me there’s always got to be a why, you have to be there for a reason [when you’re] using interactive software.’ (interview text)

The environment, in the end, is more a *place to be in* rather than a fixed system with pre-programmed habits and behaviours that co-exists with a fixed and pre-programmed choreography. The system has become part of a new ontology of performance.

## A conscious machine?

In dance there is a tendency to think that the trained body is making beautiful shapes because it has been *told* to make beautiful shapes; it has rehearsed those beautiful shapes until it is capable of reproducing them *without thought*. It can be argued however that much of contemporary dance of recent years, particularly when there is an element of

improvisation in the work, is highly cerebral and emotional (these two are not necessarily in opposition), and that the emotional content of the movement is overtly presented to the viewer<sup>19</sup>. When we try to look at these movements with a computer eye, though, the camera ignores (or cannot see) all the unconscious information (however overt it may be) and concentrates only on the physical activity of the body — the system tries (in vain) to assess the movement of each performing body with a deadly accuracy, only to miss the essential point most of the time.

*'...Science succeeds in constructing only a semblance of subjectivity: it introduces sensations which are things, just where experience shows that there are meaningful patterns; it forces the phenomenal universe into categories which make sense only in the universe of science. [It cannot realize] that the perceived, by its nature, admits of the ambiguous, the shifting, and is shaped by its content.'* (Merleau-Ponty 1964 p.11)

Pepperell says:

*'Given sufficient heat, gravity and air pressure the water in a kettle will start to boil. We can see what boiling is, we can recognise it as something to which we give a name. We do not consider it mysterious, yet we cannot isolate it from the conditions that produced it.'* (Pepperell 1995 p.6)

So, the question we need to ask is not so much what is the camera looking at, but *how* is it looking, and what is it seeing? The unconscious, not at all intelligent camera 'has no idea why its results are true' (Merleau-Ponty 1964 p.15).

Ever watched dance on video?<sup>20</sup> How rarely it is successful — dance is arguably the performing art that translates the least successfully to the screen, particularly the small screen. This is at least partially a function of what the camera — the objective electronic eye — cannot see.

What we need is a 'nervous system' which is always 'on the lookout for *the most important* activities to which to devote itself' (Jourdain 1997 p. 310).

## Seeking the subjective

---

The logical next research step is to learn how to express the subjective — in order to do this, I have to find ways to sense or in some way read the subjective. My programming of the sensing environment provides ‘the experience’ (Jones 1999 p.8) to mediate the incoming data and to wring successful information from it. The most significant breakthrough in the research was to begin ignoring, or downplaying, the positional information the system receives, and to concentrate instead on more interesting parameters like speed, acceleration, direction, and object size. BigEye<sup>21</sup>, the software I was using at the time for motion-sensing, provides me with ‘virtual objects’<sup>22</sup>, which turned out to be a key feature, rarely used by others<sup>23</sup>.

When using *BigEye* I am trying to identify, and then track, moving ‘objects’ within the performance environment. Within the system the virtual object simply carries on where the physical object left off. If a live object is travelling leftward on the stage at a given acceleration rate, and then stops — the virtual object will keep on going for a little while longer, attempting to mimic the same level of acceleration or deacceleration, and it will slowly “fade”. The system is ‘seeing’ a continuation of the movement that actually happened. (Is it perceiving it, or is it seeing it?) This gives the data a roundness, a fluidity, that it would not otherwise have. The data flow doesn’t just stop when the body stops, it sort of gently fades and dies. I earlier described a good sensing system as being proprioceptive — and perhaps this roundness in the data is what I mean. I find this a poetic notion, perhaps because, in order to function, the systems needs to believe that it has some kind of perception beyond the physical. It must have some kind of phenomenological sense of the moving bodies in its universe. As such, it feels very comfortable to be working with this kind of data within a poetic performance context. But why is this my discovery — surely credit belongs entirely to the programmer?



I have already referred to the work of the Affective Computing Group at MIT (above). There are other research centres doing similar work, and all seem to be working with similar technologies and approaches, all of which I find somewhat problematic and troubling.

As a case study, we can look at the Affective Tigger (from MIT):

*The Affective Tigger is an endeavor to build a toy that responds to the user or playmate in a natural and meaningful manner. Specifically, the Affective Tigger recognizes and reacts to the emotion the child is exhibiting. For example, when the child is "happily" playing with the Affective Tigger, the child will move and hold him in a manner that expresses this happiness: she might bounce him along the floor, or hug and kiss him. The Affective Tigger senses this physical interaction, for example he might recognize that the child is bouncing him, and outwardly expresses his own happiness in turn. In this manner, the Affective Tigger is both mimicking the mood expressed by the child and reinforcing a behavior exhibited by the child, namely bouncing him.*

(online at

[http://affect.media.mit.edu/AC\\_research/projects/Atigger.html](http://affect.media.mit.edu/AC_research/projects/Atigger.html))

I cite this particular work because it exemplifies the notion that emotion can be measured by empirical inputs that may be inferred to typify (represent) a behaviour pattern associated with a particular emotion. On one level, this does not seem so far away from the research we are discussing here, but is that the case? It suggests that certain behaviour (hugging, kissing) represents happiness — but there is no understanding here, only the notion that emotion can be inferred from a rather shaky set of empirical data.

I cite this work only because it represents a field of study that is overtly centred on emotion, but whose approach seems entirely divorced from the emotional body — it seems to have no sense at all of ontological uncertainty, of who its interactors

(playmates) are and what they are doing there, other than providing bio-mechanical stimuli.

## Emergent poetics

---

So it seems possible (and helpful) to posit that when trying to build a motion-sensing system, the centre of attention should not be the empiric body-state, or even the empiric affect-state. The focus instead should be the phenomenal body: observing *how* it is moving, attempting to extrapolate the reasons *why* it is moving, and in what way it is changing its world by its movement. This does not have to involve minutely accurate readings of each of the physiological phenomena that go to make up a particular movement. In attempting to build poetic performance environments, it is the *poetic* that must be dominant, and any computer system built for these environments must not just support the poetic, but must have its own internal poetry.

By building systems that can extend physical gesture into textual gesture, the aesthetics of movement become the aesthetics of the poetic narrative. This can be done without interactive technology, of course, but a well-designed system can extend the performer's and the audience's sense of a complete binding of gestures. The poetic is an emergent property of the physical movement — and vice versa. Bill Seaman talks about this idea in the context of virtual world building:

'...this goes back to my recombinant poetics idea which is really what I've been thinking about and writing about — emergent meaning through combinatorial relations of differing media elements. And I'm really thinking about that almost as a new approach to linguistics...as a new language, or mixed semiotic...

One of the main ideas is this notion of fields of meaning — that image communicates differently from text which communicates differently than music. And that all of them have a kind of evocative meaning force and we bring a history of our embodied relation to past meaning forces. And there's a kind of ongoing summing of meaning production. Which is very different from this signifies this. It's much more about what comes out of this set of forces. And since it's combinatoric you have this emergence. Instead of saying this will always mean this it's more like these probabilities that you load the work with and certain meanings arise out of using it.' (interview text)

His essential theory of recombinant poetics is that a *combination* of media (or layers) each with their own meaning or emotional state creates an *emergent* meaning, an emergent emotional state that is communicated to the interactor (in our case, also the audience).

## Moving On

---

We have established that it is not only possible, but highly desirable to create a phenomenological link between system and performer — to build an environment that the performer is able to *inhabit*, that at least appears to have some kind of ontological understanding of what it is 'seeing'? Is this emotional awareness? Or understanding — a consciousness? The desire, and the intent of this research is to provoke a systems language that is humanly sensitive — sensitive to poetic space, to human emotion and the phenomenal self. I want to build systems where there is a perceived communication between the machine and the human, where the communication is a live, present one. These systems are not intelligent in any sense of the word as we understand it — but perhaps they do have an innate emotional understanding (as Lovell [2001] suggested, this is *data understanding* rather than simple *data processing*).

The next chapter explores my specific research.

## Chapter 4 : The Research

*'Cameras are extremely good at bringing certain kinds of data into a system. The sensate body as a model implies a multi-sensory approach to responsive environments. The ability to program computers to parse a series of differing sensual inputs meaningfully will become pivotal to future intelligent sensing systems working functionally in responsive environments. The difficult task is to author a programming environment that can provide the meaningful interpolation of the differing fields of input signals gleaned from the environment, as well as to provide the appropriate machinic responses back out into that environment based on the intelligent interpretation of those fields.'* (Seaman: interview text)

# Introduction

---

*Imagine a spectrum of musical systems, with completely explicit systems at one end (by which I mean, systems where each note or event corresponds to a performance gesture), and completely algorithmic systems at the other end (with no interactive interface). Then there are all sorts of musical systems which lie between these two; and as one moves from the explicit to the algorithmic, the bandwidth of the gestures needed for a particular degree of musical complexity is gradually reduced. (Rothwell 1998 [online])*

In this chapter, I wish to explore a number of elements within the practical research. As the centrum of this thesis is about phenomenal space, I want to explore both phenomenal and liminal spaces within the work — how they are discovered, why, and to what effect. I will explore in depth the interactive technologies I have developed during the course of this research — again, what it does, why, and to what effect.

## Genesis (Enchantment)

---

Typically our work has long gestation periods. This is partly due to the working process, which tends to take place in intensive workshop periods, followed by long gaps. Many times, during these long gaps, I am not able to revisit the material at all; sometimes I can spend some time refining and researching, but, of course, out of context. Nevertheless, when we come back together to work, the time of reflection away from the work brings a new perspective and a new distance.

The large pieces begin with textual material. When we begin work on a new piece now (such as we began *Spinstren* in 2001) Jools and I can immediately call on the collaborative and aesthetic languages that we have developed since 1995. We begin with text — in

some sense the text always remains primary within the work. Certainly central content ideas, which set the tone and flavour of the work, grow directly from the text, which itself has probably grown from a single idea. In *The Secret Project* we wanted to explore the broad notion of secret; in *Spinstren* we began with spinning — particularly with a spinning top:

*'We spun the top that he had carved in front of us. I fell out of time and was completely enchanted by this top. It absolutely had to do with this contradiction between the spinning and the stillness (Gilson-Ellis: interview text)*

This is important to note because so much of the subsequent development of the piece remains firmly rooted in these early content ideas. The three-dimensional soundworld of *Spinstren* for example comes directly from the idea of spinning.

For a while, we become obsessed — enchanted — by the material, as we delve into it from a thousand different angles.

## **Research Methodology**

---

The working methodology is an entirely collaborative one. When making theatre of this kind, in particular the interactive environments, it is *impossible* not to work collaboratively. Unlike the model of collaboration employed in the multi-layered works of Cage/Cunningham/Rauschenberg where the chance meeting of multiple layers was the driving aesthetic behind the work<sup>24</sup>, this is a deep collaboration where everything must be made *together*. Of course, we produce material on our own: Jools writes poems, I write music, and even do some preliminary programming. I often also have the basic idea for a particular environment and will prepare the materials that will provide the shell of that environment<sup>25</sup> before coming to rehearsal. Very often, during intensive work periods, we

will work with the dancers all day and then after dinner I will have to retreat to the studio and make amendments based on things we have discovered during the day; at other times, I will make those amendments during the rehearsal itself.

This is a key point, because it demands that the system (primarily the software part of the system) is *nimble* enough to allow tweaks and changes in the middle of rehearsal.

Sometimes, though, a change in the soundworld or even the source material is required.

In that case, some very quick audio editing is required. It can take a couple of hours to alter an environment radically, and very often the alterations don't work, and we have to begin again.

First Jools, when working with her alone, and then the dancers, when we have a company together, quickly got used to the idea of working with the beginnings of an environment and then waiting as I made some adjustments, then working for a while longer, and so on. During the "down" times, they might be working on choreographic language — their part of the environment — but for the interactive environments the choreography cannot ever be fixed completely.

It became apparent early on that the essence of making a environment interactive was to make a environment in which all parties were listening, and reacting. As we've already made clear, there must be an aware, phenomenological connection between performers and machines — the performers must be active participants, must bring their entire being into the ontology of the environment. The environment design is key here: if the environment is actually *not* very sensitive, or is just not a good listener, then the performers will be unable to inhabit it, will struggle with it, or will simply give up because it is too difficult. Occasionally, I will resist this (see *Chorda* in Chapter 5) because I know that the environment *will* work if everyone can learn to live in its world. As programmer,

then, I retain a primary agency in the building of the environments (just as I also participate as a performer in the system). I realised fairly early on that I needed to make environments that could listen, that could be adjusted on the fly, that could be *imprecise* in their gathering of data.

*This is neither completely open improvisation, nor set choreography. The ways in which Cindy triggers the environment will always be different (the movement / text score is always different). She... must listen in a way dancers are not used to listening because the soundtrack is usually the same. If she (we) does not really listen and let the phrasing and phrases she triggers affect her improvisation, then the piece fails.*  
(Gilson-Ellis 2000 p.35)

The key here is the notion that the score (the ways in which the environment can be triggered) will *always be different*. This is a different kind of compositional paradigm in which traditional notions of music and dance composition — building whole, complex structures that are reproduced or interpreted by performers — are fundamentally challenged. Hanson notes that ‘as the artists adapt the technology to meet their demands, the software becomes extension of the body, with all the invisible nuances of human motivation’ (1999 p.36). Both the musical and the choreographic composition must allow for this, must allow for a listening and a live connection between their two worlds and be open enough in their structures and language to support such a connection.

Keeping the work open and consistently adaptable seems a key to this level of live nuance. A key question is *how large is the ontology of the space?* The key elements within an environment (the performers, the system, the programmer/performer, and of course the text itself) need to be together. If all (the performers, the environment, the musical score, the choreography, the spoken text, myself (as a performer and as a programmer))



continue to operate as separate entities, with separate narratives and separate needs and desires, then nothing gels. There is an ontological breakdown where nothing adheres.

## Dreaming

When I'm involved in the making, or the performing, I dream the music. Part of the process of composing, for me, is to *absorb*. I will listen to a piece of music I have written being performed on the computer over, and over, and over again, often until I fall asleep. (I use the word "performed" advisedly.) More often than not, I'm making a piece of algorithmic<sup>26</sup> music that is being created on the fly, rather than composing a fixed score. Each time the computer creates the music, therefore, it is different — a performance. If, when I wake up it still feels good, if it still has the capacity to move me, then I'm certain I will keep it. I will tweak the algorithms — the base set of instructions and ingredients of the piece — constantly until I'm happy that it will work *for ever*. If it begins to get stale, or just begins to bore me, then it will probably go, even if I've spent days making it.

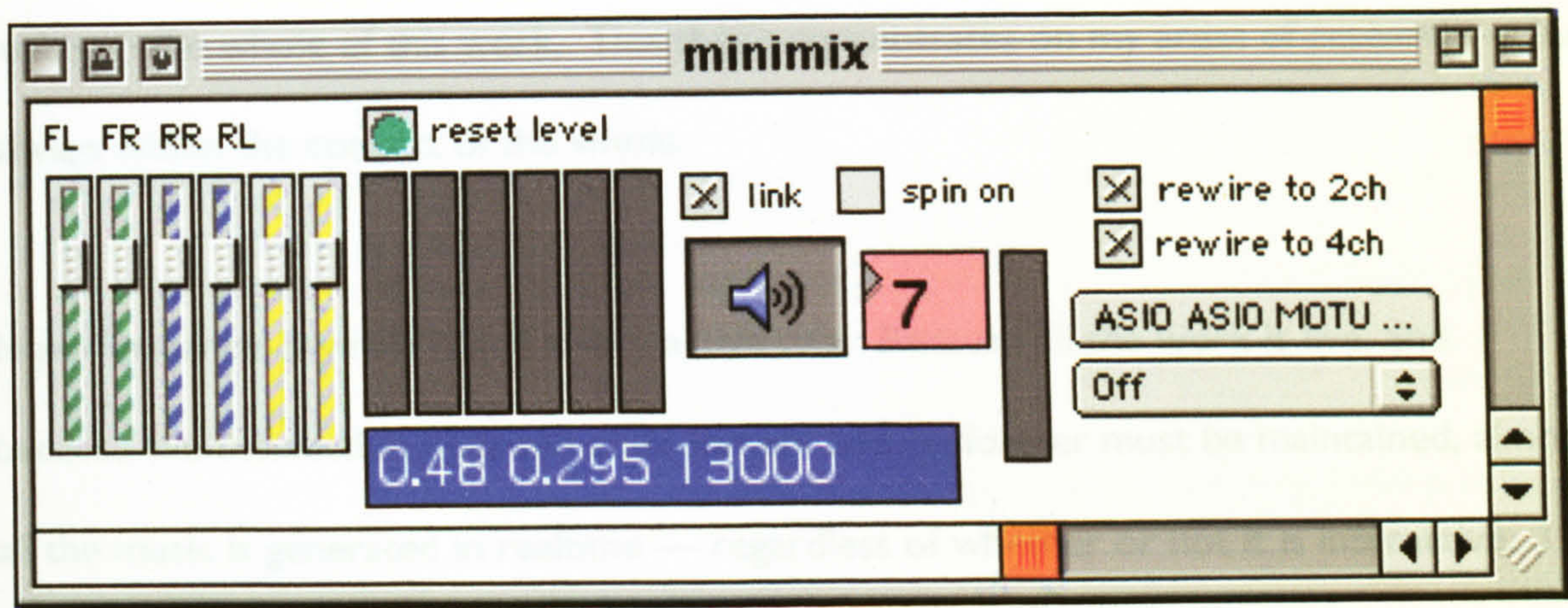
When I'm building the skeleton of an environment however, all I can do is try to pretend what it might be like. Until I'm actually in the space, with the performers and with the outline of a choreography, then I can't know what this music will sound like. And then, once all those things have come together, I certainly can't listen to it over and over again, going into that trance-like state that I enter when evaluating the other kind of music.

These environments will never be listened to over again, just once. They will never be the same twice — there can be no repetition. This, of course, is of the essence.

## The Making Process

My role is a dual one: I make all the sound worlds and the video imagery for the pieces, as well as ensuring that the piece actually gets onto the stage as a competent, fluent performance. I also perform in the sense that I am at the computer throughout the performance, tweaking the interactive hardware, mixing sound, and moving from section to section. Am I a performer in Schechner's definition of the word — am I 'showing doing' (Schechner 2001 p.22)? If I *am* showing doing, then who am I showing it to? I may not be in front of an audience, in the sense of being 'on stage', but I am an active participant in the environment, I most certainly have agency in the environment, I am part of its shared ontology.

I programme everything in an environment called *Max*<sup>27</sup> which allows me to create highly fluid yet tightly structured performance control systems. In these systems, I manage everything from sound and video playback to creating and interpreting the incoming data streams from the movement on the stage. In *Max* I create a performance interface — a window that is as clean as possible that lets me have access to primary performance parameters easily and quickly. This is my graphical user interface (GUI) for the performance. Here, for example, is the patch I call "minimix" that is present throughout *Spinstren*. Using it, I can control the volume of each of the six independent audio channels, and I can switch various resources on and off, and monitor the general health of the system as it is running. (The number seven shown below in Figure 1 is showing the load on the computer processor (CPU). That is a crucial number, as I sometimes push the CPU load right to its limit.)



**Figure 4-1** *minimix* from *Spinstren*

I build the bones of an interactive environment in my studio, but in rehearsal I am able to tweak it and change it *quickly*. This is what makes *Max* so essential to the process. Unlike many programming environments, it is essentially visual, which means that reprogramming or tweaking of a programme parameter is relatively straightforward — much more so than in any other programming environment. It thus becomes possible for me to work *with* the performers as they learn to respond to, and to function within, the environment. They quickly become common property, as sometimes the fundamental structure of the environment changes to meet the needs, frustrations and desires of the performers. They shape and mould both the interactive and non-interactive environments as much as I do.

This research methodology is paradigmatic of practice-based research (sometimes called Action Research), in which 'the researcher wants to try out a theory with practitioners in real situations, gain feedback from this experience, modify the theory as a result of this feedback, and try it again.' (Avison et al, 1999). However, there are multiple levels of research happening at the same time — it is the combination of the technical systems, the built soundworld, the choreographic language, and the poetic/narrative language that

make up the whole of this work. This thesis concentrates on my areas of research — but always within the context of the whole.

In performance, my role is still a very active one. Because all the work is live, and because the connection between environment and performer must be maintained, almost all the music is generated in realtime — regardless of whether or not it is interactive. I retain agency, and can alter parameters as I see fit. Computer systems remain fragile, and it is this very fragility that brings an edge to the performance, and maintains a live connection that I believe to be so essential to the work.

## Learning Consciousness

---

Can we build systems that mimic consciousness? The discourse around artificial intelligence (and its successors) has asked some version of this question since the 1950s (Turing 1950 and others). We must eschew so much of the (particularly early) debates about 'computer as opponent' (Heim 1993 p.60) — can a computer *defeat* a human player at chess? If a computer can win, is it "smart"? Does it exhibit intelligence or consciousness? More usefully, we can adopt the 'computer as component' (Heim 1993 p.60) in which we accept the computer as a partner. Without this, it is impossible for the computer to participate in the ontological space of performance. Given that we do not currently have conscious machines, what are the techniques by which we can begin to broaden its phenomenal horizons?

It has already been made clear that, if we are to create a *sensitive system*, a system that can see the phenomenal body rather than the empiric one, then the system itself must have a degree of human-ness. If 'the inspired man [has] the gift of tongues', then we must create (or nurture) an inspired machine with 'fleshly eyes' (Merleau-Ponty 1964 p.165).

## Fuzzy Logic Systems

Fuzzy logic may be instructive. 'Fuzzy logic is a superset of conventional (Boolean) logic that has been extended to handle the concept of partial truth — truth values between "completely true" and "completely false". It was introduced by Dr. Lotfi Zadeh of UC-Berkeley in the 1960's as a means to model the uncertainty of natural language.'

(<http://www-2.cs.cmu.edu/Groups/AI/html/faqs/ai/fuzzy/part1/faq-doc-2.html> [online article]). This notion seems highly pertinent. Fuzzy logic devices tend to be real-world devices like washing machines and microwave ovens. If the machine receives an instruction from the user that it judges to be incorrect (or *illogical* ?) it will either ignore the input, or will instead substitute what it judges to be the correct command. Fuzzy logic is perhaps the closest we have got (will get?) to a working artificial intelligence (it is in fact a branch of AI research). Can its techniques be applied here?

The language of fuzzy logic has strong resonances: terms such as 'degrees of membership', 'the universe of discourse', 'membership function', and 'the degree of truth' (<http://www-2.cs.cmu.edu/Groups/AI/html/faqs/ai/fuzzy/part1/faq-doc-2.html> [online article]), seems highly pertinent to the discussion thus far. Let's say, for example, we take a range of motion and define it as a set of values between 1 and 100 (this is a not-

unlikely scenario in the systems we use). If we choose to discard all motion with a value of less than 20, and all motion with a value of more than 80, then we are left with a range of motion between 20 and 80 — the comfortable 60% centre of the entire motion spectrum. Fuzzy logic says: give the value 20 a value of 0, and give the value 80 a value of 1. All the values in between will therefore have a value somewhere between 0 and 1. If we call the (fuzzy) value 1 “frenzy”, then all the motion we see will have a degree of membership of frenziedness. A quiet movement with a value of, say, 25, will not be frenzied at all, but it may be useful to us to determine its degree of membership within the class called frenzy.

If we can thus begin to look at *qualities of movement*, then we can begin to perceive the phenomenological space. At the beginning of this research, I knew nothing of this.

## Early Work

---

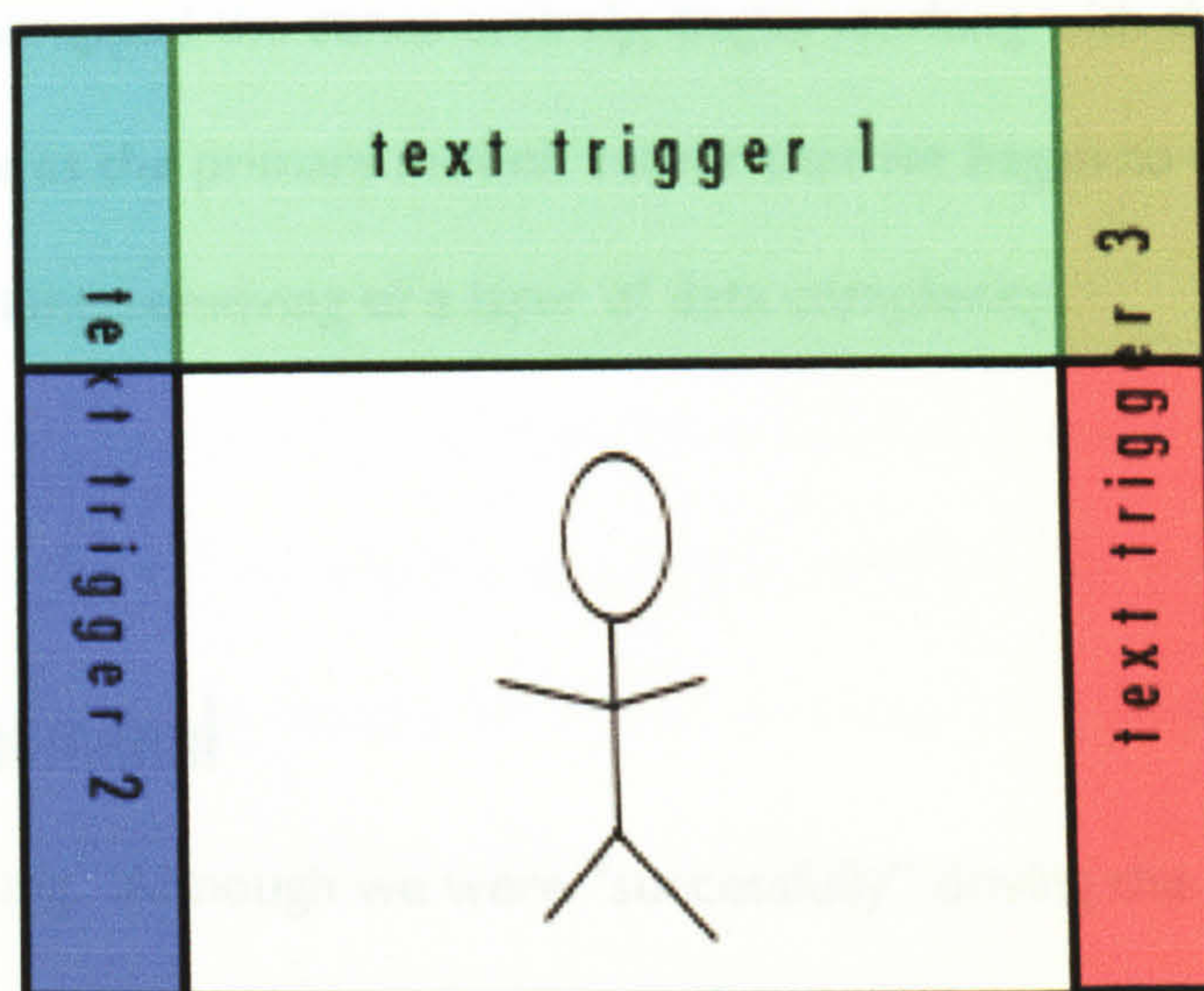
The early research residencies at STEIM in 1997 and 1998 allowed us to begin the movement from the screen-based work we had been doing with *mouthplace* (Gilson-Ellis, Povall 1997), and to move towards public performance. It was here that we began work with BigEye, under the watchful, and helpful, eyes of the programmer, Tom DeMeyer. It was during this period that I began to use the scripting language in BigEye<sup>28</sup> — and this provided the initial breakthrough in the work.

*‘In Amsterdam in 1996, with the glee of innocents, we began experimenting with colour. This involved me in all kinds of big-contrast costume changes — red gloves, orange vests, hoops of bright blue telephone piping. What happened with these early experiments was that the movement became overwhelmed by the aim of making a singular colour trigger ‘hit’ a particular point. The choreography became two-dimensional, and overly concerned with something outside of itself. We switched to using motion, and something interesting seemed possible. This difference is an important one for any digital interactivity.*

*It is the difference between the simple on/off switch (if you go here and click this something happens, and it always happens in the same way) to a more textured, troubled and corporeal relationship between moving bodies, and aural worlds of text and music'. (Gilson-Ellis 2001)*

As Gilson-Ellis says, the decision to move from sensing something specific (like colour) to sensing motion, was a crucial one. In particular, it was discovering the freedom of ignoring the *position* of a particular object (ie its position in the x-y-z<sup>29</sup> axis) and beginning to look at quality of movement — qualities like acceleration and speed. This was the big breakthrough in the research, and it came relatively early once we began to work in depth. That decision freed everything, from the choreography to the nature of the musical composition itself. The choreography was no longer rooted in x-y space: the dancer did not have to hit a particular point in space in order to make something happen. The relationship between input (movement) and output (sound) immediately become more complex, and more interesting.

We had spent quite a lot of time working with literal space before we reached this point. In *mouthplace* we had experimented a great deal with *clickable text spaces* — empty spaces that had to be discovered by the user before they could discover the next chunk of text. We were not doing this to make a gamed environment, but to make the environments (what we also called the *rooms*) of *mouthplace* mysterious, haunted spaces. Most CD-Rom navigation is very literal and obvious, with buttons to push and arrows to follow. Some artists had experimented with the form, most notably Laurie Anderson with her CD-Rom *Puppet Motel* (1999), which we discovered half-way through making *mouthplace*, and which turned out to be working with many of the same hidden text spaces as we were. A logical extension of this when attempting to move towards performance was to create an environment with hidden text spaces. So we set up a virtual environment that looked like this:



**Figure 4-2 Triggering Text**

In this example the stage area was split up into a number of zones. When a new movement entered one of the zones, it would trigger a piece of text. We spent several weeks working with this idea, and eventually developed it to the point where the side zones caused major events to happen, while the upper zone caused a new piece of text in a sequence to be triggered. This introduced the concept of narrativity, or non-linear narrative into the work, as I was able to write the programme in such a way that *either* a sequential piece of text was triggered (creating a linear narrative) *or* a random piece of text from within a single poem was triggered (creating a non-linear narrative). The side zones might be used to decide what mode (eg linear or non-linear narrative) the system was operating within, or perhaps would move the environment on to a different poem altogether, or move into an entirely different environment, changing the virtual stage completely. All this worked quite well — but it felt stilted and awkward precisely because the choreography was completely dominated by the need to enter certain zones in order to cause something to happen.



It was only when I scrapped the zones entirely, began working with the entire stage, and looking at difference as the primary motion sensor that we began to move forward. This was the first, important, removing of a layer of data complexity.

## Finding the phenomenal

Something was lacking. Although we were “successfully” driving the system and getting all kinds of technological things to happen, it all seemed rather mechanistic. I felt like I hadn’t moved on from my early research in the early 1990s, where performers were required to “hit” invisible targets (triggers) within virtual camera space. This feels very fixed and non-fluid — very opaque. ‘What stays opaque you cannot scrutinize and manipulate’ (Heim 1993 p.90), and that seemed to be the route of the problem here.

I decided to try something different.

In addition to *BigEye* we were also at this time working with a software called LiSa. LiSa was also made by the STEIM group, and was a “**Live Sampler**”. Briefly, this means that short soundfiles (samples) can be recorded into memory, and simultaneously processed, broken up, and played back in multiple layers. This is a potent tool.

LiSa can be used with any kind of sonic input, so using the singing voice seemed like an obvious starting point. The key to LiSa is that it allows real-time manipulation of the material in its sound buffer, even allowing material that is coming *into* the buffer to be manipulated at the same time it is being recorded and stored for later, additional manipulation. It is possible to hear multiple layers at the same time, so that one might hear the actual voice, a manipulated version of it, and manipulated versions of earlier

recordings all at the same time. It also manipulates with a resolution of a single sample. There are 44,100 samples per second, so this is a very high granularity. In theory, it becomes possible to be working with grains of sound that are  $1/44100^{\text{th}}$  of a second long. We played for a while, discovering the innate richness of vocalised sound, improvising, fragmenting and building and re-building the voice in real-time. It was quite exciting work. Jools reported that she felt as though her voice, her being, was being 'cracked open', that something was happening almost at a molecular level.

A breakthrough moment occurred, however, when we began to use *BigEye in combination with LiSa* — something which had not been tried before, at least to the knowledge of the STEIM team, who tend to have a fairly good overview of the ways in which people are using their software.

Immediately we had access to something extraordinary. The phenomenal space of the physical and vocal utterance was apparently accessed because we could *control the ways in which the voice was being manipulated and made to sound in the space by the movement of the body*. The singing/speaking gesture *became one* with the moving gesture. Each could extend the other. Because I could continue to shape and tweak the environment, I, too, became part of the ontology of the environment. There was a melding of beings. This moment in the research probably defined much that came later: we had found a door into something that has so far eluded me in my work with motion-sensing technologies. The object was the *phenomenal* gesture, not merely the physical gesture. The concerns were now about *quality* of movement rather than the pragmatics of movement. This dancer was now a 'phenomenal dancer, never an object moving to commands but [alive in] every moment' (Preston-Dunlop in Way 2000 p.60).

## Breathing Life

I recorded Jools performing breathing sounds, from the gentlest to the almost hysterical. This provided me with a dynamic range of sounds from which I could construct a series of emotional layers that Jools could in turn access again as she performs the piece. As she moves in a particular way, she triggers a particular layer of the breath sounds, as well as making breathing sounds live into her headset microphone. In Chapter 5, I discuss this section in greater depth, but the reason I say that this was the first *successful* foray into motion-sensing technology performance was simply because of its ability to begin to explore phenomenal space. The conversation between captured (the original recordings of the breath sounds) and recaptured (the recovery/playback of those sounds through physical movement) and live (the sounds made by the performer in performance) for the first time had some phenomenal resonance. We seemed to be accessing the very emotional at the moment of its creation.

The movement of *breath* is difficult and visceral and grabs an audience's attention immediately — the use of the technology is mysterious and unclear, and it takes a while before the audience understands that there are simply too many voices (breaths) for them to be happening “live” (Indeed, the environment itself is only switched on about half-way through the five minute piece.). They may be recorded, but they carry their own aura and viscosity. This is a phenomenal place, neither entirely metaphysical nor entirely empiric.

## Miking a moving target (mediatising the space)

---

I've already discussed the fact that we are using microphones to capture the vocal gestures of the performers, but it is valuable to explore this a little further. One of the first pieces of equipment purchased to support our research was a headset microphone. This is a wireless microphone worn by the performer, an apparatus looking like a pair of headphones, but with a microphone arm extending in front of the mouth.

The microphone moves the voice from the realm of the body to the realm of the larger auditory space. In Auslander's terms (1999) the voice becomes mediatised, which represents a major shift in the ontology of the performance space. A twenty-first century audience may have no problem at all accepting this, in fact, it has been shown that contemporary audiences accept the manipulated audiospace as *entirely natural* (Auslander 1999 pp.53-54 and elsewhere). It has long been accepted in the sonic community that once a voice (or any other instrument) is moved into the electronic space (ie is amplified or reinforced<sup>30</sup>) it cannot be moved out of it for the rest of the performance. The ontological space of the performer has been changed and she is now part of the much larger auditory space created by electronic means. This may exist only at the front of the auditorium (mimicking the position of the stage) or may be distributed throughout the auditorium.

In this work, the *extension* of the physical voice (body) into the larger, mediatised space, is important. Because we are working with sounds that are electronically projected, but are seen as part of the phenomenal whole of the performing space — the emotional space — and where physical, vocal, and other sonic gestures *should be seen as one*, it is essential to bring the voice into this larger realm. This is not just about ensuring that the audience can hear what is said — it is about ensuring that the voice is located within the larger

whole. The technospace, for want of a better work, has its own working ontology, one that should be inseparable from the performance space as a whole.

It could be argued, particularly from Benjamin's standpoint, that mediatizing the voice in this way is reducing the distance between performer and spectator, and in so doing, destroying or lessening the aura of the performer. Auslander, it seems, would agree:

*'Following Benjamin, I might argue that live performance has indeed been pried from its shell and that all performance modes, live or mediatized, are now equal: none is perceived as auratic or authentic; the live performance is just one more reproduction of a given text or one more reproducible text.'* (Auslander 1999 p.50)

I can't agree. The sophisticated contemporary audience is able to accept a rich electronic soundspace as something entirely natural — indeed we seem to be in the realms of Elam's 'disattendance convention' (2001 p.89), and acceding to Auslander's position that all performance space is now mediatized. Auslander seems to be arguing that, although the amplified voice still 'belongs' to the performer in the sense that the audience will still view the performer's voices *as their own* even though they are now in the electronic sound field, the distance created by the removal of the body from bodyspace into technospace destroys the aura of the performer, destroying Benjamin's 'authentic' original. If, however, the audience sees the technospace as *part of the ontology of the performer*, (in other words, that the technospace is embodied) then their willingness to give the performers their voices back negates any distancing and restores the auratic power of the performers.

The performer wears a small transmitter, about the size of a pack of playing cards, to which the headset is attached with a wire. All of this solves the basic issue of amplifying voices attached to moving bodies — air microphones obviously can't get close enough, and lapel (lavalier) microphones won't work because they stay on a fixed position on the

body whilst the head is moving (or vice versa). There are tiny microphones that can be worn on the forehead, on the hairline, much beloved of Broadway, but way beyond our financial resources (they may be visually less intrusive, but they are functionally no different from other wireless microphones). Three problems remain, however:

- i) dancers get out of breath. Lots of unpleasant snorting and air noises across the microphone tend to result<sup>31</sup>. Solution: careful placement of the microphone (below the chin);
- ii) the transmitter packs are bulky and painful to roll over. Solution: each dancer has found a particular place to wear the pack — mostly somewhere around the small of the back. This is only a partial solution, as they still stick out (to the audience) and in (to the dancer when she rolls over it). Long-term solution: a major research project to be undertaken in the future involving the design of a transmitter that is essentially flat, and flexible (much like some of the portable keyboards that literally roll up and fit in your pocket). These flat transmitters could be worn on the leg, or the arm, or the midriff, just stuck on or bandaged on. The technology is *probably* available to do this, although power remains a major issue. Radio transmitters are still quite difficult to design electronically, so this would be a fairly major research undertaking; and
- iii) aesthetically the headsets and transmitters are still very problematic. The original headset that Jools wears, which is a VHF system, is small, fits with a band over the head, and is reasonably invisible. The two headsets which were purchased years later are UHF, which makes them considerably more stable in a variety of performance venues, but the headsets are (unnecessarily) clunky and ill-fitting. The solution to this is not a research problem but a financial one. New headset designs are very small, very invisible, and when funds are available we will purchase three of these. It is quite remarkable how many audience members comment on the headsets.

Because of the long-held and long-cherished tradition that dancers are not supposed to use their voices, we are having to overcome not just the resistance to a talking dancer, but also to an *amplified* talking dancer, where the *means of amplification*, moreover, is visible, and quite intrusively so. Precisely because of the magical spaces we are designing, and the care we take to minimise the visible presence of any technology in the space, the headsets are still a major problematic in the work, even if their mediatization of the performance enhances rather than diminished the auratic presence of the performer.

## The Poetic Environment

---

All of what has been discussed thus far in relation to both *Spinstren* and *The Secret Project* is about one thing: the creation of a series of layers and environments that create a poetic space. The poetic text is quite dominant here — its linguistic tone, and its performance (its tone and its utterance), are paramount. This is initially what gives the work the 'haunting, yearning quality' (Kelleher 1999) that all the other elements are brought into play to support and enhance. The poetic tone of the text creates its own phenomenal aesthetic space, and all the other elements at play must support that aesthetic. This is what drove us in the first instance to try to find ways of working that were phenomenological rather than technical and empiric; it is why we work with emotional space; it is why the work is carefully crafted and the aesthetic of the space painfully enforced.

It is enormously difficult (actually, thus far, it has proved impossible to maintain a suspended, magical state of being for almost eighty minutes, and the difficulties, it seems,

are pragmatic ones of staging and dramaturgy rather than anything else. *Spinstren* for example uses a large table, spinning wheel(s)<sup>32</sup>, a small table, many spinning tops, etc. These items should magically appear when required, but of course, they don't. Although this 'extra-textual noise' should, according to what Elam calls the 'disattendance convention' (Elam 2001 p.89), disappear, it doesn't, according to many audience comments we have received. This is problematic, because these pragmatic moments shatter the poetics of the space we are trying so hard to create. If Elam is suggesting that normally these kinds of activities are simply disregarded by the audience (although he does point out 'there are...limits to the flexibility of the disattendance convention' [2001 p. 89]), then either we are creating a performing space that is far too susceptible to intrusion — too precious — or we are going about it all wrong — the dramaturgy needs attention.



## Chapter 5 : The Secret Project

*'(inbreath) (inbreath) trip, shift to side. Over slow, down. (breathe) runs, slipping up over. Over down. (outbreath). Fall (breath). Down and wide. Singing out over wide. to the left. wide. ocean. I have you. I'm falling. (outbreath) (two small sighs overlapping) sings, root of her, (outbreath). Touchlight, falling, waterlight, over. ache, high, falling and over (escapes) (small breath). seeming. shift and echo to the side. twice turning. fly lightful, air wards, cleanly (breathe), small flicks passionate. keep sky, out over down. aches two. light folding over. small secrets, up over down. twice turning. stop. (outbreath) (outbreath)'*

*text from The Secret Project (Gilson-Ellis, unpublished)*

## Introduction

---

This chapter looks in depth at the practical research — a body of work stretching from *The Secret Project* (1997-99) to *Spinstren* (2001-03). These two major dance-theatre works represent the culmination of my research into motion-sensing technologies.

## The Work(s)

---

*The Secret Project* was a co-production of half/angel, Firkin Crane (ICD<sup>33</sup>) in Cork, Ireland, and the Banff Centre for the Arts<sup>34</sup> in Banff, Canada. Firkin Crane provided, primarily, management support; the Banff Centre provided us with several months of research residencies, spread over a period of two years. It was this indepth research time, particularly as we were able to receive some very informed and informative external evaluation of the work, as well as technical support, that allowed us to begin developing our interactive technology. The research periods at Banff culminated in a five-week residency in the autumn of 1999, when *The Secret Project* was completed and staged in the Eric Harvie Theatre.

*Spinstren* was solely produced by half/angel. It had a very different genesis and development than *The Secret Project*, in that conception to completion took only nine months, and only the last three of those months were spent in full-time work with the full company. I spent the last six months of 2001 working on the soundworlds that *Spinstren* would inhabit. However, because rehearsal time, particularly rehearsal time in a fully-

equipped environment, was very limited (particularly compared to the luxury of working in residence at the Banff Centre) the interactive work suffered greatly. Because of that lack, however, I was able to develop a richer, expanded soundworld compared to that of *The Secret Project*. Similarly, the performers spent more time actually learning choreography (as opposed to developing environments), and thus the piece is also much richer from a movement perspective than *The Secret Project*.

Throughout, we should be reminded of the central research questions: i) *Is it possible to create an interactive performance environment that has emotional awareness, and ii) what is the role of the poetic in this context?*

## **The Secret Project**

---

*The Secret Project* is a sixty-five minute performance work for three performers. *The Secret Project* is about the *idea* of the secret: personal, cultural, political and Irish. Like all of half/angel's work, the production uses original writing by Jools Gilson-Ellis, interactive sonic environments and visuals by myself. The piece was performed by Mary Nunan, former director of Daghdha Dance Company in Limerick, Cindy Cummings, independent dancer and choreographer, and Jools Gilson-Ellis. These three women, all choreographers in their own right, came together for this project to engage with a contemporary take on secrecy and the possibilities of new technologies for their own practice.<sup>35</sup>

This work was the culmination of two years' research into motion-sensing systems carried out primarily by Jools and myself. It was, in the end, an indepth exploration of the

extent to which motion-sensing systems could be brought into an emotionally and aesthetically rich world, a place of ghosts and snow and angels. The piece is language-rich — it uses live and recorded texts in English, French and Irish, and explores the relationship between spoken/performed and written/poetic text. The soundworlds rely heavily on these texts, and are often drawn directly from them. It has been described as

*'...a magic-realistic world of snow-ghosts who trip when you walk in the show or words themselves that themselves fall ...[where] the interaction with the technology was ever changing but not relentless and because the dancers themselves were in control of their soundworld there was a real feeling of witnessing a work that lived and breathed.'*  
(Seaver, 1999)

This reviewer sums up the essential drive to create work in which *the dancers themselves [are] in control of their soundworld*, and that the work *lives and breathes*.

Rather than explore the entire work, I will focus on a number of sections that exemplify a particular approach to the use of the motion-sensing technology. Specifically, I will look at four sections: *breath*, *twice turning*, *lingua*, and *chorda*<sup>36</sup>. These represent four entirely different approaches to motion-sensing, all except one initially developed as solo environments. I also look at *Snow Ghosts* because it represents a different kind of collaboration that looks forward more to the work in *Spinstren* — representing perhaps the beginning of a new relationship that evolved into that work.

### breath

*breath* was one of the first sections we made in our early motion-sensing research — or at least, it was one of the first we deemed ontologically and aesthetically successful. Its basis is human breath. Jools uses breath and the sound of breath a great deal in her choreography, and I suggested one day that we should make an environment based on those sounds. I recorded her moving, and breathing, going from the quietest, almost inaudible breath sounds, building to a crescendo and peak of violent, almost hysterical sounds. I divided these sounds into around 120 individual soundfiles, each representing a single breath gesture, and sub-divided the whole collection into six sections, each of which represented a stage in this continuum from barely audible to hysterical. Essentially, the sounds are based on physical movement — that is, come from actual movement. When recording the sounds, Jools was moving as she would normally move when performing — there was no sense in which this was a recording purely for aural purposes. The set of recordings, then, is quite visceral in nature.

In programming the motion-sensing software (BigEye) to access these different layers of breath sounds, I chose to use acceleration as the deciding factor. If a particular movement contains a large amount of acceleration — it is quite violent, at one end of the scale — then the sound picked for playback is from group 6; similarly if the movement is barely above the threshold of activity to be classed as movement<sup>37</sup>, then the sound picked is from group 1; and so on for the intermediate stages. This means that Jools can play the emotional levels contained within the orchestra of breath sounds as though it were her own body speaking. Indeed, as she moves to access these sounds, she also is making breath sounds live, into her microphone, as well, also sounds generated by, and therefore

*belonging to the movement. As times, it becomes impossible to tell whether she is sounding, moving, or causing pre-recorded information to sound.*

*'the work itself is rooted in the body and in the moment - the environment relying entirely on the quality of movement from the performer (not merely triggering proscribed responses through invisible, virtual triggers). The quality of the movement itself feeds off the environment, indeed relies on the environment.'* (Povall 1999 p.455)

This is a phenomenal dancer in phenomenal space, or in phenomenally sensed space. I am using both the techniques of fuzzy logic in looking at degrees of, for example, hysteria, as well as creating an environment that can be inhabited: the dancer has changed the space she is inhabiting. 'By changing space, by leaving the space of one's usual sensibilities, one enters into communications with a space that is psychically innovating... we do not change place, we change our Nature' (Bachelard 1964). Here, something extraordinary has happened: the performer has changed her 'usual sensibilities' through the inhabiting of this environment, something that has a profound effect on her and on the environment itself.

## **The *breath* script**

Looking at the script for *breath* begins to show us both the simplicity and the elegance of working with this kind of information:

```
var chan=0
var rang=0

chan=int(object_speed/8)
if(chan==1) rang=10
  else if(chan==2) rang=24
  else if(chan==3) rang=20
  else if(chan==4) rang=22
  else if(chan==5) rang=14
  else if(chan>6) chan=6
  else rang=1
```

```

if(object_number==1&&object_speed>2)
note(chan, x_position/158*rang+48,
object_speed*5, 1/1+chan)

display(chan)

end

```

In this script, there are two very simple things going on. Unusually, the camera is zoomed in on a static body — almost all the movement in *breath* takes place in the upper body, and the feet are rooted in the same spot. Zooming the camera in is usually not possible because of the range of travel in the choreography, but here it is possible to zoom in and work with much greater detail. Because of that, I need to limit the amount of information I'm using so that I'm not overwhelmed by data:

```

if(object_number==1&&object_speed>2)
note(chan, x_position/158*rang+48,
object_speed*5, 1/1+chan)

```

Here, the `if` clause set an initial threshold where object speed needs to be greater than 2, and data is seen only if the object number is 1. In *BigEye*, the computer is capable of “seeing” up to 16 objects (which can be limited by a slider in realtime). In order to minimise the data I am looking at, I restrict it to one object only, which gives me enough information about the close-up view of the moving body. When the input stream passes the thresholds, a breath sound (represented by `note`) is played: `chan` selects the range of instruments available; `x_position/158*rang+48` looks at the position and generates a particular MIDI note, which in turn plays a particular sample; `object_speed*5` generates a loudness (velocity) for that note, and `1/1+chan` plays, in essence, a duration which is in inverse proportion to `chan`.

`chan` is generated each time a note is played, based entirely on the *speed* of the current motion:

```
chan=int(object_speed/8)
if(chan==1) rang=10
  else if(chan==2) rang=24
  else if(chan==3) rang=20
  else if(chan==4) rang=22
  else if(chan==5) rang=14
  else if(chan>6) chan=6
  else rang=1
```

Here the object speed (divided by 8, which is a number plugged in during rehearsal and chosen as the most appropriate, after significant experimentation) chooses one of the six



**Figure 5-1 *breath from The Secret Project (excerpt)***



**CD-Rom: Fig 5-1**



ranges of breath sounds as outlined above. If the speed of the current object is low, sounds from channel 1, the quietest sounds, are played; if the speed is very fast, then it will play a sound from the most hectic sounds. The variable `object_speed`<sup>38</sup> is, literally, pixels per frame; if one is looking at the x-axis, then the range maximum number is 160 (if it's the y-axis, then it is 120). In this instance, the variable `rang` is limiting the range of MIDI notes, and represents the actual number of samples I had in each class of breath grouping.

Choosing the x-axis as the basis for the selection of sound would seem to go against everything I have already said about positional space. In practice, however, it is not. The computer is zoomed in so that it is only looking at the upper half of the body. The x-axis, in this instance, becomes meaningless as a measure of position, and is simply a generator of information about motion. As I'm only interested in random choices from within a pre-defined group, this method of choosing a particular sound is as valid as any other. The more important information (which group is being used, how loud is it) is based on object speed, in both cases.



*breath* was early research, and shown widely to critical audiences. The response was always strong: the work is seen as visceral, emotionally haunting, subtle, and clear in its use of the technology. It is one of the simplest uses of the technology, yet one of the most elegant in its final output. This is a technology inhabited by the phenomenal dancer, embracing her, and me, into its own ontology. There has been a merging (Torgovnich 1996 p.4).

# lingua

*lingua* is a model of a different kind of environment that features spoken and recorded text. It should be seen, in many ways, as exemplifying the research at this stage (1997-99). There are two *lingua* sections in *The Secret Project*: one performed by Jools, and using English and French based around the lexicographical definitions of the word *secret*; the other performed by Mary, and using Irish (Gaelic) as its base language, also around the word *secret*. In Mary's case, I also added music underneath. Here's what Jools says about performing *lingua*:

*'In "Lingua" I dance through two languages, one a language I trigger with my motion, and another which I speak. I graze one against the other. How I dance is composed from this relation of text to text, both of which are performed through my voice. One is recorded and triggered by my motion, the other I speak in the liveness of performance. One is spoken in French, the other in English. Both give definitions and etymologies of the word 'secret.'<sup>39</sup>By using a headset microphone, I can voice intimately. How I voice (and both my live voice and my recorded voice are 'triggered' by my body) is not a different thing to how I move. It is the same gesture.'* (Gilson-Ellis 2001)

The notion of "voicing intimately" and the notion of a physical voicing, based on the motion-sensing system, is key. From the standpoint of the performer (as well as from a theoretical standpoint), there is a confusion between what is spoken (and by "whom"), and how the body is moving. It's often very unclear to an audience where the vocal gestures are coming from, and most at first assume them all to be coming from the performer, spoken as she is dancing. It becomes apparent, however, that this is not the case (the same confusion about the sound source happens also in *breath*) but nothing is clearly, or literally, stated. It remains difficult to determine the source of the sound, but beyond that, there is a confusion between moving and speaking that makes the work "secret", mysterious, a little magical. Movement and speaking remain confused.



**Figure 5-2 Jools Gilson-Ellis performing *lingua* from *The Secret Project***



**CD-Rom: Fig 5-2**

Even though the same script is used for each of the *lingua* sections, there is an enormous difference in the choreographic, and sonic content. Both recorded voices belong to their respective performers, but the mellifluous French and archaic English used by Jools contrasts sharply with the shorter Irish phrases in Mary's section. The choreography each developed as an improvisation language is quite different from that other. Here, for the first time, I did use x-axis information to map different words and phrases onto the

breadth of the stage; the performers could move from left to right knowing that certain phrases were contained within a particular space.

```
if(object_speed>1&&current_tick>(markR+250))  
{  
  ch=(random(8)/4)  
  ctr(ch, 10, xwidth)  
  note(ch, ((xwidth/127)*41)+36,  
  random(30)+70, 500)  
  markR=current_tick  
}
```

If that was all that was going on, it would be rather literal in its use of motion and space,



**Figure 5-3 Mary Nunan performs *lingua***



**CD-Rom: Fig 5-3**

and fairly uninteresting. There is an additional layer, however, which uses a random generator to trigger text phrases from one layer or another. Critically, the performers do not know which layer they are going to trigger from, so that they must listen and stay connected to the system in order to make the improvisation work. This is *not* an obviation of all that I have said about fixed systems that put too much emphasis on place, and robotise the movement; instead it is making the environment itself a phenomenal place that must be inhabited and engaged with before it will live. The random element is essential to this sense of connection, but it should be said that the random element is *only choosing between two alternatives*. If it were literally choosing text phrases at random from the entire collection, then there could be no connection between performer and environment; the limitation is the essence. See Appendix 4 for the full script for this section.

Similarly, I limited the number of phrases that could be triggered. The line

```
if(object_speed>1&&current_tick>(markR+250))
```

provides the limits.

Once again `object_speed` is a threshold (but a very small one) but there is also a time-based threshold that needs to be passed before another note will be generated. Each time a note is generated, the timer begins again, and will not play another note until 250 ticks have passed (equivalent to 1.25 seconds in actual time). This time limitation is important to the flavour of the section which we never wanted to become frenzied. In Mary's choreography in particular, there are some gestures that are very fast, but the overall sense of both choreographies is quite meditative and slow. This essence is captured by

the time-base override on the incoming data. The English/French text used by Jools offer a broad variation on phrase length and intonation:

**secrecy** *n.* condition of being secret.

**secret** *adj.* About 1378, hidden, concealed, private; borrowed from Old French *secret* concealed, private, learned borrowing from Latin, and borrowed into English from Latin *secretus* set apart, withdrawn, hidden, originally past participle of *secrenere* to set apart.

An earlier form *secre*, with the meaning of a prayer said in a low voice, found in Middle English about 1300, borrowed from Old French *secre*, variant of *secret* *secret*, *n.*

**secretive** *adj.* 1464 *secretife* *secret*, hidden, formed from Middle English *secret*, *adj.* + *-ive*. The current sense of having the habit of secrecy, not frank and open, first recorded in Charlotte Brontë's novel *Villette* (1853). This sense is a back formation from earlier *secretiveness* (in *phrenology*) quality or state of being secretive (1815); formed from *secret* + *-ive* + *-ness*, patterned on French *secretive*.

*also rarely of time*

*also rarely of movement*

The variations in the length of the phrases adds the rhythmic richness to the overall section (this was only really true in the English/French version, not in the Irish version). There was no particular differentiation between the material in layer 1 and in layer 2 — they were simply different. Because of the varying phrase lengths, Jools did not know whether she would trigger a long phrase or a short one, but both performers experienced the discovery of a word or phrase in space, and having once discovered it, played with. The object played with showed little resistance, but just enough (it was always liable to switch to the other layer's phrase or word) to keep it interesting. Jools was also speaking this text live, so there was a sense of narrativity and choreography within the piece. The choreography, while improvised, was a structured improvisation, using the x-axis of the stage as a mapped environment in which particular words and phrases could be uttered through movement, as opposed to the more structured words and phrases that were uttered by the performer, controlled by the text.

Jools speaks about *lingua*:

*'In Lingua from The Secret Project, I speak the etymologies and dictionary definitions of the words 'secrecy,' 'secret,' and 'secretive'. ...This is a text characterised by its attempts to install meaning; to capture the sense of words....The French words and phrases are all associated with secrecy; mysteries and hidden things. And then I move. I nudge French text, and counterpoint it with my English definitions. I use physical phrases which suggest hidden things, but with an assurance, that whatever secrecies I conjure here, they are on the move.'* (Gilson-Ellis 2000 p.47)

She goes on to talk about 'gesture pools', 'listening, speaking, moving alive things', 'spatial dynamics', 'the...playfulness of layering'. Again, something extraordinary is happening here. The sense of touching and grazing words is palpable, something unseen becomes something felt and something perceived, even as the object itself shifts in response to her gesture. This is a liquid environment, that seems at once very trigger-centred, yet which bends and shifts sometimes at the will of the performer and sometimes at the will of the system. There is a playfulness between the phenomenal dancer and the phenomenal system. Spoken (live, spoken (pre-recorded, triggered) and physical gestures become one, become indistinguishable. The text is embodied, becomes part of the being-space of the performance.

## twice turning

*'(inbreath) (inbreath) trip, shift to side. over slow, down. (breathe) runs, slipping up over. over down. (outbreath). fall (breath). down and wide. singing out over wide, to the left. wide. ocean. I have you. I'm falling. (outbreath) (two small sighs overlapping) sings, root of her, (outbreath). touchlight, falling, waterlight, over. ache. high, falling and over (escapes) (small breath). seeming. shift and echo to the side. twice turning. fly lightful, air wards, cleanly (breathe), small flicks passionate. keep sky, out*

over down. aches two. light folding over. small secrets, up over down.  
twice turning. stop (outbreath) (outbreath)' (Gilson-Ellis 1999)

Having worked extensively with text and text-like sounds, we had a desire to build an environment in which narrativity could play a role. This was an extension of *lingua*, in which there was a narrativity and structure from the spoken text. The overall approach of the *environment* for that section was almost entirely non-narrative, obviated only by the x-axis mapping of the soundspace. I asked Jools to write a text that was fragmented, and yet which told a story — had a narrative strand. I was interested in working with narrative, but until presented with this text did not know what to do. The intense rhythm of this text called out for an environment that simultaneously exaggerated and subverted its rhythmic qualities. I made an environment that was extremely reactive — something that could take big movement and yet also respond to the tiniest of movement. In this script (and I quote the entire script here for reasons of clarity)

```
var dur=0
var window=48
var checking, count, accum // this is for the
bassoon voice control
count=current_tick-checking
if(count<20) accum=accum+1 // allows the
accumulator to grow

chan=int((x_position/158*2)+9)
dur=(1/1+abs(object_speed))
  if(dur>80) window=(window+0.25)
  if(dur>60) dur=dur*20
  if(accum>650 && (random(600)<15))
note((random(16/8)+11), random(36)+48,
random(40)+80, random(5)*6+5)
  if(accum>1000 && (random(600)<15))
note((random(16/8)+11), random(36)+48,
random(40)+80, random(5)*6+5)
  if(accum>2500 && (random(600)<15))
note((random(16/8)+11), random(36)+48,
random(40)+80, random(5)*10+5)

  if(count>80) accum=0
```



```

display() // piece ends when window is around
94
note(random(16/8)+9,
(x_position/158*3+window),
object_acceleration*10, dur/5)

checking=current_tick
display(window)
end

```

there are two distinct levels of play. Working above the primary threshold, which is set extremely low, but below the secondary threshold, which is set unusually high, fragments of sounds are triggered.

```

dur=(1/1+abs(object_speed))
if(dur>80) window=(window+0.25)
if(dur>60) dur=dur*20
if(accum>650 && (random(600)<15))

```

Here the variable `dur` is inversely proportional to `object_speed`. The length of the fragment is dependent upon the size of the individual gesture — or, more specifically, the non-scriptable thresholds were set in such a way that tiny gestures were read very quickly, thus corresponding to a *fast* object speed; larger gestures were not read so quickly, and thus were seen as having a *lower* object speed (this is perhaps counter-intuitive). Thus it is possible to be almost still, moving perhaps a hand or even a finger, and trigger tiny fragments of a word — probably not recognisable as such — over and over again, very quickly.

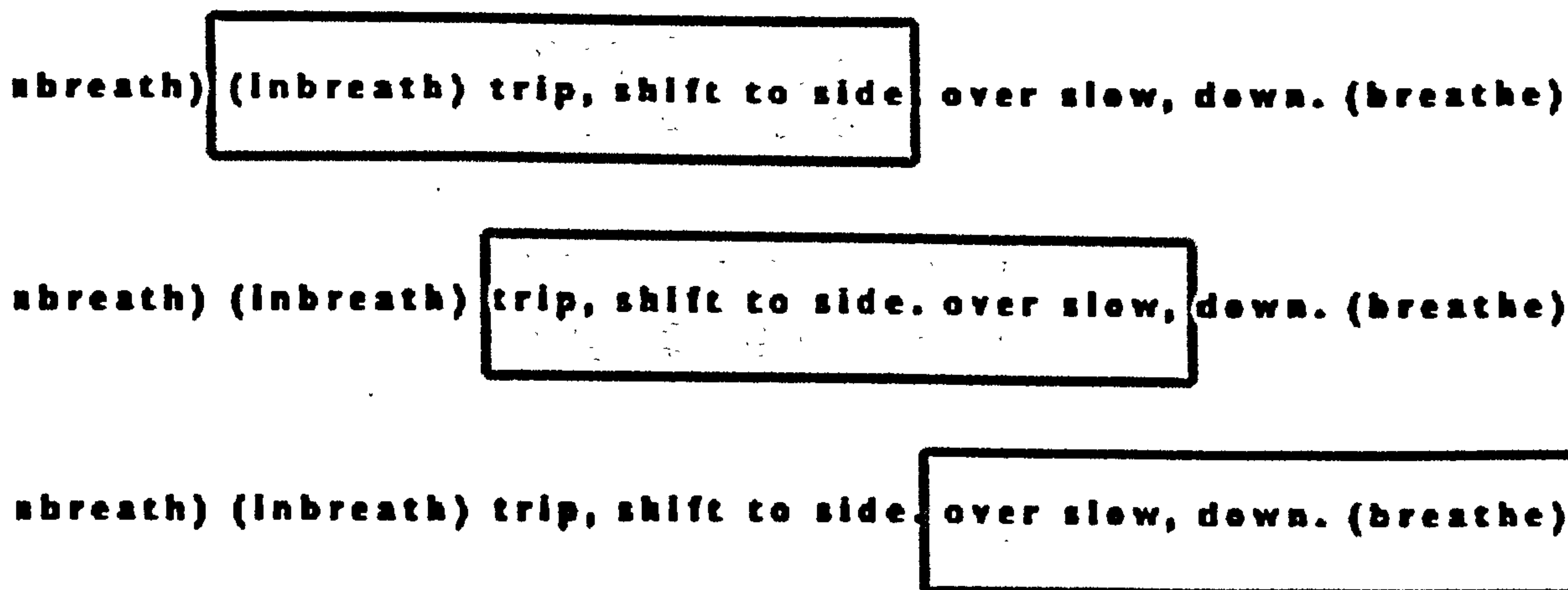
```

note((random(16/8)+11), random(36)+48,
random(40)+80, random(5)*10+5)

```

Once again, there are two layers of sound available, each one half of the poem. Each event triggers randomly from a layer<sup>40</sup>. Each time a new trigger occurs, it goes back to the beginning of the sample. On a much bigger gesture, the duration of the triggered

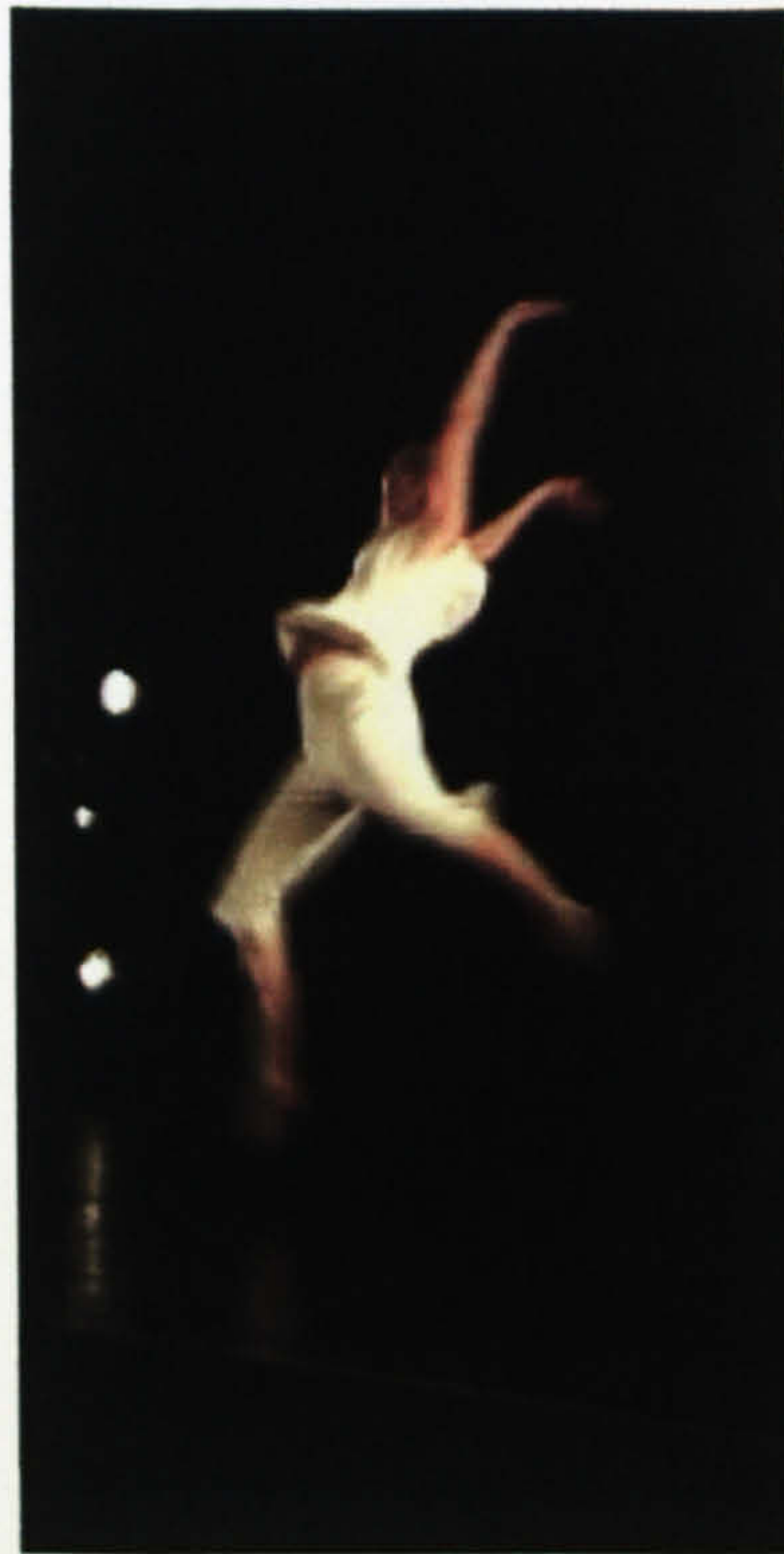
sample is much longer, and a whole word or even a number of words become audible (`if(dur>60) dur=dur*20`). Thus it is possible, using large or small gestures, to quite violently change the rhythm and sense of what is heard. This was stage one in the development of the environment — obviously, however, the performer could never provide enough dynamic range in the movement to move from triggering a fragment of a word to the whole poem. As the sample played again from the beginning each time it triggered, there was never any progression beyond the first few words. I still wanted to work with narrative, and the solution I eventually tried was to add yet another threshold, so that there were now three: one to trigger a sound, a second to lengthen the sample played, and a third to “move on” the narrative.



**Figure 5-4 moving window for twice turning**

This figure shows how the narrative is moved on. At any given time, there is a window through which we can access only a small amount of the entire text. This is the material available to the environment. At the third level threshold, the window shifts, so that a later portion (with considerable overlap) of the narrative is heard.

In rehearsal, each of these thresholds was adjusted to work with the choreography that was being developed for the section. The solution to the narrativity was to open a window on the entire sample (which is the whole poem) (`var window=48`). The size of the window doesn't vary, but its position does (`if(dur>80)`  
`window=(window+0.25)`). When the third threshold is crossed, the performer is able to move the window along — we hear the narrative of the poem emerging through this highly fragmented soundscape. Here is just the sound produced by Cindy Cumming's performance of the piece.<sup>41</sup>



**Figure 5-5 audio from *twice turning***



**CD-Rom: Fig 5-5**

This environment was originally designed by and for Jools, in some of our early research work at the Banff Centre in 1997-8. Her performance was highly energetic — indeed, we

wanted very much to develop a section with high energy, as most of the other language we had been developing was very intense, internal, quiet. This very new soundscape developed a very new movement language that was intense and difficult to perform because it required a sustained high energy that requires enormous stamina. The narrative of the poem is emergent from the intensity of the movement. It's all happening very quickly, so there's little immediate sense of how the three thresholded layers are working — and yet, to the performer, it is very clear and almost visceral. A more detailed viewing of the section will show that Jools is using certain kinds of hand and arm gestures, and some flying/jumping gestures to trigger the larger changes. She is clearly able to articulate words and phrases, and to move the narrative forward. The thresholds were adjusted in each performance so that the balance between the three elements (stuttering, audible words, narrative) was working. If the third threshold is set too high, the dancer cannot move the narrative on — and she knows that the section does not “end” until the poem is over. If she can't move it on, then it becomes impossible to sustain this level of energy over the long haul, and the sonic momentum dies as the energy of the performer flags.

There is an engagement here that is at once playful and oppositional, competitive. There is a striving to reach the third level that takes an extremity of effort in what is already a constantly high energy section. My role is also crucial because I can adjust the thresholds on the fly. I, too, am engaged in the struggle and can either help or frustrate the performer in her efforts to reach the highest level. Is this Heim's 'computer as opponent' (1993 p.60)? I don't think so, because the engagement is quite playful, designed to work *with* the performer, not *against, in opposition* to her, even though it calls for physical feats of strength, power and endurance (and even though I have suggested that it is 'oppositional', there is no intention to *defeat* the 'opponent').

This environment represented yet another breakthrough in the research. It's quite clear from looking at the choreography that it's not bound in any way by the demands of the environment — and yet the environment is very demanding of the performer. The overt nature of the performance does not allow the performer the time to concentrate on internalities. If the environment is not entirely intuitive here, it would not work. This is significantly different to either *breath* or *lingua*, both of which are very internal. Here the subjectivity of the response of the system is absolute — there is little time, in performance, for reflection, adjustment, or even performer-system feedback. And yet the environment seemed to work exceptionally well. It satisfied a need for a different kind of choreography and a different kind of soundscape and a different kind of response. Nevertheless, there was something missing: the soundscape needed an underpinning to anchor it, and yet it was clear that it could not be a musical bed, like I had used in *lingua*, nor could it be something static. The high energy of the piece required something with rhythmic intensity, but not so rhythmic that it interfered with the clarity of the interaction. I decided, in the end, simply to add another interactive voice — a low, bassoon-derived instrument that behaved in a similar way to the text voice on thresholds one and two. It added a layer into the sonic landscape that was not previously there and seems to provide sonic underpinning otherwise lacking.

## Sharing Voices

---

When it came to making the full performance, some of the environments that had been made with Jools needed to be “shared out” to the other performers. This in itself became a huge issue. If an environment is developed by and for one individual, what does

it mean to have someone else 'perform' it? Although Cindy's particular style of movement quickly fitted into this environment, and required little change to its basic design, it was Jools' voice she was triggering — not her own. How did this fit into the neat theoretical package of speaking/moving? How would it effect the ontological integrity of the environment? Here Jools talks about this moment in the research when we began to work with the other performers within an environment we had designed:

*'Unlike many of the interactive environments designed for The Secret Project, twice turning does not involve the speaking of text in real time in relation to samples of text triggered by movement. ... There is a voice, and it is mine, and I am speaking my writing. What does it mean then for another body to perform this piece? What does it mean when Cindy performs this piece in the final version of The Secret Project? Does she, in some sense 'speak' my writing? Does she, in another sense 'choreograph' my writing, as she controls its ebb and flow by her leaps, curves and stillnesses?... In the performance of twice turning, Cindy's working flesh — her breathing, arching, sweating body grazes and tangles the writing / voicing she triggers. In what sense is she the writer of this text? And in what sense am I its choreographer? The process of making this piece 'work' is one in which Richard develops the environment as Cindy works, as I watch, giving them both feedback. Cindy develops an improvisation which is structured in response to the environment. The environment becomes her dancing partner.'* (Gilson-Ellis 2001 p.35)

So here, the ontology has shifted. Cindy's 'arching, sweating body' does indeed graze the text in an entirely different way, and there is a sense of partnership rather than the merging that we experienced in the earlier sections. What is significant is that Cindy is not also voicing with her own voice — there is a clear distinction between her physical gesture and the vocal gesture she controls, particularly as the vocal gesture is atomised,



**Figure 5-6 Cindy Cummings performs twice turning (excerpt)**



**CD-Rom: Fig 5-6**

shattered, removed from the immediately 'human' speaking voice. Cindy's control of this shattered vocal landscape is part of the fractiousness of this section — it seems unsettling and riven with power struggles in ways that we have not seen before.

Cindy's performance was altogether physically different from Jools'. She is a very strong, muscular performer, with the endurance and strength necessary to carry this piece off.

Fig 5-6 is Cindy's version (obviously the environment is tuned for her, but it is essentially the same as the original version developed with Jools).

# Chorda

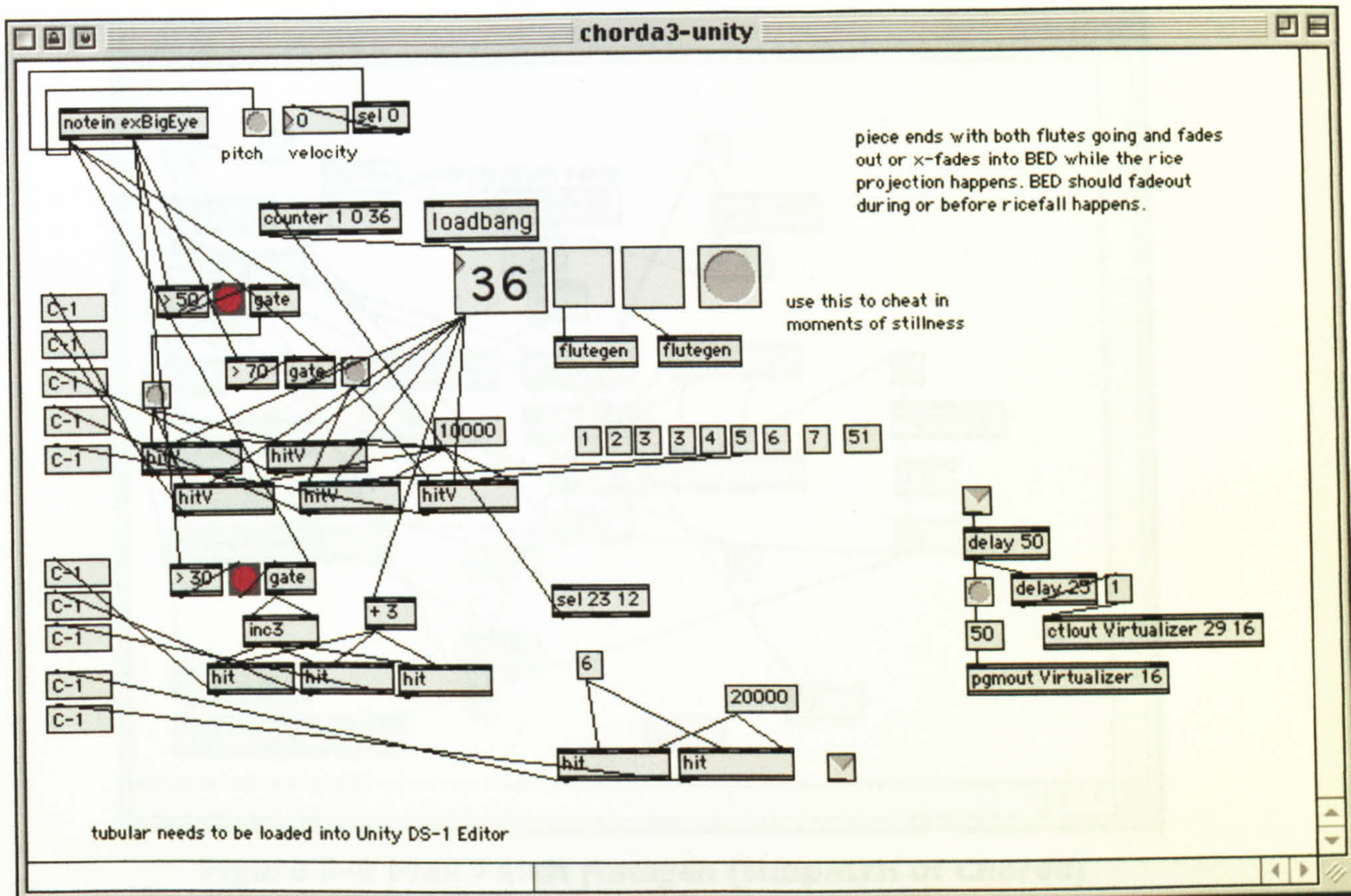
This section was unusual in a number of ways. It was the only section in *The Secret Project* that did not exclusively use BigEye scripts to control the sounds. In this case the primary BigEye script was exceptionally simple, serving mainly to time-limit the incoming data.

```
var markCh=0 // declared timer var
display(object_speed)
if(object_speed>30&&current_tick>(markCh+80))
{
  note(0, 50, object_speed*1.5, 4)
  markCh=current_tick

}
end
```

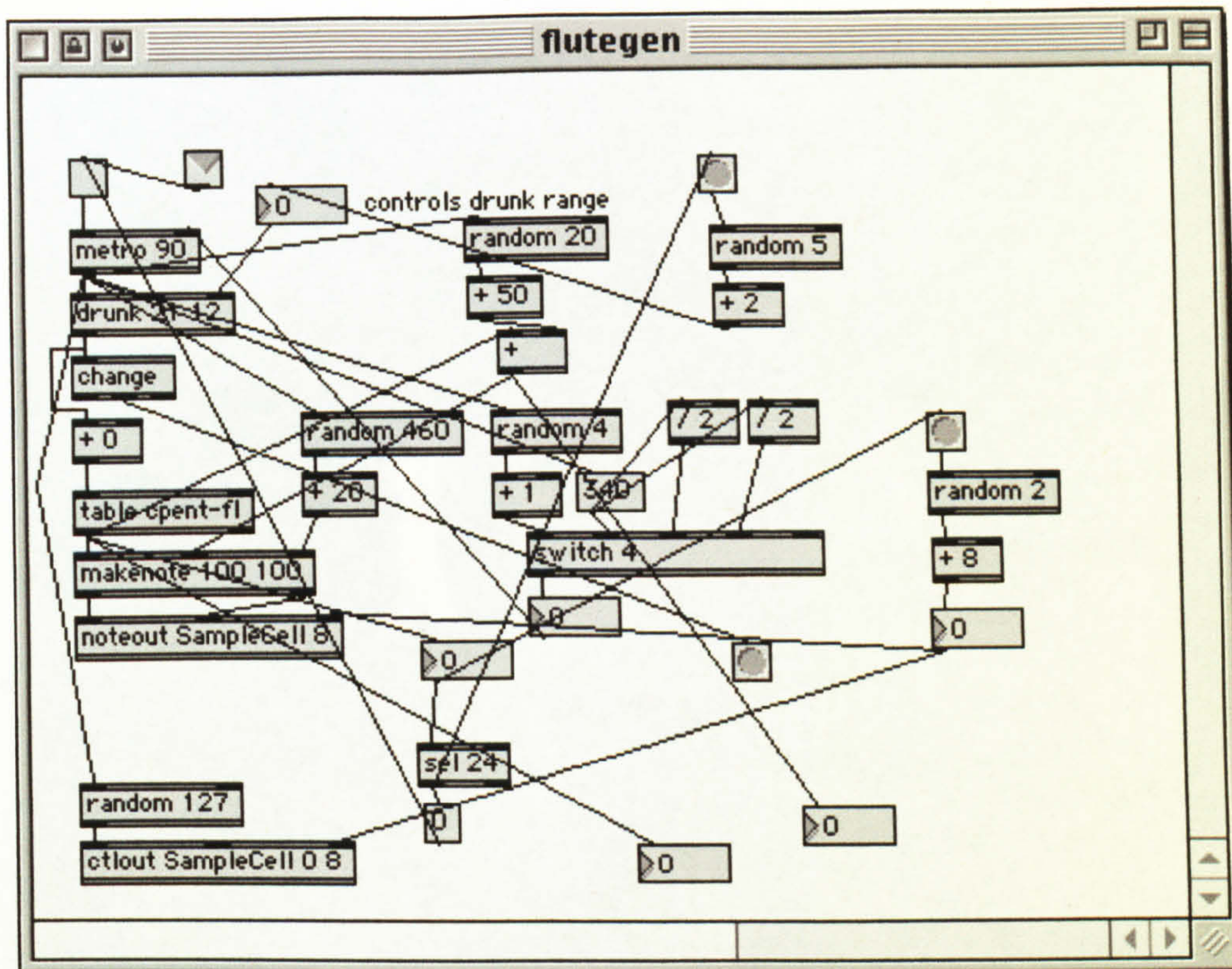
All this script does is to pass a single MIDI note when the incoming data passes the two thresholds of `object_speed>30` and a timer control, `current_tick>(markCh+80)`. This is a logical AND, so it has to pass both thresholds in order to generate an event. `object_speed` at 30 is quite a high setting, but this was a high-energy performance; the time limitation is  $80*5$  milliseconds, which equals 0.4 seconds. Once this MIDI note was generated, it was passed to a Max patch.(next page)





**Figure 5-7 Max Patch Chorda**

This is a complicated patch that is difficult to analyse out of the context of the environment. There are several things happening, however, that are significant and quite unlike anything that has been seen so far (and unlike anything I have done since). Essentially, the main Max patch (Figure 5-8) is looking for simple “bangs” from BigEye, caused by a large movement. Again, this is a very high energy section — a trio, which is also unusual and particularly problematic for these kinds of environments (see *Seeing Double*, below). Once the hit is received, it plays a chord (hence the title of the piece).



**Figure 5-8 Max Patch *flutegen* (subpatch of *Chorda*)**

which comprises a tubular-bell derived sound, as well as other sounds that linger, and oscillate. These secondary sounds last quite a long time, as long as fifteen seconds in some cases. Thus it becomes possible to sustain a soundscape — and a large one at that — with movement happening only below the threshold, which in this case is set quite high. When the movement explodes into a higher energy, then the soundscape explodes also. However, as time progresses the large counter you see in the main patch (the large 36) begins to count down with each major hit. As it does so, the bell sounds begin to diminish, leaving only the oscillating sounds. At the same time, however, a pair of flutes begin a rhythmic pattern that we hear first as individual notes, growing to short phrases, and eventually to a continuous rhythmic pattern. At this point, once the flutes have taken over (dependent entirely on the energy of the dancers, who are causing the large number to countdown, and progress the internal workings of the patch), I switch the environment off manually, which is a trigger to the performers to move towards the end of the section.



**Figure 5-9** *Chorda* from *The Secret Project* (excerpt)



**CD-Rom: Fig 5-9**

One other notation on the main patch needs comment: look closely and you will see “use this to cheat in moments of stillness”. Musically, this patch requires constant sound because without it, it dies, loses all momentum. A new chord should have been struck before the previous one dies out completely, otherwise the soundscape flags and waivers. To strike a new chord requires a physicality and energy that sometimes just didn’t or couldn’t happen in time to stop the previous chord dying out completely — hence the “cheat” button that would allow me to trigger a chord if necessary. As can be seen in the movie, it is a choreography of troughs and peaks — the sound in performance was very big: loud as well as expansive. It was often hard for the choreography to match this, and it is something we struggled with from the outset of working with this environment. That

struggle is quite clear here, and it is fair to say that the choreography in this section, and the environment as a whole, is perhaps the weakest in the entire performance. This is partly to do with the fact that there are three performers on the stage, and that the relationship between movement and sound is a very complex one. I am also forced here to show an example where the environment was not behaving particularly well (it is the only recording I have of this section of the piece). Was the complexity of the environment confusing for the performers? Yes, the complexity undoubtedly did make it difficult for the performers to inhabit the environment fully — there was a battling with the environment as well as a being in it. This was sometimes quite delicious, and sometimes catastrophic. It represented the true nature of improvisation in these environments: Blom's 'intriguing yet precarious undertaking' (1988 p.119) where there is a definite sense of danger.

## Seeing Double

---

It may have been noted that, until *chorda*, all the environments analysed are for solo performers. This is no accident. One of the largest issues as the research progressed was the movement from working with a single performer (Jools) to working with the full company. Having discovered how to build a system with a phenomenal link to the performer, an environment that seemed to breathe, to have its own being, that could merge with the performer, I quickly discovered that all the connections fell apart when inhabited by more than one performer — its intimate ontology was shattered. We found solutions with two performers fairly quickly (essentially by cheating, by having only one

performer move at any given time); but it took months before we were able to find something that worked well with all three performers, and that resulted in *Chorda*.

The different kind of language I used in describing that section, particularly with concerns about opposition and struggle, are no accident. The extraordinary intimacy that exists in the solo sections didn't happen here, with multiple bodies. There was an enormous struggle in building the choreographic language for *Chorda*, and it was because the environment itself was so difficult. It was as though the environment was overwhelmed by these bodies. The choreography never completely gelled — there was never a oneness in the way the performers worked together — and so the environment itself never felt entirely gelled either. The computer was seeing double (well, triple, actually) and couldn't quite resolve what it was seeing.

## Snow Ghosts

# snow ghosts

**Figure 5-10 Snow Ghosts (audio only)**



**CD-Rom: Fig 5-10**

*Snow Ghosts* is a very different section, from a number of perspectives. *Snow Ghosts* was one of the earliest poems written for *the Secret Project*, and perhaps defined the flavour of our work on this piece more than any other single piece of writing. It evoked a sense of place and a sense of other-place that is very strong. It was written during one of our early visits to Banff, when we had begun to think about *The Secret Project* as a performance and were developing new material. It was late Spring, and still snowing up in the Rocky Mountains — sometimes brilliantly sunny and warm, and the next moment flurrying with snow with the white mountains as a backdrop. Jools read it to me that first morning (she had arrived a few days early, and had written the narrative the day before), and we recorded it, in one take. It was clear that this was *not* going to be part of an interactive environment — here was a narrative that was strong and clear, that needed not to be fragmented. Some nights later, I wrote some music, not necessarily for the text, but with the flavour of the text in my head. It, too, was recorded in almost one take — a different kind of subjectivity at work, but an equally important accession to subjectivity and intuition within the composition process. I tried the two together, and it ‘worked’ — but it still wasn’t clear how we would use this very traditional reading of a narrative text with musical accompaniment. I felt strongly that the combination of the two elements was powerful — the longing the desire the muted adolescent-eroticism the pleasures of girlhood and of snow — all these belonged to and were enhanced by the music, when the two were put together. They became inseparable. The music has a yearning, languid quality that can only have been written for *this* text; compositionally it is neither complex nor at all innovative, but as a piece of music it exists for this text alone, and for *The Secret Project* alone.

It was only towards the end of the process of actually designing the performance that I suggested using this seven-minute piece just as it was — a recording — played largely in

the dark with only the occasional movement/light gesture in it. The notion of throwaway gesture had become quite important in the work — outbreaths of light and gesture that could almost not be seen. These were added to *Snow Ghosts* — but otherwise the blackness and stillness provided a moment of respite from the liveness of spoken text and movement. This decision provided a breakthrough in other ways: we had known all along that the use of the technology within the performance was going to be an understated one. This is a position that has hardened in our work (see *Spinstren*, below), but it felt important even then to limit the audience's view of the technology (in fact, reducing it to nothing) and to limit its aesthetic and physical presence within the work. This is work that is served by technology, and not technology dressed up with a little dancing. While the work couldn't possibly exist without the use of the interactive technology — in no sense, in fact could it do so — the actual use of the technology must be subservient to the larger aesthetic and theatrical issues at stake. Whilst there are numerous mini-sections<sup>42</sup> within the piece — none of which use any technology, or even music — there was not until *Snow Ghosts* a large section that was entirely devoid of any technology. It could be argued that playing a pre-recorded text, with pre-recorded music into a blackened space is entirely an environment dominated by technology, but here I would diverge from Auslander's definition of a mediatized environment and argue that the pre-recorded material *feels* as human and as live as the performers do. There is an auratic presence in the space, without doubt.

This lack of technological space is something we would expand much more in *Spinstren*.

# Chapter 6 : Spinstren

text from Spinstren  
*The Lost Song*  
audio only



**CD-Rom: Fig 6-0**

*'Carla woke up singing. It had happened twice before, but only since she stole the damn top. When they move towards her, one beside the other, tall and stout and slight, their woven voices in a four-thread, their singing moved inside her, lifting the lost song. This was the song, the lost song. And as they moved past her, she wept. And then there was nothing.'*

*Here in the roar of it came a moving steady knowledge. She let herself loose from conscious shores, and belly sound wound from her. It moved around and beside and inside the song between them. Unknowingly, she knew where her voice could find its way between the other ribbons of song. Sometimes their voices rose to a tumult, all of them keeping voices rising and swelling in strange harmonies. Other times she would turn and find herself in a whispering conspirational tangle - intimate and urgent. Carla woke out of breath.'* (Gilson-Ellis 2002)



## Outline of the piece

---

*Spinstren* is a very different piece. Made in 2001-02, it reflects the distance in time from *The Secret Project*, but it also reflects a different making mechanism. *The Secret Project* was made over a long period of several years, mostly in intensive rehearsal/research periods. *Spinstren* was made under duress, at home-base rather than in a residency, and over a three-month period during which I could not be present at rehearsals a great deal of the first two months. We knew early on that there would be less reliance on the use of the interactive environment; the piece is much more theatrical, described in our original writing about the piece as *visual theatre*<sup>43</sup>. These words are key: we wanted to make a performance environment that was significantly more theatrical than TSP, in the sense that it told a story (or, as it turned out, a number of stories), but we also wanted a performance environment that was visually beautiful, magical, mesmeric. This was not to be done so much by stage trickery as by the content of the work, the movement, the soundworlds and the visual environment created by video — the overall aesthetic. It was always assumed that there would be a further development of our work with interactive environments — that we would be able to extend the research into new areas.

Because of the peripatetic nature of the rehearsal work<sup>44</sup> technical issues became a nightmare. It was rarely possible to work with full tech available, which as we've discussed, is key to developing interactive environments. At best, we were able to do it once a week in the early stages of rehearsal, but at worst there were quite a few weeks I missed because I could not be in the country.

Thematically, the piece draws on four strands: the story of Carla, a girl who is so enchanted by the beauty of a spinning top that she steals it; the story of *The Sleeping Beauty* who falls asleep for one hundred years because she pricks her finger on the distaff

of a (forbidden) spinning wheel; and the story of Arachne and Athena, the goddess who was so jealous of a girl's extraordinary spinning that she turned her into a spider; and the Spinstren, a breed of magical women.

## General discussion of the liminal world

---

*Spinstren* is a magic-realistic world where the characters from the three primary narratives appear and disappear and almost mingle. It is made up of almost fifty short sections, some of which are just gestures, haiku, or tiny narratives in word or movement. There are also major sections that are either duet or solo. I describe this as a liminal world because it lies somewhere between the inhabited space of the real and the imagined: the weaving together of folk tales (ancient and traditional, or contemporary and quasi-traditional) creates a world of uncertainty, where we are unsure how narrative and character are functioning. The sonic environment is very rich, unseating the audience, disconnecting them from reality. Its yearning, haunted quality reminds us of *Snow Ghosts* and its hovering between the real and the remembered. Carla inhabits a dreamworld, the Spinstren an imagined, mythical world but a myth that (unlike the other mythical strands in the piece) is unknown to its audience because it our creation<sup>45</sup>.

Essential to this is the flavour of the choreography, which is almost painfully restrained, quiet and inward-looking. It has a precision and cleanliness that the improvised world of TSP never did. Some sections (most actually) are much more precisely choreographed. Only two sections out of the fifty plus are interactive environments in the sense that we have talked about thus far.

Essential, though, is the sonic world. As already mentioned, it is a three-dimensional world (more of this below) that creates space within the performance environment. I am using specific techniques and technologies (none of which I can claim to have invented) to expand the perception of physical space. I can send sound spinning around within this three-dimensional space, sometimes gently and slowly, at other times impossibly fast. The soundworld underpins the entire piece — there are very few moments when we are not within a sound environment (this, too, is very unlike *The Secret Project*).

## General discussion of the technologies

---

The particular issues I set out to research in the making of *Spinstren* were live text generation, and the spinning of sound around a three-dimensional soundspace. I wanted the sonic space in the theatre to feel larger than the theatre itself. I was determined to use 5.1 surround sound, a technology I had not used before.<sup>46</sup> Because of the need to be portable, I was also determined to make the piece work on a single laptop computer<sup>47</sup>, which in hindsight was probably a mistake. I tried to use BigEye using a video input card on the laptop, but found that it was just too slow when played in the background, particularly as I was also doing live synthesis on the same machine<sup>48</sup>. Most of the environments were built in Max, and almost all of the music we hear is generated in realtime (see discussion of algorithmic composition above). Whilst there are a number of interactive environments similar to those developed in *The Secret Project*, none of them uses triggered text; many more of the sections in *Spinstren* have no direct interaction

with the performers, although I become the primary interactor, controlling a number of parameters in realtime (see below).

## Generating Text

My early research for *Spinstren* dealt with attempting to generate text in realtime. Actual generation of text, using Markov techniques to create new texts from known language/style bases (see Appendix 8 for one example), was relatively easy. What I wanted to do, however, was to generate *spoken* text in realtime. This meant providing a grammar by recording a segment of text, cutting it up into word fragments, and making those fragments available as a library (just as I had done earlier with *breath*). I attempted to generate language information (ie grammar<sup>49</sup>) from these fragments, but of course their original syntax was lost once they were broken up into individual words — I could only generate word frequency counts rather than actual grammar<sup>50</sup>.

Markov chains are particularly interesting when applied to written language or poetic text. Essentially, a Markov chain looks for coincident groupings of words and uses those coincidences to form probabilities for new groupings of words. Thus, a Markov chain will re-assemble language in a way that, at first glance, appears to make sense, but which is, in fact, nonsense. I ran this English translation of Ovid's original telling of the story (from *Metamorphosis III, Book VI*) of Arachne and Athena through a Markov chaining process.

[Original text] *They both set up the looms in different places without delay and they stretch the fine warp upon them. The web is bound upon the beam, the reed separates the threads of the warp, the woof is then threaded through them by the sharp shuttles which their busy fingers ply, and when shot through the threads of the warp, the notched teeth of the hammering slay tap it into place. They speed on the work with their mantles close girt about their breasts and move back and forth their well-trained hands, their eager zeal beguiling their toil.*

*[Processed text] To show that you have done no good by your advice, we are both of the warp, the woof is then threaded through them by the sharp shuttles which their busy fingers ply, and when shot through the threads of the warp, the notched teeth of the hammering slay tap it into place.*

*They speed on the work with their mantles close girt about their breasts and move back and forth their well-trained Then Athena assumed the form of an old woman, put false locks of grey upon her head, took a staff in her hand to sustain her tottering limbs, and thus she began: Old age has some things at least that are not to be despised; experience comes with riper years. Do not scorn my advice: seek all the fame you will among mortal men for handling wool; but yield place to the goddess, and with humble prayer beg her pardon for your words, reckless girl.*

A fuller extract is reproduced in Appendix 6.

As written text, this is quite interesting — but I was very unhappy with the spoken version. The text sounded entirely artificial, simply because the intonations of the individual words, taken out of context, were artificial. This is not an unknown phenomenon to sound editors, who have known for decades that the problems encountered when editing spoken text are largely intonational. Spoken text is one of the most difficult things to edit. The audio editor is typically attempting to piece something together that will sound seamless. Platform information in many railway stations is now generated remotely by stringing together samples of individual words. They are carefully intoned (uttered) so that they are emotion-neutral, and even largely intonation (pitch)-neutral. Speech patterns are carefully designed and constructed in such a way that it becomes possible to patch words together in any order and have them sound somewhat natural. It's interesting to compare the earliest of these systems — on some of the London Underground Lines (the Northern Line was one of the earliest) when the language sounded quite stilted, to later systems on some of the other Lines and on Railtrack where the generated language (which is what in effect it is) sounds relatively

natural. Actually, live station announcers tend to use quite a wide intonation in their messaging, what we think of as “sing-song” speech. The automated announcement systems only work because there is very little intonation — the language has been neutralised. Intoned language, or poetic language, simply doesn’t conform well to this kind of processing. It became apparent quite quickly that attempting to construct or generate a spoken poetic text, *and keep a sense of the poetic in its performance* was not possible. The intonations and phrasings that are so crucial to the delivery of spoken poetic text was disrupted, destroyed even, and in a not at all interesting way. The speech (the words) was still there, but the *utterance* was lost. I decided to abandon this approach and find other ways to work with generated text.

One of these ways was devised by Jools and Cindy in the Spinstren section called *Geometries*. In this section, the speaking of the text is broken up with repetition. This is not strictly generated text, of course, but it is nevertheless a narrative re-working of the text such that apparently random repetition and re-iteration of words and phrases are used, but always in a linear, narrative way.

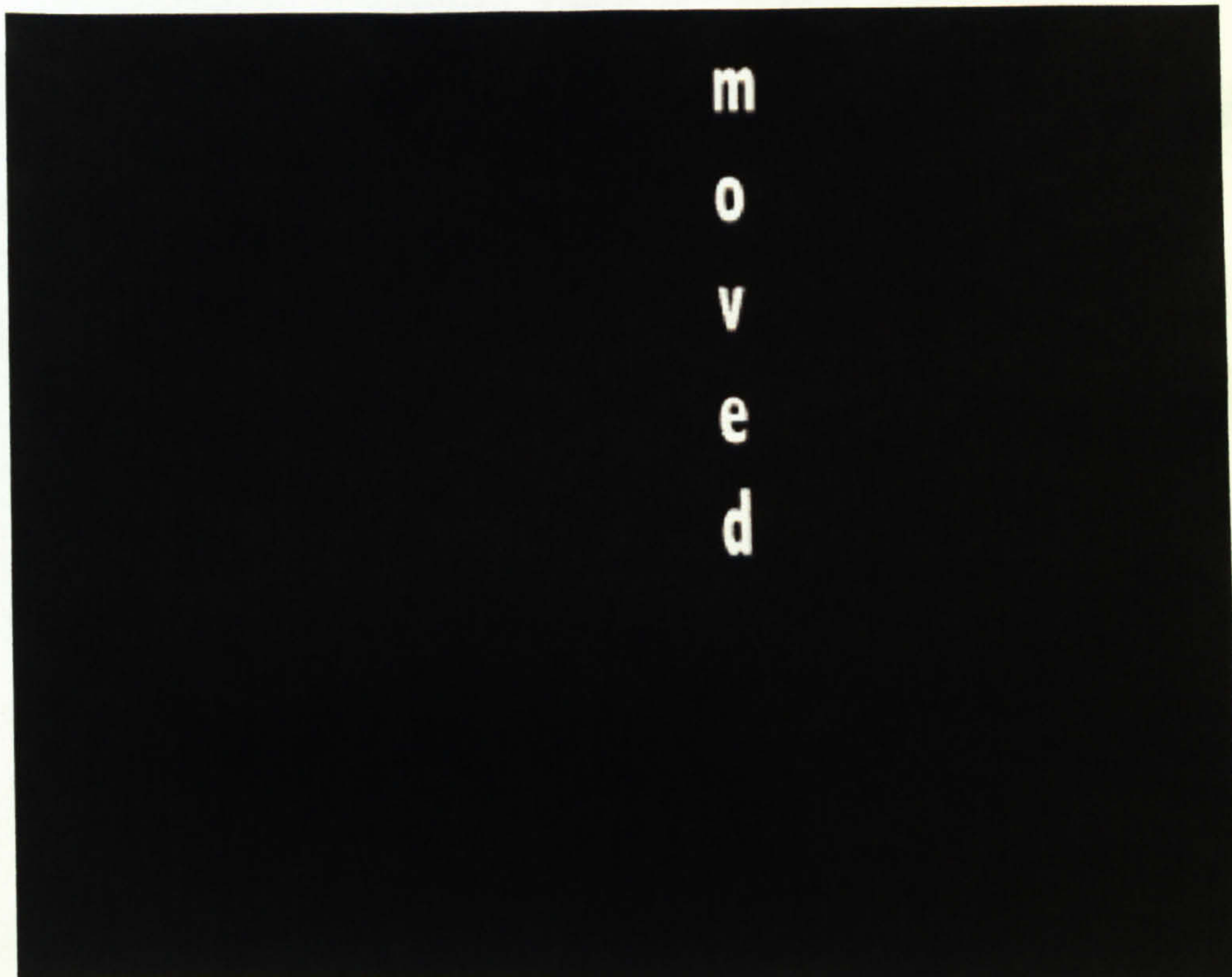


**Figure 6-1 Geometries from *Spinstren* (excerpt)**



**CD-Rom: Fig 6-1**

I also made a series of generated texts on video that were to be used in performance. For technical and aesthetic reasons, they were ultimately abandoned, but these were issues of performance, not issues inherent to the methodology used in the text generation. Once again, the text is not strictly speaking being generated by the computer, but the text we see is the result of a process in which I made a file from each word of a text, designed as a vertical stripe. Each word lasts only 5 frames (one fifth of a second), except for what I chose as “keywords” — words I considered important to the narrative. Some of these words I elongated to one second (although they instantly begin to fade once they appear on the screen, so they are not actually visible for the entire



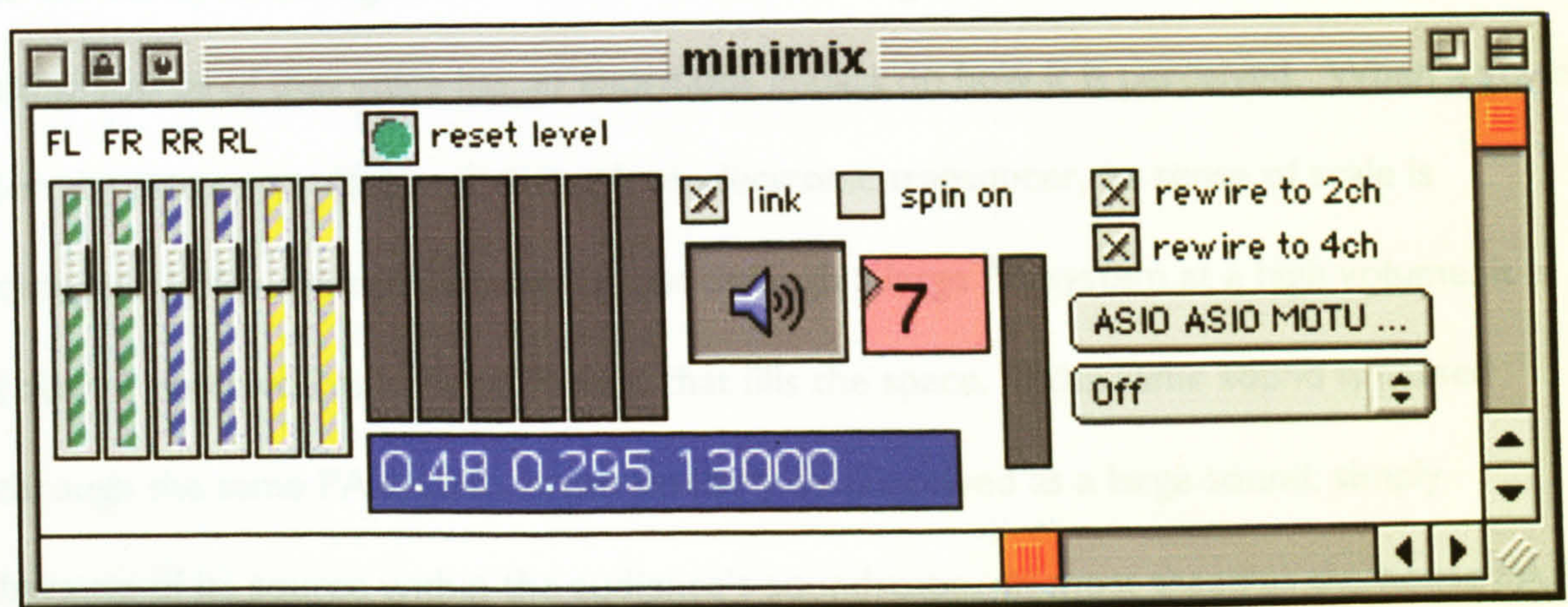
**Figure 6-2 Carla text**



**CD-Rom: Fig 6-2**

second). In practice, this created a blurred, illegible series of words flashing by on the screen, with some of the keywords being legible or close to legible. This is a visual representation of background speech, where the ear is only picking out certain words. Whether these words construct an actual narrative or not is irrelevant — the words themselves tell a kind of story. This is not a grammar-based generation of text, but it is a content-based generation, or re-ordering of a visual text.





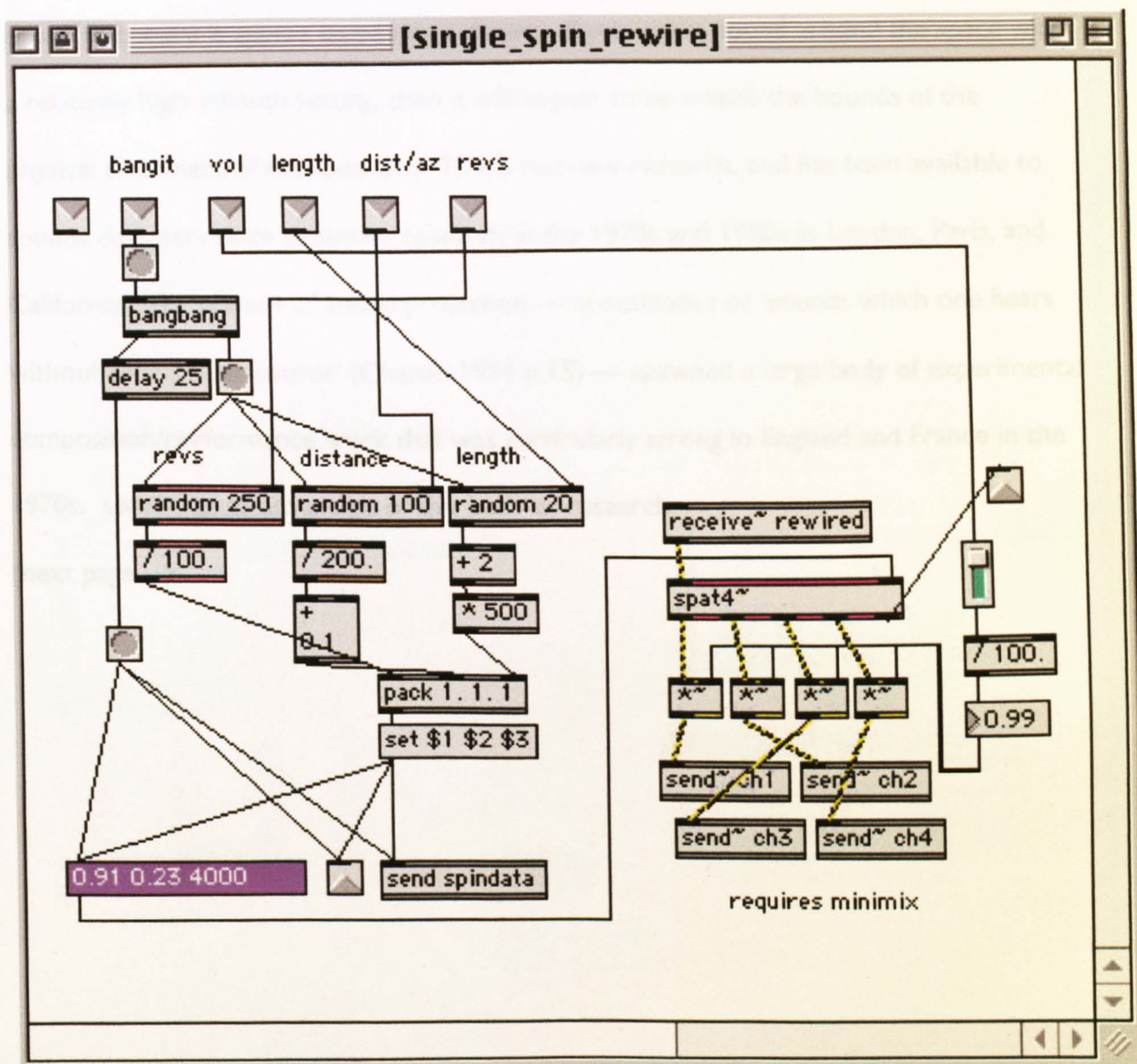
**Figure 6-3 Max patch providing overall systems info**

I mentioned earlier in this chapter that I began the project with the desire to use 5.1 surround sound for audio reproduction. Again, one of the criteria in selecting a system was to ensure that it could be used with the laptop, so that I had a completely portable system. To this end, I purchased the EMI 2:6 USB Audio Interface<sup>51</sup> and undertook a series of experiments with 5.1. The EMI provides six output channels, and so was ideal for 5.1. Much of my experimentation, however, took place not on the laptop but in my studio, where I use a G4 tower rather than the laptop. Instead of using this with the EMI (which in retrospect would have been more sensible) I used an Audiowerk 8 card (2 inputs, 8 outputs), which is a PCI card that fits inside the tower. Subsequently, I ran into significant problems when I tried to transfer the live performance score to the laptop — but more of that later.

There were numerous patches available<sup>52</sup> to begin to work with 5.1 Surround, which worked well in the studio. I found I was able to move sound around freely in space, with quite a degree of control. It was only when I began to consider the logistics of

transferring this system to a performance system that I began to re-think. Firstly, I wanted to be able to move *outside* the sphere of the overall 3D soundscape, and I wanted to do this by localising some sounds. When working with recorded voices, the actual sonic source of that voice has an enormous impact on how it is perceived. When a voice (or any other sound) is sent through an electronic transducer, its sense of scale is changed. If, for example, a sound is put through a large PA system at a high volume, it is (clearly) perceived as a “large” sound that fills the space. If the same sound is passed through the same PA system, it can similarly be perceived as a large sound, simply because of its source within the audience’s soundscape. In most theatres the house PA, the main system used to playback sounds, is above the audience, usually over the stage. If you are using a multi-channel system, the speakers are still likely to be above the house, but distributed more widely around the space. Therefore, if I was using the house system to play back voices, they would be “coming from” overhead. While the *live* amplified voices were able to come through the main sound system without too much distortion<sup>53</sup>, simply because that sound is perceived<sup>54</sup> to be coming from the performers themselves, particularly bearing in mind Auslander’s comments on mediatised space (1999). But I also planned to use prerecorded voices in the work, and I wanted to ensure that they would feel local to the stage, not part of the overall soundscape. This required a literal, physical separation. This led me to abandon 5.1 sound (which was taking up all my available audio channels from the computer) and instead shift to a four-channel, quadraphonic system (much more generally available in theatres anyway) with two discrete channels available for use on the stage. In performance, I placed two small speakers as invisibly as possible on the stage, and these were used to reproduce the recorded voices. It turned out, particularly in the larger space of the rehearsal space or theatre (as opposed to the very enclosed space of my studio) that four channels worked just as well as five in being able to give the sense of sound moving in space. The front-centre channel, designated for dialogue or narration in the original 5.1 specification, really wasn’t necessary here.

I used two primary patches to move sound around:



**Figure 6-4 Max patch for spinning sound**

This is the patch I designed as the primary controller for spinning sound around at will. It uses a patch by called `spat4~55`, which gives me control over three critical parameters: revolutions, distance and length. Revolutions controls how many times in any given event the sound will rotate from start to finish; distance controls how far away the sound is perceived to be; and length determines how long the particular event is. So, for example, I can trigger an event that will take the incoming sound and place it only front-left and

move it over a period of six seconds to rear-left. If the distance (sometimes also referred to as *azimuth*) control is left at or near zero, then the sound will be very immediate, with no reverb. If that number is set higher, however, then it will add reflections into the sound that make it appear to be more distant. If you spin a sound around the space with a relatively high azimuth setting, then it will appear to be *outside* the bounds of the physical placement of the speakers. This is not new research, and has been available to sounds designers since extensive research in the 1970s and 1980s in London, Paris, and California. The science of sound projection — acousmatics or ‘sounds which one hears without seeing their source’ (Chanan 1994 p.15) — spawned a large body of experimental composition/performance work that was particularly strong in England and France in the 1970s. spat4~ takes advantage of this body of research.

(next page...)

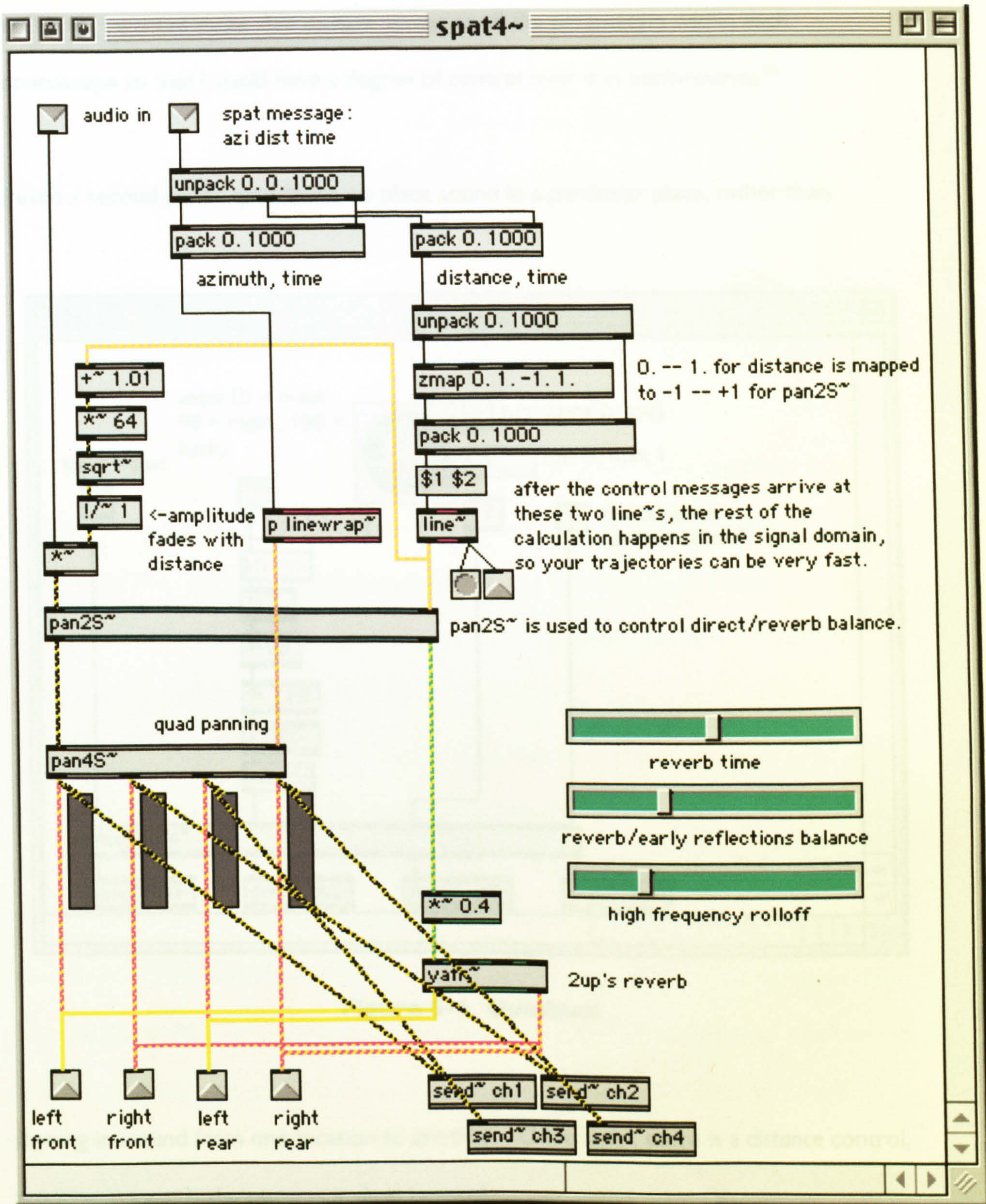
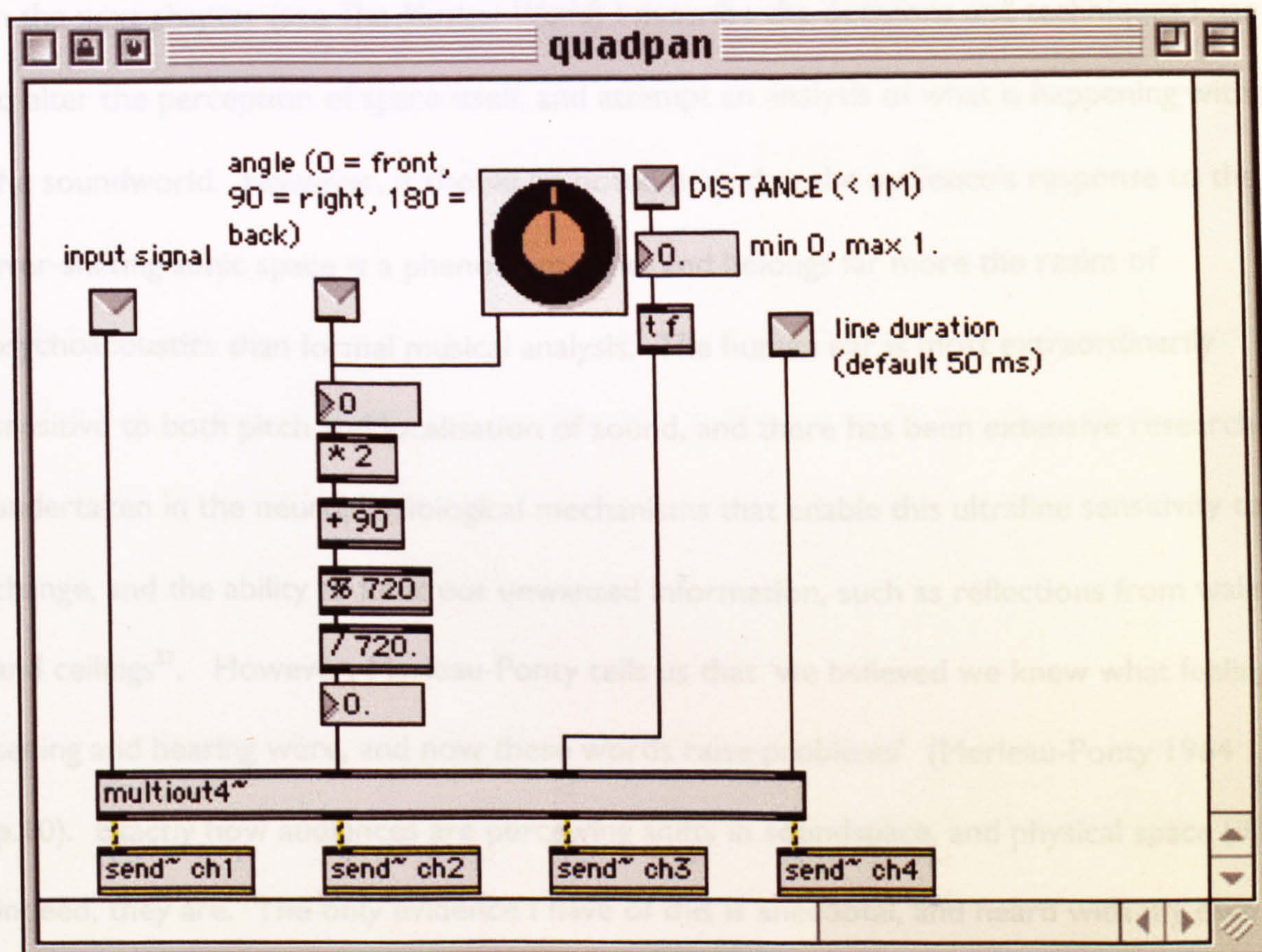


Figure 6-5 spat4~

I used random number generators to control a range of possibilities for the spin, and in the studio was able to generate each sound in realtime as well as controlling its spin in

realtime. I wanted to be able to have access to all the parameters within each soundscape so that I could have a degree of control over it in performance.<sup>56</sup>

I used a second patch, **quadpan**, to place sound in a particular place, rather than



**Figure 6-6 Quadpan**

moving it around from one location to another. Once again, there is a *distance* control, working in exactly the same as it does in `spat4~`.

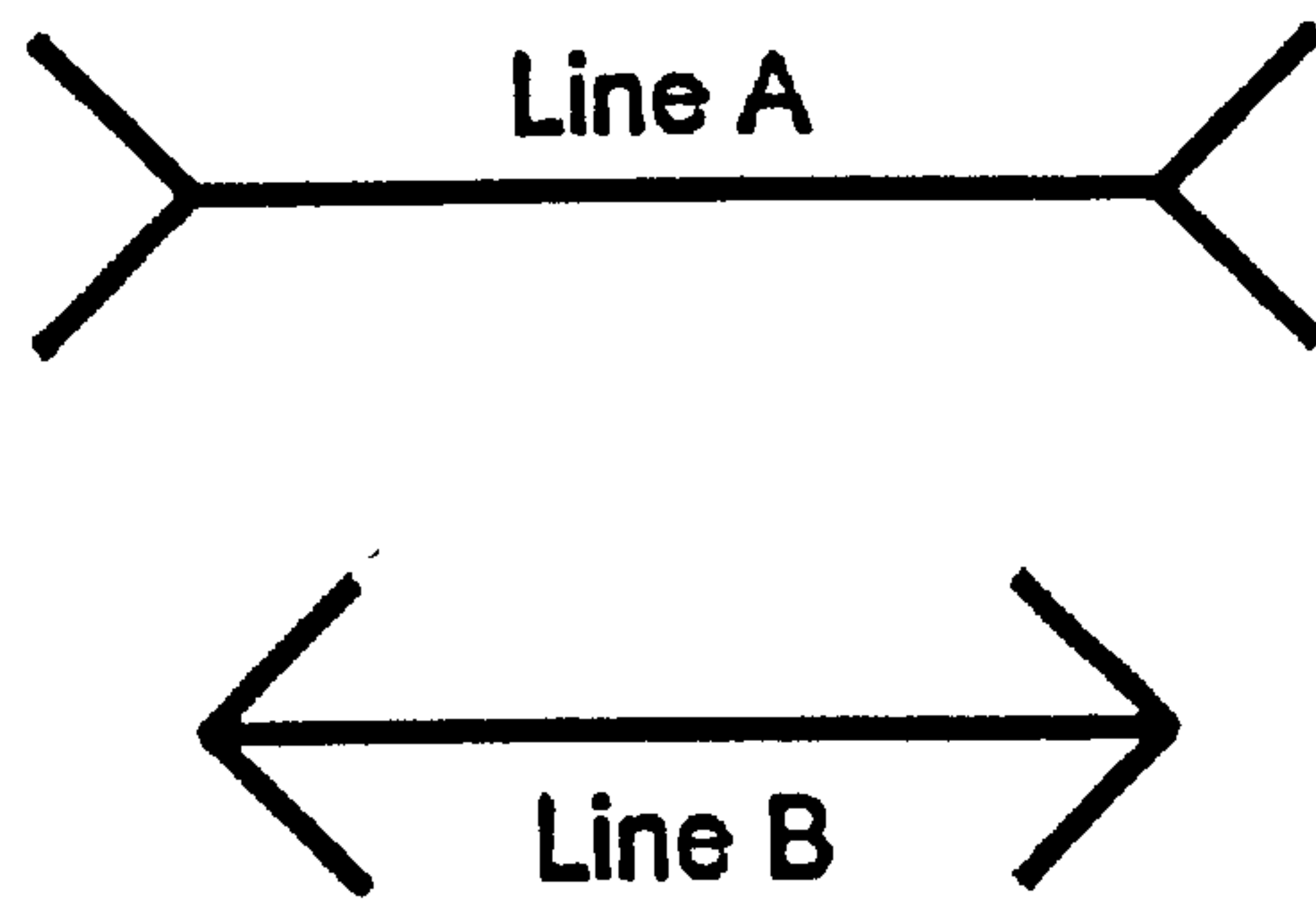
These two patches (`spat4~` and `quadpan`) formed the basis of most of the sound patches, and allowed me a considerable degree of control over the soundscape.

# The phenomenology of the 3D soundworlds

---

I suggested earlier that I wanted to 'unseat' the audience with these three-dimensional soundworlds. What do I mean by this?

In the next chapter (see *The Musical World*) I describe the decisions and techniques I use to alter the perception of space itself, and attempt an analysis of what is happening within the soundworld. However, it should be noted here that the audience's response to the ever-shifting sonic space is a phenomenal one, and belongs far more the realm of psychoacoustics than formal musical analysis. The human ear is most extraordinarily sensitive to both pitch and localisation of sound, and there has been extensive research undertaken in the neurophysiological mechanisms that enable this ultrafine sensitivity to change, and the ability to filter out unwanted information, such as reflections from walls and ceilings<sup>57</sup>. However, Merleau-Ponty tells us that 'we believed we knew what feeling, seeing and hearing were, and now these words raise problems' (Merleau-Ponty 1964 p.10). Exactly how audiences are perceiving shifts in soundspace, and physical space (if, indeed, they are. The only evidence I have of this is anecdotal, and heard with my own ears) is clearly a phenomenal problem, not a scientific one. I can apply a particular filter or a particular delay or a particular pitch shift to a sound and I can sense its effect on me. Is the same thing happening here as is happening in the famous Müller-Lyer optical illusion<sup>58</sup> ?



**Figure 6-7 Müller-Lyer illusion**

Which line is shorter, Line A, or Line B? The empirical answer, of course, is that they are both exactly the same length, but our eyes tell us otherwise. Our consciousness expands Line A and diminishes Line B — we perceive the latter to be much shorter than the former.

So, too, with our perception of sonic space, which can be bent and buffeted. Certainly the physical size of the room in which the audience is sitting is not changing, but their perception of the size of the room, and perhaps how they are sitting in it, is altered by the sounds they are hearing. My three-dimensional soundworlds, then, become part of the phenomenal space of performance.

## **Supporting the speaking voice**

I built a series of sound generation patches that were drone-like in quality. Almost all of them had to support a live speaking voice, which was a major design parameter.



Providing support for a speaking voice is not just a matter of turning down the volume. Instead there needs to be a hole through which the voice can pass. This is a matter of designing a sound that leaves enough space in its harmonic makeup, or to be more precise, its frequency map, for the voice's most important frequencies to pass through and thus be heard easily. If there is a strong element in the 5Khz to 9Khz range in the music, then the most important frequencies (ie the frequencies we use to understand the voice<sup>59</sup>) will be masked — create a hole for those frequencies and the music can be correspondingly louder. Add some other commanding element to the music, however, and the voice will also be lost. If the music has a strong beat, then it will compete so heavily for our attention that we can no longer concentrate on the speaking voice — it's not that the ear can't hear the voice, but simply that the brain is overwhelmed by too much information<sup>60</sup>. A significant part of the research for this thesis was involved in making sound that can support the speaking voice yet remain musically viable.

Of course, in the studio, I was designing the basic environments without the live speaking voice — another reason to build in a large degree of flexibility and control in the final environment.

Fig. 6-8 is an example (like Snow Ghosts, above) of a performed text with music. The only interaction happening here — the live connection — is between myself, controlling the spinning of the 3D soundworld, and Jane who is performing. What cannot be shown here is how the sound is moving around the space, making movement as if of water lapping. Nevertheless, the way in which the sound supports the text, the text, the movement, and so on, is clear here. If the connection between Jane and myself is lost, which usually happens when Jane's pacing changes, then the lack of it is very apparent in the performance, and the whole does not flow.



**Figure 6-8 Jane Kellaghan performs *Today is the Day* (excerpt)**



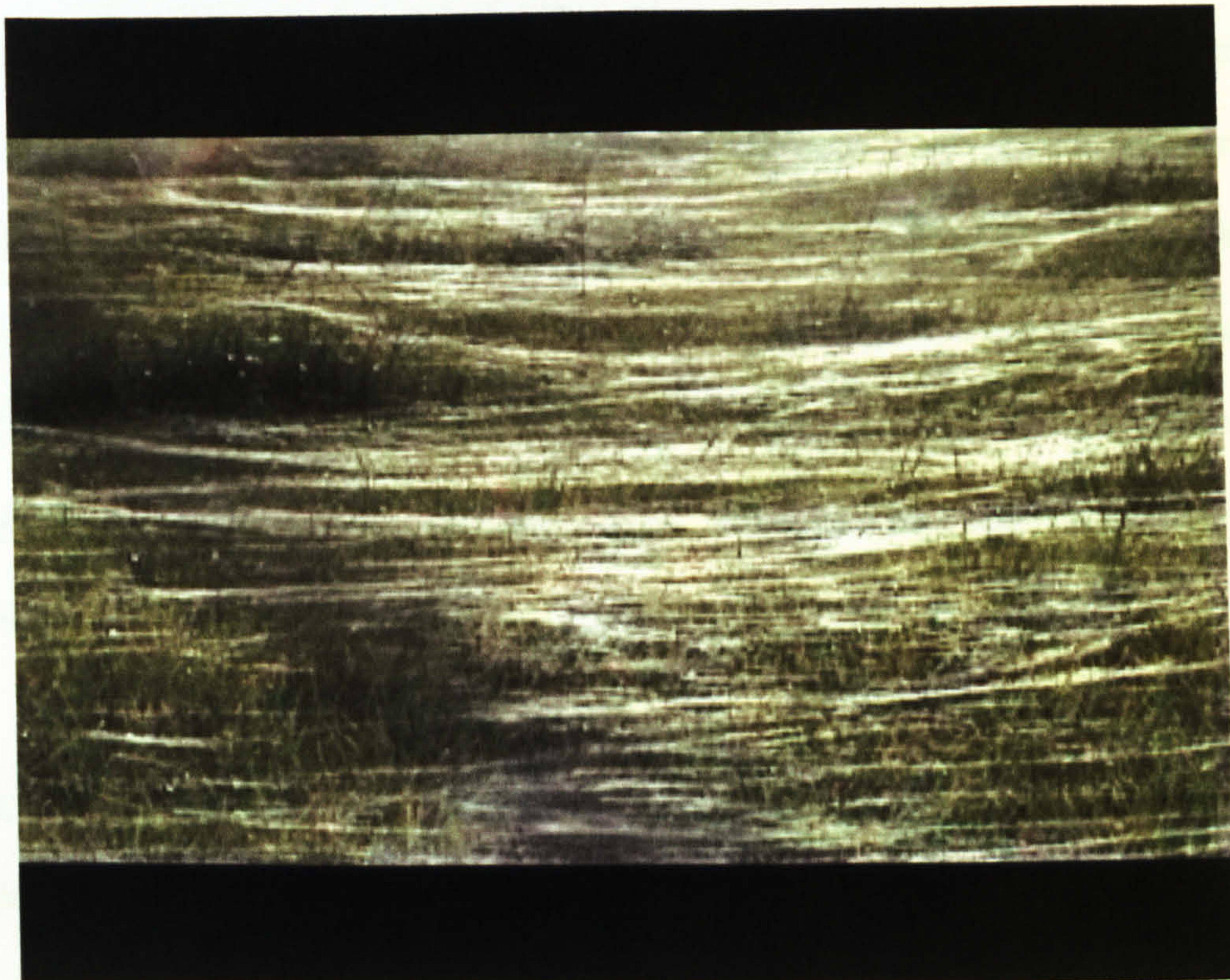
**CD-Rom: Fig 6-8**

## Moving to performance

---

Moving all this to live performance proved catastrophic. The live generation of sound, plus the computation involved in moving the sound around proved too much for the laptop, and more particularly, for the USB interface. One of the key indicators I used in 'minimix' (Fig. 4-1) showed me CPU utilisation. In the studio, that number frequently hovered above 60%, which is very high<sup>61</sup>. In the rehearsal space, using the laptop<sup>62</sup> and the USB interface, that number soared above 80% and the patch no longer functioned. The computer, in essence, shut down because of too many demands on the CPU. I was forced to give up some of my control, and decided to use prerecorded soundfiles and lose control over the sound generation, rather than lose control over the sound placement (spatialisation). I therefore created a series of mono soundfiles that were fed, live, into the spatialisation patches. This, for the most part, solved the problem, and allowed me to retain control over spatialisation in performance.

There were a number of patches that still needed to be generated live, but for the most part they did not require spatialisation, so these I was able to retain.



**Figure 6-9 Underworld from *Spinstren***



**CD-Rom: Fig 6-9**

Fig. 6-9 is an example of an entirely pre-recorded text shown in performance as it appears here — as a video projection. It is an example of the use of video imagery used together with sound and recorded text. Once again, the three-dimensional aspect of the sound cannot be represented here.

## **Red Top (The Lost Song)**

One of the few interactive sections in *Spinstren* is Red Top. In *Spinstren*, I decided not to use BigEye because I found it would not run in the background on the same computer

that was running the Max patches — or at least, it would not run fast enough to work well. In any interactive system, if there is a visible lag between input gesture and output sound, then the system doesn't really read to performer or audience — the feedback loop is lost (see comments on The Secret Project above for the importance of this feedback loop). I therefore had to choose a new system, having already rejected for pragmatic reasons, the addition of a second machine just for processing video. After a number of false starts<sup>63</sup> I decided to adopt Rob Lovell's Eyes<sup>64</sup>, which is a Max patch providing much of the information available in BigEye.

The Red Top is not dissimilar to The Secret Project's *breath* (see above). The poem that was its inspiration (although it does not appear in this section) is The Lost Song:

*'Carla woke up singing. It had happened twice before, but only since she stole the damn top. When they move towards her, one beside the other, tall and stout and slight, their woven voices in a four-thread, their singing moved inside her, lifting the lost song. This was the song, the lost song. And as they moved past her, she wept. And then there was nothing.'*

*Here in the roar of it came a moving steady knowledge. She let herself loose from conscious shores, and belly sound wound from her. It moved around and beside and inside the song between them. Unknowingly, she knew where her voice could find its way between the other ribbons of song. Sometimes their voices rose to a tumult, all of them keeping voices rising and swelling in strange harmonies. Other times she would turn and find herself in a whispering conspirational tangle - intimate and urgent. Carla woke out of breath.'* (Gilson-Ellis 2002)

Here we wanted to evoke that sense of a lost song — a searching and a finding. I built up a library of sung phrases; some were extremely short, barely vocalised, others were longer, but still a little tentative. These I split into two classes — the tiny barely vocal phrases, and the rest, more clearly sung. The system was designed to pick up tiny movement (Jools felt the piece was a little uncomfortably close to *breath* and wanted the movement to be significantly different in quality). Again, she is stationary, so almost all of the movement comes from the upper body. The lighting is very dim, so the system is

pushed to its limit as it tries to see through the gloom<sup>65</sup>. The environment is relatively simple. I simply used a counter to expand the possible library of sounds that could be triggered. The first set of sounds were only from the first class, as Jools is attempting to find her voice; later the more clearly vocalised phrases begin to appear, as Jools begins to find her voice and the song. I also added a long sustained open fifth vocal chord, to give her some support in holding the home key. At any given point in the piece, she can throw her Red Top, and sing solo while it spins. This is my signal to turn off the interaction and slowly fade the vocal chord in the background.

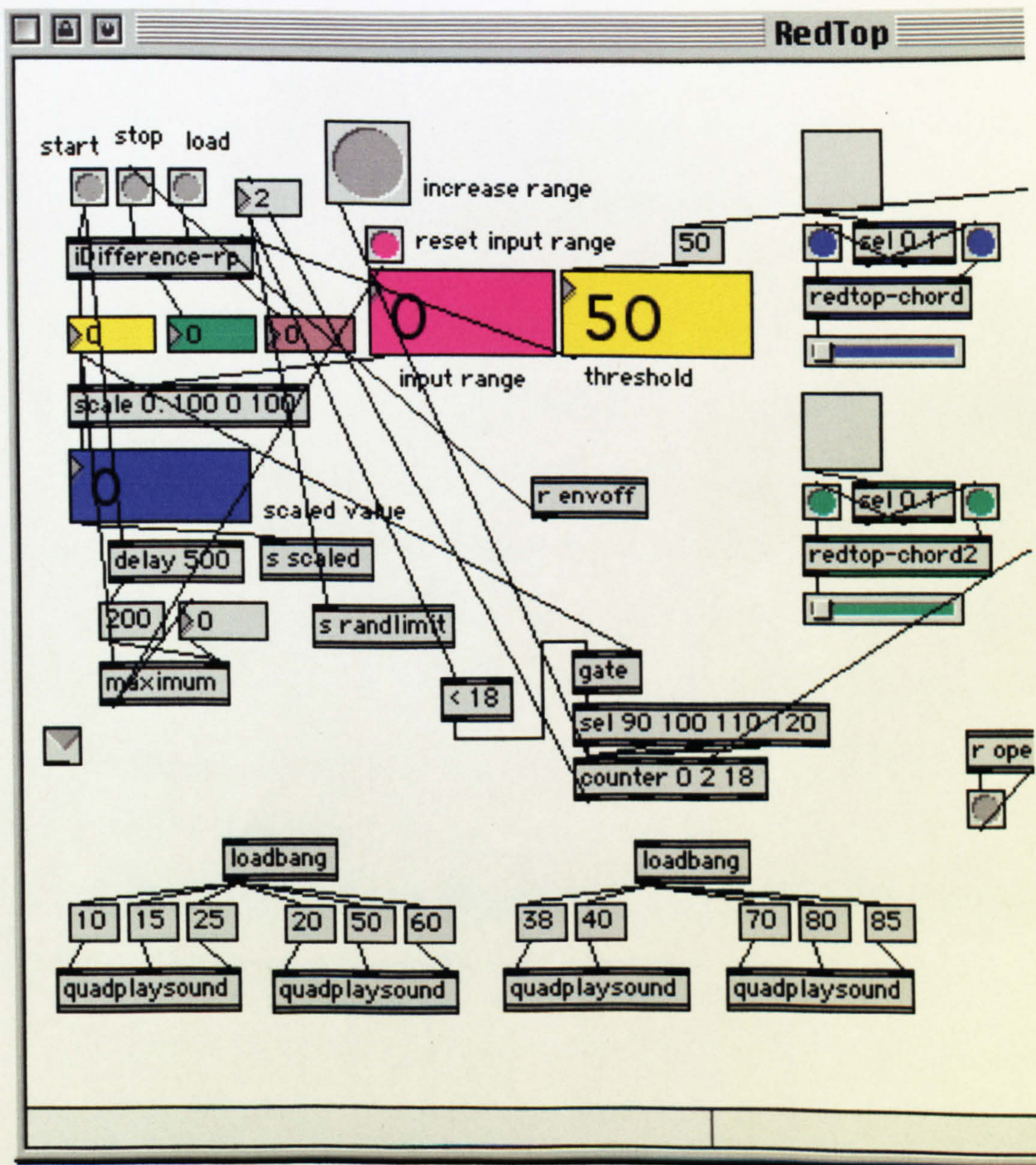


Figure 6-10 Max patch for Red Top

This is certainly a very simple patch — I am simply looking for a threshold of movement, but a very finely tuned threshold that allows the performer to move barely at all if she is to avoid triggering something. There is an extraordinary delicacy, and an extraordinary danger in working with an environment this minimal, with a performance voicing that is so hesitant.

# Chapter 7 : Reflections & Analyses



## Introduction

---

**T**his Chapter provides some reflections and analyses on the entire body of research, and particularly on the two performance pieces.

## The Early Breakthroughs

---

The most significant moment in the research was the discovery of the linking of bodyspace and technospace. This happened the moment we began to use the moving body (the physical gesture) to control and manipulate the singing, or vocalising, or speaking body (the vocal gesture). The work begins to be about corporeality (the body), writing (orality), and the interactive performance link/loop (aurality). Here a semiotic analysis may prove useful, what Salvaggio refers to as 'a working and kneading of sound into written language and critical thought for the very purposes of expanding and multiplying possible meanings' (Salvaggio 1999 in Gilson-Ellis 2001 p.3). This was an extraordinary moment in which the voice was, quite literally, blown apart, fragmented, rebuilt. But it was also a moment when the metaphysical vocal gesture was also transcended, wormed into, expanded, where the bodily gesture and the textual gesture could become confused and suffused. Suddenly, we were able to 'weave both the sound of voicing and the vision of writing' (Gilson-Ellis 2001 p.31). The technology entered into the phenomenological, the emotional space of the performer, *and vice versa*. This was a system that could begin to understand utterance, rather than speech; to understand physical gesture rather than movement.

## The Composer's Rigid Frame

The same thing was happening to my compositional structures. Although I had been working with interactive systems for a number of years, here I began to find a compositional integrity that belonged to the body. This is not an entirely new idea. Performers often talk about the point when a piece of music enters the *body* — they are able to play it almost from an internal impulse instead of simply reading it from a score. Very little research has apparently been done in this area, but simply from anecdotal knowledge, and from my own knowledge as a performer, I know that this moment happens, and that it is a threshold moment.

It is limited, of course, by the rigidity of the score. A cursory history of western classical music is to delve in and out of the connection to the performer. The earliest forms (plainsong) were learnt largely by aural teaching. There was a notational form, and it was explicative because of its lack of meter — the manuscript was only there 'to serve as a reference copy' (Chanan 1994 p.69). All the notes were there, but the way in which they were sung was simply known, bodily, by the monks who sang the music every day, every season, every year. Music was entirely linear, musicians thought in line-shapes, not in vertical blocks (ie harmonically). Despite its apparent narrow bandwidth of expressivity, to sing plainsong is to experience it quite physically, and it *feels* like a highly expressive form, largely because of its rhythmic freedom, and its sense of being in the body. As music and its notation became more sophisticated, so too did the relationship to the performer. Again, largely by tradition and aural teaching, performers of the 18<sup>th</sup> century *knew how to interpret a score* and knew the parameters in which they were allowed to explore, to deviate from the written text — the score was seen more as a 'skeleton for performance' (Chanan 1994 p.70) than as anything absolute. As the cult of the composer began to dominate, the freedom of the performer disappeared, so that by the end of the

19<sup>th</sup> century, and the beginning of modernism, the performer's right to deviate was highly curtailed (although any score, however complex, still requires a degree of *interpretation*<sup>66</sup> even if that interpretation is increasingly curtailed by the demands of the composer), so much so that by the middle of the 20<sup>th</sup> century the music was so complex and so difficult and so *unrelated to the body* that performers found it terribly difficult to play (and audiences found it terribly difficult to listen to). Since the aesthetic explosions of the 1960s performers have once more received degrees of freedom, sometimes to the point of extreme, and are once again sometimes able to find bodily connections to the music they are playing.

So, when a dancer is in an environment we have developed, and discovers a 'transaction between consciousness and the thickness of existence' (States in Fortier 1997 p.31), then the system has become sensitive to the phenomenal space of the performer, and the performer has a conscious connection to it. Then alchemy can happen.

## Poetic Space

---

From this moment it became clear that technological decisions would no longer drive our work. We had found an extraordinary connection between body and machine, the connection that Mark Coniglio talked about at much the same stage in his research with *MIDI Dancer*:

*there's just this magic. It's very basic, and it's part of the appeal of technology in general...When you first put on this device, suddenly things that you never thought of as being possible are suddenly possible. And, it's tactile. And that's the other thing, I mean, it's not intellectual, it's tactile. You move your body, and you see or you hear a response. That kind of bodily connection is even stronger than just an intellectual one. (Interview text)*

What we have built is a 'nervous machine' (Merleau-Ponty 1964 p.162) that is 'on the lookout for the most important activities to which to devote itself' (Jourdain 1997 p.310).

In making *The Secret Project* we wanted to create a performance aesthetic where the poetic gesture of the text was paramount in the overall aesthetic, the *feel* of the work. At the same time we wanted to exploit, to quite a large degree, the new performance gestalt we had discovered. In a preview to a performance of *The Secret Project* in Dublin in 2001, writer and critic Michael Seaver wrote:

*'Dance and Technology would seem to be at odds, one basking in the senses the other denying those senses and elevating the mind. Up to now dance has lost out. Performances showed a moving body framed by lasers and video monitors, grasped by electrodes and confined in an artificial space policed by floor pads. We lost sight of the body but were infatuated by the technology. This was the future.'*

*'When I saw *The Secret Project* premiered in Cork over a year ago, it reaffirmed for me what dance represents and how its ability to awaken our senses need not be diminished should it choose to present itself in a different way. It also highlighted the need for the technology to be sensitive enough to capture not only the movement, but the sense of the movement.'* (Seaver 2001)

The ultimate key to the development of a poetic performance space is to keep the audience suspended in the poetic-narrative worlds we are trying to create. This is an extraordinarily difficult thing to maintain over a period of more than an hour, and terribly easy to shatter with the moving of a table or the brushing of a microphone.

## The Musical World

'Music presents the problem of a semiotic system apparently without a semantic plane' (Eco 1977 p.11). So how, if at all, does music communicate meaning, or emotional

content? Bernstein proposed that music possesses a rhythmical and harmonic deep structure that is essentially symmetrical, 'which transformations of various kinds mould into a complex aesthetic surface, full of ambiguities.' (Chanan 1994 p.84). Is this helpful?

*'For Bernstein, music and poetry are both the result of phonological and syntactical transformations. In the case of poetry the process of transformation interacts with syntactic content to generate new meanings. In the case of music, with its lack of explicit denotation or direct referential content, a similar process has the effect of creating its own kind of meaning: the meaning is generated by the transformations themselves, acting on the generative cells of the music and on each other. (Chanan 1994 p.85)*

In creating the composed (although still primarily algorithmic and live, with just a few exceptions) music for *The Secret Project* and *Spinstren*, I was attempting to create a sonic landscape that could not only support the spoken voice (see above) but which also evokes a strong emotional response. I'm trying, as one audience member commented, 'to make the piece[s] float'. What does this mean?

*'What is music after all? You can't see it, you can't touch it, you can't eat it, but its palpable presence always makes itself felt; not just in a physical way, but in a way that reaches down into the crevices of our souls.'* (MacMillan 2003)

How can music achieve this and can its affect be analysed? For many hundreds of years debate has raged about how music evokes, creates mood, is affective, etc. (For a good overview, see Meyer 1956, Hargreaves, 1988, Cook 2001 and Lundin 1964). Whilst Seashore can say that 'experiments have shown that musical chords may be matched against the principal types of human moods' (Seashore in Lundin 1964 p.197), no particular mode of study, whether it be psychometric, biological, psycho-physical, or psychological has been successful in showing just how music makes you cry. Even if you take an entirely phenomenological approach, rather than a cognitive one, the only thing that is clear is that musical language is learned, that cognition is involved, and that music has the ability to arouse the listener. If we listen to a music whose language we do not

know (ie to music from a culture that is not our own, even if the culture is quite close to our own) we will not respond in the same way. It can also be shown that the same responses hold true even in those who have no musical training at all — we absorb the music of our culture, and learn its language, unconsciously.

Why the composer is able to create music that is not just about raw emotional power, but is instead about subtly changing or supporting mood is therefore unclear, but *my own response* as well as anecdotal audience response leads me to believe that the musical landscapes I built, particularly for *Spinstren* which has an almost constant underpinning of sound, do have a significant impact on the overall mood of the performances. With the soundworlds in *Spinstren* I am hoping to move the audience to a state of suspension, an other-world in which the 'action' takes place. This is clearly part, a significant part, of the poetic space we are attempting to create, something that I believe was more successful in *Spinstren* than in *The Secret Project* largely because of the almost non-stop soundfield generated for *Spinstren*.

To what extent, then, can the musical content be analysed? I can at least say what I do and do not do. Except for the few through-composed pieces that exist within these works:

- I do not compose melody. I do however create a melodic/tonal language and provide a set of instructions to produce an improvised melody
- I do not use tonal progression. Tonal progression is considered by many theorists (together with rhythm (see below)) to be the emotion engine of western music. By denying the listener this most fundamental of structural/emotional clues (see Schenker, et al) I am deliberately letting the music support the poetics, rather than trying to "paint" them, or compete with them. The music floats because it is not grounded in tonal shift or progression.

- I do not use rhythmic progression. The algorithm that generates the music is, in almost all instances, rhythmically very simple, and based almost entirely in 1X, 2X, 4X, and 8X divisions. The music *meanders* rhythmically, it rarely attempts to be expressive, to draw attention to itself by rhythmic development or tension/resolution.
- I typically design minor-ish modes, rather than using familiar keys, and I bend pitch enough to make a music that exists in a dynamic non-equal temperament. This is unsettling — our ears find non-equal tempered scales, where the 12 semitones of the octave are not split into twelve equal divisions, uncomfortable, uneasy<sup>67</sup>. This more than anything is perhaps what adds a darkness to the overall tone of the soundworlds.
- In *Spinstren* I use distance and spatialisation also as unsettling elements. Because the music is never still, or fixed in its position relative to the listener, it instead occupies a space that it never quite possible to get hold of, never quite stable.

In the previous chapter, I cited the Müller-Lyer optical illusion, where empirical information and perceived information do not agree. There is a huge body of research in musical perception, suggesting that the ways in which audiences listen to, and respond to, music is primarily an unconscious process (see for example Chanan 1994 pp.100 ff). The musical worlds of both *The Secret Project* and *Spinstren* are just one part of what I have been describing as a phenomenal performing space,

## The Textual World

Even though it has been said elsewhere, it should be made clear again that both performance works have an almost constant flow of text, most of which is richly poetic in tone, as well as being quasi-narrative. I cannot begin to present an analysis of the text here, but it is clear that the richness of the language, extended as it is (and as we have

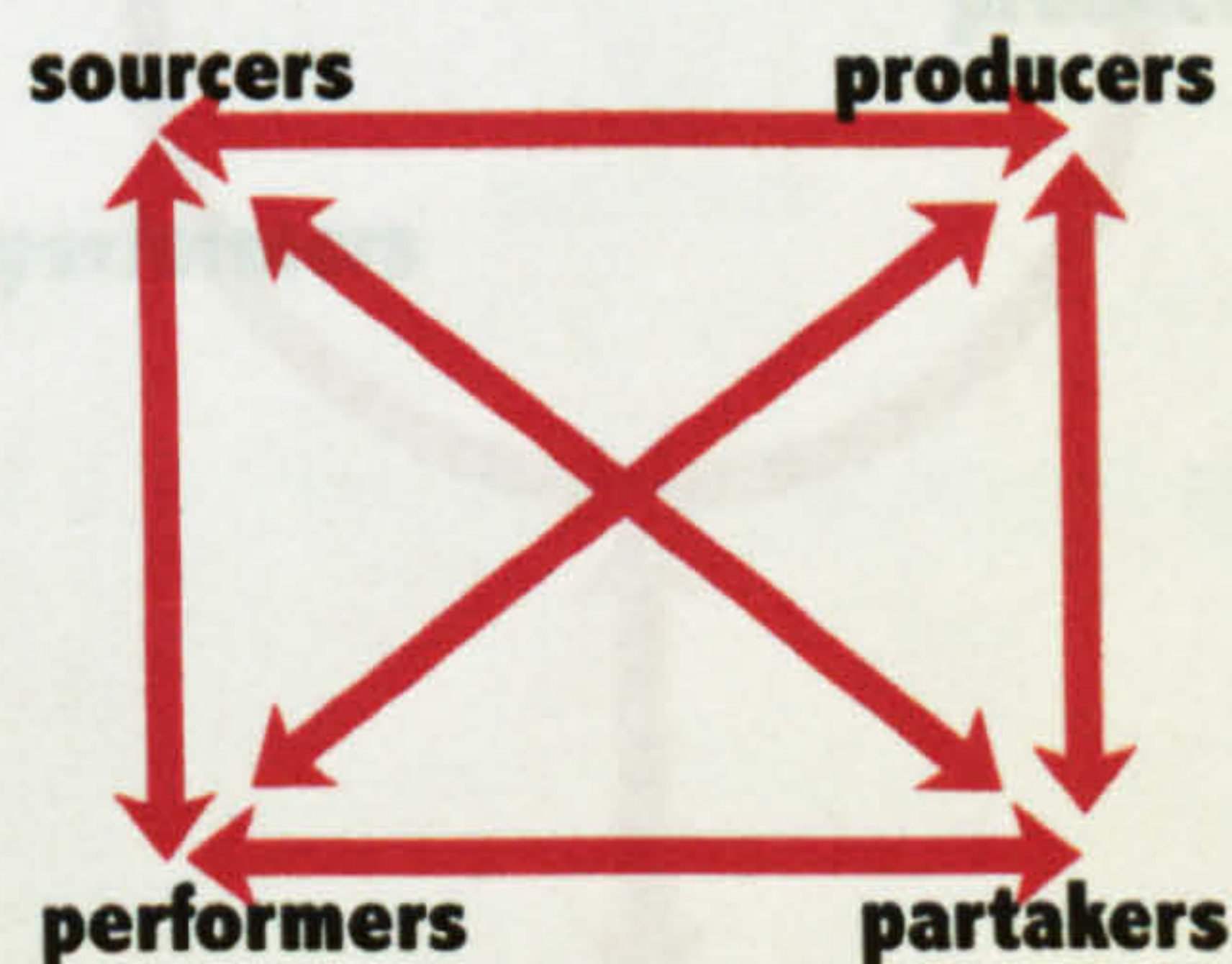
discussed) by the sonic and other technical systems at play, as well as by the choreography, is the underbelly of the poetic worlds we are creating.

## Theatrical Structures

Schechner (2002 p.215) has proposed the 'performance quadrilogue', the four essential elements in making a performance:

1. sourcers (authors, choreographers, composers, dramaturgs, etc.)
2. producers (directors, designers, technicians, business staff, etc.)
3. performers
4. partakers (spectators, fans, juries, the public, etc.)

He proposed numerous different models for the interaction of the elements of the quadrilogue, none of which seems particularly apropos. His map of the quadrilogue 'with all connections possible' (2002 p.215) looks like this:



**Figure 7-1 Schechner's Performance Quadrilogue**

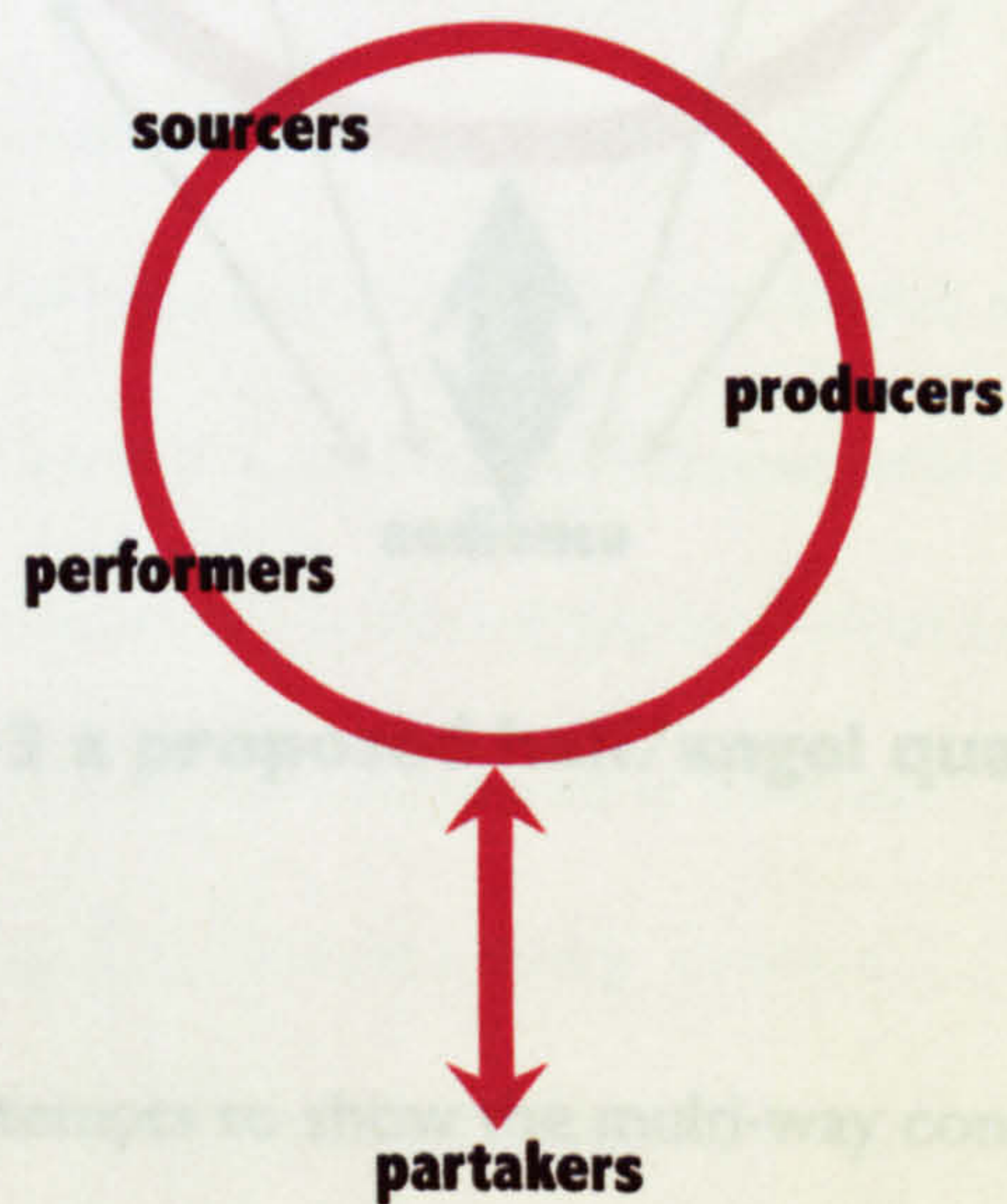


The first difficulty in analysing half/angel's work arises in distinguishing Nos. 1 and 2.

Whilst the conventional theatrical model may differentiate between author as sourcer and director as producer, here that distinction doesn't really apply. Even the element of "performer" is troubled here, as both authors, and directors, are in some way also performers. The only element that holds good as a distinct element is the partakers.

There should be no suggestion, despite its interest in interaction and in experimenting in virtual and phenomenal fields, that our work breaks the fourth wall. The partakers are, of course, interactors in their own right, in the sense that 'there are energies that automatically resonate back and forth between spectators and performers' (Daniel 2000), so they must be included in any quadrilogue we attempt to make to analyse the relationships in our performance work.

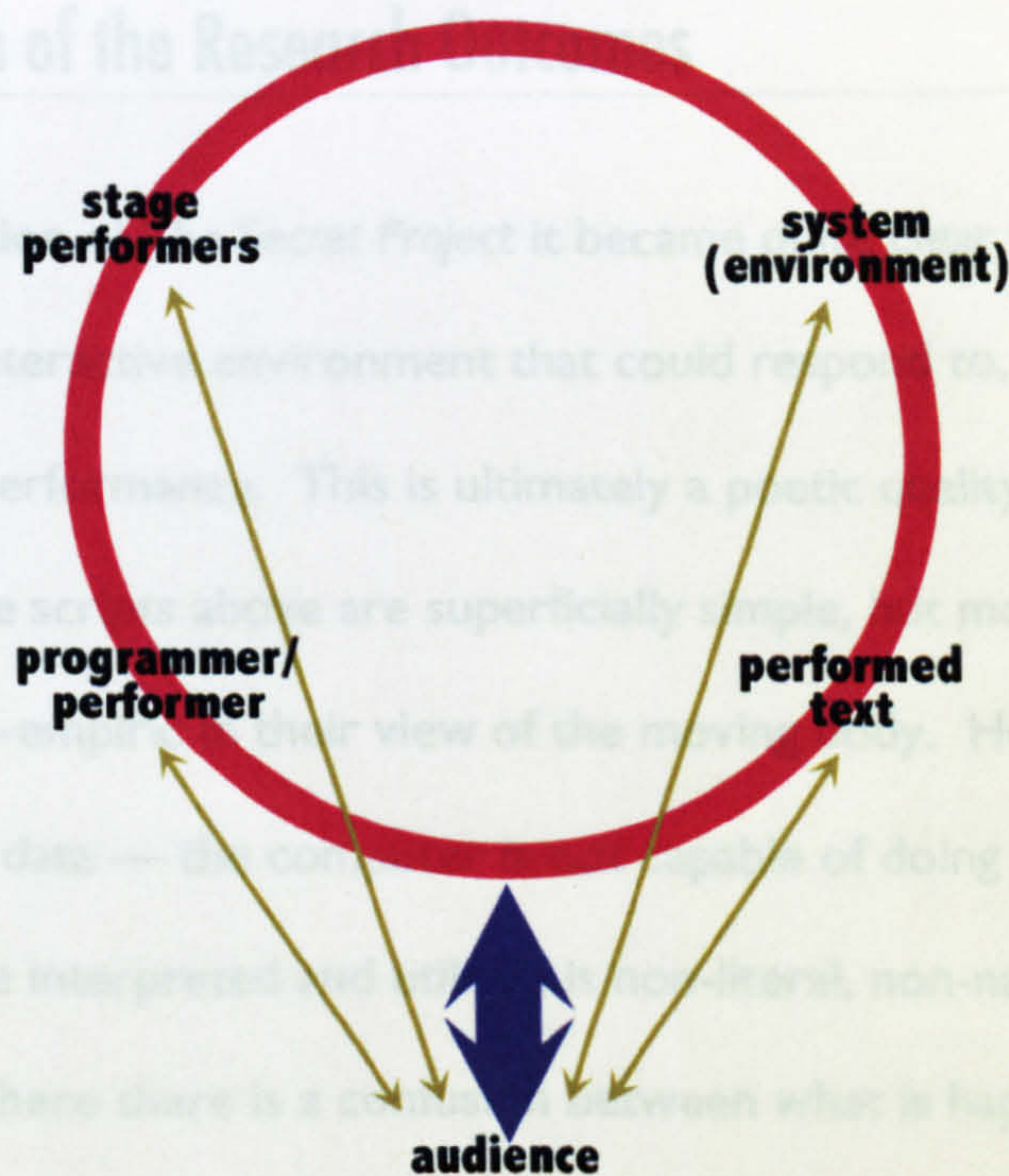
We might propose the following map for half/angel's performance work:



**Figure 7-2 a proposed half/angel quadrilogue**

But this doesn't feel quite right. Perhaps instead we have to look again at Schechner's four elements and use his model as a basis to look at how our performance environment is working.

I attempted to do this, and found that although I was able to represent all the elements of the performance, I was unable to represent the lines between them, which grew ever more complex as I attempted it. The closest attempt looks like this:



**Figure 7-3 a proposed half/angel quadrilogue**

This is unsatisfactory, but attempts to show the multi-way connection between the major elements of the performance: the primary and circular connection between the performers, the environment and the poetic text, and its phenomenal relationship to the audience, the partakers. The circle attempts to suggest that each of the four elements within it are linked to one another directly, as well as broadly.

As we have discussed elsewhere, the essence of the interactive environments is that they are *live* and that the choreography cannot be completely set, just as the music cannot be completely through-composed. It is that liveness, that phenomenological connection, that breaks down the hierarchical links between sourcers, producers, and performers.

Without that liveness, its breath fails.

## Technical Evaluation of the Research Outcomes

---

By 1999 and the evolution of *The Secret Project* it became quite clear to me that it was possible to design an interactive environment that could respond to, and reflect, the phenomenal space of performance. This is ultimately a poetic quality, not a physical or literal one. Most of the scripts above are superficially simple, but more importantly, they are non-literal and non-empiric in their view of the moving body. How? In almost all cases I am using literal data — the computer is not capable of doing other — but the way in which those data are interpreted and utilised is non-literal, non-narrative, and phenomenological. Where there is a confusion between what is happening *within* the body (ie directly from the performer on the stage) and what is happening *external* to the body (ie generated by the system) that confusion is delicious, rich, and deliberately fudged and unclear. Using Jools' language, we are making 'precise' (ie literal, objective) spaces 'designed to be imprecise' (ie non-literal, subjective, phenomenological ).

In *Spinstren* I believe I developed these ideas to a more general, not always interactive, application. *The Secret Project* contains little music or sound that is not generated live (with the exception of a couple of sections); *Spinstren* contains a great deal of music, all of which was intended to be generated in realtime, but very little of which was based on

the motion of the performers. This is a different kind of interactive language — one that is to do with making environments that support and enhance the text and movement, that can be tweaked in performance to do this better. This is the essence of creating an interactive performing environment that is emotionally aware, a poetic space that lives and breathes, a phenomenal space that has its own being.

# Chapter 8 : Some Conclusions

## Emotionally Aware Performance Environments

---

What is an *emotionally aware* performance environment?

**It is an environment not dominated by its technology.** As I began this research, I had already spent some five years working with motion sensing systems, but with little satisfaction. I always felt that the work (mine, and that of others) was dominated by the technology, that the technology was crude, and that the lack of sensitivity in the systems I had used were to blame for these problems. The largest work I had undertaken up to this time, a collaborative work made at the Institute for Studies in the Arts at Arizona State University, at the time one of the world's leading research centres for this kind of work, was made in 1992. *The Last Garden* was a multi-layered work, with a narrative beyond the sensing technologies themselves. I'm not, however, sure that the technology actually added a great deal to the performance. Take it away and the piece could probably have stood on its own quite happily.

My early research with Jools Gilson Ellis with our screen-based work, *mouthplace*, led me into new territory of building interactive environments for text, layered meaning, gendered computer environments, building musical/sonic environments around spoken text. and a discovery of the phenomenal body.

**It is an environment not defined by an empirical reading of space.** When we came to begin work on *The Secret Project*, we began with a residency at STEIM in Amsterdam, where the software *BigEye* (see Appendix I) was made. There we worked with its author, Tom DeMeyer, and I began programming the scripting language for

BigEye. Several breakthroughs happened at this early stage in the research. Until this point when using sensing systems, I had worked primarily with a very defined x-y grid. When we first began using BigEye, we began where most people begin with this software — in colour space (ie reading motion information based on colour). The apparent power of the system to track a number of colours independently, with different behaviours attached to each colour seemed very exotic and powerful. In reality, however, it quickly palled — primarily not because of any lack of responsiveness, but for aesthetic reasons.

That part of Amsterdam was having major renovation work done on its underground phone lines, and there were piles of cable and cable conduit lying around on the streets. One night when we were roaming, we picked up two lengths of a bright blue, semi-rigid conduit, probably each about 3m in length. Back in the studio, we put some fluorescent yellow tape around the ends of the two pieces of piping, and Jools began to use them almost like prosthetic arms, moving in front of the BigEye camera. Suddenly I sensed something new — we both sensed something new. Looking just at the yellow tips — and therefore at an *extension* of her arms, I found the system responding in the most interesting ways. At that point my scripting/programming skills were fairly basic, but I could nevertheless sense that we had discovered something that represented a major step forward.

What that something was, although I can only recognise it now with the hindsight of this body of research, was that I was looking not at her physical (actual) body, but at her phenomenal body. Using the blue piping, I was getting a kinetic picture of the body that was actually an extension of the body. The movements were not her actual movement, but a strange extension and magnification of them. We couldn't explain what we were witnessing, but we knew it was something new.

The downside came when thinking about taking this work to staged performance. While the piping experiments might have been astonishingly successful, dealing with the aesthetics of fluorescent yellow and blue piping was a challenge we simply couldn't meet. Moreover, most of the other experiments we had undertaken in colour space were lacklustre.

Elsewhere, I've discussed the other breakthrough moments, and our discovery of what we can now label phenomenal/emotional space.

As we began to show the work, tentatively, in public, the excitement we felt seemed to be felt by others. This was a lively time in the world of dance and technology. The late 1990s spawned many companies and individuals experimenting in this area, but we seemed to have something unique. The uniqueness lay in the *sensitivity* of the system, its relative invisibility, and its ability to operate in phenomenal space. The piece we made first, and showed most widely, was *breath*, which became the opening section of *The Secret Project*. This was emotional space at its most intense, working with a huge range of the quintessential gesture of life — breath. It marked the point at which I was no longer terribly interested in sensing motion in space, so much as sensing motion, and e-motion, in time. It has been well explored in this thesis.

It was also the beginning of a trajectory of research that moved away from empiric to phenomenal space. I began to look at how I could build environments that seemed to have some awareness of the humans moving within them; that had a level of sensitivity and the ability to read and interact that I had not experienced before.



**It is an environment that is open, responsive, and sensitive to its inhabitants.** For the first time, working not just with Jools but with other professional dancers, I got strong feedback from the dancers about the environments. Clearly they felt that these environments somehow lived and breathed, that they were places *they could inhabit*, and which themselves were *inhabited*. There was, for the first time in more than a decade of this research, an *embodiment* in the environments I was making — they were emotional environments that could appear to sense with a degree of apparent intelligence the emotional and physical state of the person inhabiting them. I use the words “appear” and “apparent” advisedly. Of course there is no sense in which these environments meet any of the criteria for artificial intelligence — and yet they are environments that can cradle a whole human, rather than simply and objectively generate movement data.

## Reading the Phenomenal Dancer

This research has shown that it is possible to infer *invisible data*, and that these data in some way reflect the emotional state or phenomenal space of the performer. I have called this an *inferred data space* because it is information that does not exist empirically, but belongs to the phenomenal dancer.

When someone runs to the bus stop just as the bus is pulling in, externally they are moving in a particular direction at a particular pace on a particular surface, etc. Internally, however, they are hurrying. The use of that word implies all kinds of combinations of data beyond what we can see. We can infer that the person is anxious, that they have

accelerated their pace because they are afraid they are going to miss the bus; we can infer that there is a degree of anticipated anger that the bus driver will choose not to wait for them to arrive before he pulls away; there is worry about missing an appointment. All of this is visible whilst it is invisible. Here there are inferred data. Here is a phenomenological reading of running.

In the context of performance, where an emotional and emotive language is at play, where meaning is embroiled in gesture as it is in textuality, where there is an intertextuality at play in what we are reading on the stage, those inferences can be made and motion that is not objectively visible can be read or understood. Data can be subjectively read, perhaps too in a mixed semiotic space that goes well beyond the literal reading.

Within *Spinstren*, we are not so much using these data to generate information as we are using an emotive soundscape to create emergent meaning based on its combination with the movement and text. Here (with the exception of two sections) we are not working with interactivity at its most literal level, but are working with it at a deeper level and a more unconscious level. Here, too, there are inferred and invisible data at play, this time linking the music we hear with the movement we see and the text we hear.

## Poetic Space

---

In the final analysis, the poetics of *The Secret Project* and *Spinstren* are the heart of the work. This is about aesthetic choices that underlie the entirety of the work. The tone of

those choices are set, in the first instance, by the tone of the poetry, the initial 'text' upon which almost all future ideas are based. The technical systems *behave poetically* in that they respond phenomenally to the phenomenal dancer, they yearn, they are haunted, they weave spells.

There are extraordinary moments that happened in the development of these systems that amaze, take the breath away. In making *breath* we discovered a poetics of breathing; in making *Red Top*, a poetics of almost-singing, in *twice turning* a new poetics of utterance. The richness of the environments provoke a desiring, a longing.

*'I, too, overflow; my desires have invented new desires, my body knows unheard-of songs. Time and again I, too, have felt so full of luminous torrents that I could burst.'* (Cixous 1981)

# Notes

---

- 1 See *A Word about the We* below
- 2 MIDI (Musical Instrument Digital Interface) is a protocol developed in the 1980s to describe an interaction between a device (typically a musical instrument, such as an electronic keyboard, although not necessarily) and the computer. It is a commonly used term and is used throughout this thesis.
- 3 STEIM is one of the world's leading centres for the development of interactive musical instruments. In latter years it has concentrated on the development of software-based performance tools, including BigEye, used extensively in this research. My first explorations with BigEye were done under the watchful eye of the ever-helpful lead programmer, Tom DeMeyer. STEIM is located near one of the main canals in Amsterdam, in an old merchant's house.
- 4 The Banff Centre for the Arts is Canada's premier international arts centre, as well known for its development of artists from across the globe as for performances and exhibitions. I am particularly grateful to Sara Diamond and the Department of Media and Visual Arts (MVA) for supporting and nurturing our early research, particularly in *The Secret Project*. One other work mentioned in this thesis, *Trajèts*, was also developed at the Banff Centre.
- 5 Although the typical reaction to (usually a first) immersion in a VR space was reported to be quite visceral, this was usually associated with simple motion sickness (the same motion sickness reported by pilots training with heads-up navigation devices where navigational data is projected directly into their vision, so that they are reading a virtualised world as well as real one). The response rarely had any emotional depth or significance, and often wore off after the first or second immersion.
- 6 I have seen countless telematic artworks, usually performance based, and have been directly involved in a small number. Most notable of these was a summer workshop held at Arizona State University in the Summer of 2000 in which high-speed telecommunications technology was used to link two remote sites on campus with full-screen two-way video projections. Due to the limitations of the technology, particularly given that the whole thing was also being streamed live to the internet, there was a six-second lag between the two sites. For a gesture to originate at one site, pass to the other, and be reciprocally sent back to the originator took twelve seconds, a ludicrously long time for any kind of genuine interaction.
- 7 *Body Mécanique*, at the Wexner Centre for the Arts, Columbus Ohio, 1999.
- 8 This is saying something. This particular exhibition had an extraordinary number of successful pieces within it — far more than might be expected of any exhibition of this kind of work. These pieces included Bill Seaman's *The Engine of Desire*, Merce Cunningham, Paul Kaiser & Shelley Eshkar's *Hand-drawn spaces*, and *Artificial Changelings* an interactive video installation by Toni Dove, all of which were extraordinarily engaging works.
- 9 Another extraordinary facet of this piece is that the sensation of touching the velvet remains with you for some considerable time after the performance — if you have stroked (or caressed) the velvet surface for ten minutes or more, the tingling remains on your fingertips for an hour or more, afterwards, leaving a visceral taste of the piece in your body long after you have left the installation space.
- 10 Sherrington C. S. 1906 *The Integrative Action of the Nervous System*. Cambridge University Press pp.335-43, and Sherrington C. S. 1940 *Man on His Nature* Cambridge University Press Chapter 11, esp. pp.328-329. Cited in Sacks 1985 p.42ff.

- 
- 11 ...which, while it might be descriptive and meaningful to us, turned out to be a marketing disaster — no one knew what “visual theatre” was, and were unable to put it into a comfortable marketing pigeon-hole. We may still use this term internally, but not in any external marketing!
  - 12 Ascott speaks of a ‘technoetic aesthetic’ where he proposes a shamanic relationship between body, mind, and technology. See Ascott 1999 pp.68-71)
  - 13 ...and often have done. See (Gilson-Ellis & Povall (forthcoming)).
  - 14 ...and include such artists as Todd Winkler, Merce Cunningham, David Rokeby, Char Davies, amongst others.
  - 15 Although, as will be discussed elsewhere, these systems are often capable of creating an implied third dimension by looking at the size of a moving object. If that size changes, it is assumed that it is moving closer to the camera, and therefore a “third dimension” can be created. In reality, of course, the 2-dimensional camera’s lens is creating a cone-shaped picture, so any third dimension we try to extrapolate is going to be false, or at least flawed.
  - 16 Thecla Schiphorst told me an anecdote about her work with Merce Cunningham in the early days of *LifeForms*, the choreographic software that was breaking all the moulds in the early 1990s. Cunningham became very excited by the possibilities of virtual choreography, and made a number of pieces using the technology. The software, however, was capable of producing movement that was physically impossible, as it did not have the basic rules of physical possibility programmed into it. It was possible to move limbs in impossible ways or impossible relations to one another. Cunningham became terribly excited by this movement, which he had never seen before, and proceeded to set it on his dancers, some of the world’s most physically and technically capable. Few other choreographers have access to the extraordinary physical prowess and technical expertise available here, and he was able to make his dancers do what appeared to be physically impossible movement, echoing what had happened in virtual choreographic space. Schiphorst did not mention whether the performers’ own reactions to this were recorded anywhere!
  - 17 ‘Elegance’ is a term used by programmers to describe such things as clean interfaces and coding that works well with the minimum amount of processing power. An ‘elegant’ piece of code is one that produces the ‘smartest’ output for the least amount of code (‘overhead’).
  - 18 This takes us back to Rob Lovell’s notion of *image understanding* as opposed to image processing.
  - 19 Postmodern dance often sought to excise emotive gesture and narrativity, but more recently there has been a re-emergence of these elements
  - 20 We have to distinguish here between videodance, in which the piece is made specifically for the video medium, and dance on video, which is typically a documentation of a live performance.
  - 21 For a detailed examination of this software, see Appendix I.
  - 22 It should be noted however that VNS has a “presence” object that functions in exactly the same way, and is very elegantly controllable as well.
  - 23 When I spoke with Tom DeMeyer about his design of the virtual object into the BigEye shell, he was amazed to hear that I was using it — he had heard of no one else who had. He

---

created the virtual object because “it was a cool thing to do”, but he had no sense of how it might be used.

- 24 In fact, there is plenty of anecdotal evidence that many of these “happening” performances were carefully staged, with far more control and planning over the individual elements than was admitted publicly. Of working with Cunningham, Cage said: *We work in various ways. He chooses an existing piece of music and makes a choreography, or he makes a dance and I either compose for it or choose an existing piece, or invite some other computer to write for it. Our collaboration has been such that neither one of us is at a fixed point. We started at a time when dancers were very proud. They made the dance first, and then a musician came in like a tailor. From about 1952 on, our music was no longer fitted to the dance. The music could go on for any length of time; so there no longer needed to be rehearsals of the dance and music together.* [Kostelanetz 1991 p 20-21] Later, however, he says: *I would like the happening to be arranged in such a way that I could at least see through the happening to something that wasn't it. We'd be out of the La Monte Young fixation ideal. We'd be in the Duchamp-Fuller-Mies van der Rohe business of seeing through.* [Kostelanetz p. 26]
- 25 This involves, critically, choosing a sound world or a source text. To “have an idea for an environment” means that I must prepare soundfiles to be triggered, and decide how the system needs to be programmed in order to set up an environment for this soundworld. This means that I must also have some idea of how the environment should be inhabited — what kind of movement and/or interaction will happen there. This is a lot of prerequisites, so, not surprisingly, this doesn't happen terribly often. Mostly, ideas for environments gestate during rehearsal.
- 26 Algorithmic music is made on-the-fly by the computer, based on a set of instructions — a recipe — that I make. I can specify, for example, what the tonality might be, what kind of shape melodies might have, what rhythmic patterns or layers might emerge, but all is dealt with as probability rather than actuality. Hence, the computer ‘performs’ the music.
- 27 Max was originally made at one of the world's most important music research centres, IRCAM (Institut de Recherche et Coordination Acoustique/Musique) at the *Centre Pompidou* in Paris. It is now maintained and developed by a small US company called *Cycling74* ([www.cycling74.com](http://www.cycling74.com)). It is perhaps the most historically significant piece of software within the realm of interactive music composition, and remains unrivalled in its ability to process musical (MIDI) data and to interact with the physical world.
- 28 *BigEye* is really just a framework with certain capabilities (as are most of the motion-sensing programmes). Scripts (or whatever other mechanisms are offered) are what gives the programmes certain behaviours, turning them into live environments.
- 29 As has already been mentioned, *BigEye* is not actually seeing three-dimensional space, but is only capable of reading the x-y position of a particular object. However, by tracking the size of an object, a virtual third dimension can be implied: when an object moves closer to the camera, it becomes larger; when it recedes, it becomes smaller again. Hence, the third dimension.
- 30 There is a critical difference between these two terms. To amplify a voice means that its source *becomes* the loudspeaker; to reinforce a voice means that its source remains with the performer, but the sound is subtly enhances (reinforced) by electronic means. Many classical venues use sound reinforcement that is deliberately invisible to the audience — they have no idea that they are in a mediatised performance space.
- 31 Why is this a problem? There is certainly a discussion to be had about the fact that the audible sounds that come from a dancer are as important to the phenomenological performing space as the sound of their footfall. When recording dance for video, it is

---

important to capture these sounds — without them much of the life of the movement is lost. Similar to the *utterance* of spoken text (Sacks 1986 p.77), the utterance of movement (the phenomenal space of movement) includes many other visual and audible clues, including footfall and breathing and grunts and splutters. However *in this instance* because I'm creating a carefully crafted sonic space, I want to be able to choose between the sounds I judge to be aesthetically consistent with the work, and those that are not. Moreover, I don't want to add sounds that are artefacts of the microphone ('pops' and 'windnoise') which have nothing to do with the ontology of the performing space, but are rude intrusions. In short, what I'm trying to attain — what "the problem" is — is the be able to reproduce the natural sounds (breathing and footfall) but minimise the unnatural artefacts. *Sometimes* I want to groans and snuffles and grunts, sometimes I don't. These are essentially aesthetic choices in the moment, not a denial of the physicality or the phenemonal space of the dancer.

- 32 Although the original version of the piece use just one spinning wheel, we are now working with two.
- 33 Now known as the Institute for Choreography and Dance at Firkin Crane (and henceforward referred to in this text as ICD)
- 34 Specifically the Department of Media and Visual Arts (MVA). It was at the instigation of Sara Diamond, Director of MVA, that Jools and I were invited for a research residency in 1997. Out of this, and other subsequent residencies at Banff and elsewhere, grew *The Secret Project*. Our final five-week residency was in co-operation with the Theatre Department, and marked the first time that these two departments had co-operated in a research residency and the mounting of a major dance-theatre work together.
- 35 The Secret Project was funded by The (Irish) Arts Council's Interdisciplinary Collaborative Commission Scheme. Other major funders were Middlesex University (UK) and the Arts Council of England's New Audiences Fund (UK). Additional funding and support came from University College, Cork and the Oberlin Conservatory of Music (USA).
- 36 The titles of sections are all internal for rehearsal purposes only, and are not given to the audience.
- 37 BigEye has both a GUI and a scriptable threshold, below which it will see nothing.
- 38 This is a pre-defined variable within BigEye; other variables, like chan are my variables
- 39 The thematic organisation of the piece around the notion of the 'secret' arose initially out of our work with interactive technologies. In such work odd corporeal confusions arise between whether one moves in space or utters text. We are interested in what these new technologies conjure as 'secret', and how our other (Irish) secrets might bleed into such a performative tool. This shifting sense of the 'secret' as bodily / technological as well as cultural has continued to orient our thinking in the making of this work. (JGE)
- 40 For operational reasons, these were located in channels 11 and 12, hence the rather abstruse  $((16/8)+11)$  calculation.
- 41 Initially, this environment was built for Jools. Once it came to making the full performance, however, it was taken on by Cindy. Later in this section I will compare the two versions of the piece.
- 42 *halfangel* often uses tiny glimpses, haiku, and other very small forms within their work. The work is episodic by nature, and this is emphasised by these tiny sections, hereinafter referred to as *mini-sections*.

- 
- 43 This turned out to be a huge mistake, from a marketing perspective. Not surprisingly, no one knew what “visual theatre” was, from producers to audiences. We are now using the phrase dance-theatre to describe the work. This may be a little prosaic, but it does the job rather better!
- 44 The rehearsals took place on three days each week, each in a different space in the city of Cork.
- 45 After one performance, we had a “fan letter” telling us that he would love to know more about the Spinstren — he had heard of them in Irish myth, but couldn’t quite pinpoint where.
- 46 One of the standards for DVD audio, 5.1 Surround is a system that utilises six audio channels: Front Left, Front Centre, Front Right, Rear Right, Rear Left, and subwoofer. It is the most popular of a number of competing formats used in DVD for “Home Cinema” surround sound (these include 7.1 and 10.1 systems). 5.1 Surround is intended to give its audience, sitting roughly in the middle, an enveloping sound experience and is used in cinemas as well as in the home. Dialogue is usually sent to the centre (mono) channel, with the others used to project sound into the room/listening space. All too often, the rear channels are used only for special effects.
- 47 In the past, I had insisted on using two computers: one for the video input and BigEye processing, the other for the sound processing. This gave me the maximum computing power for each process, thus giving me a very responsive system.
- 48 Because of the use of the laptop, I was no longer able to use *SampleCell* which is the hardware sample player I had used in previous work. The computing power required of the software sample player put quite a load on the machine.
- 49 The use of the word ‘grammar’ indicates the conflation of linguistic style, the structure of sentences, poetic/narrative style, and so on.
- 50 I attempted to work with three sources: *The Sleeping Beauty*, the story of Arachne and Athena, as told by Ovid in his *Metamorphoses*, and Jools’ texts about Carla. Each of these had very distinct grammars.
- 51 Made by the German company Emagic, this interface was the first USB interface offering multiple channels (2 in, 6 out). Its main portable competitor, the MOTU 828 (8 in, 8 out) is a firewire device costing more than twice as much, and somewhat less portable. I subsequently purchased an 828 and discovered that its additional speed solved many of the problems I had encountered with the EMI.
- 52 Max is an extensible system, in that there is a significant community of users who make patches available freely to other users. Using some of these patches, I was able to bring work with 5.1 quite quickly, using them as a basis for my own extensions and changes.
- 53 Here I’m using the term distortion not in its literal sense of electronic distortion, but instead to imply a shifting in the sense of the size and position of a sound and its source.
- 54 If you have ever pointed a remote control at the loudspeaker in order to turn down the volume or change the CD track, or point it at the TV to control a videotape, and have it not work because you’re actually pointing it at the wrong device, then you have experienced this particular perception. We always perceive the output transducer as the source of the sound.



- 
- 55 spat4~ is one of the many pre-programmed patches that come bundled with the *Max* programme. Many of these patches are contributed by the community of users, who are used to sharing them as though they were open code (which in a way, they are). I cannot however offer credit to the individual who wrote this patch, as I was unable to find out who it was.
- 56 I could, of course, simply have recorded many of the sound environments used in *Spinstren*, at least those that were not interactive. It would have required a four-channel digital recorder, which I did not have. However, having access to at least some of the parameters in performance is important, even if the environment itself is not interactive. Performance spaces can be radically different, so that some ability to change the nature of the 3D sound is necessary. More critically, performances also vary, and I need to have as much control as possible over the soundscape *in performance* to be able to adapt to a particular performance of the moment. This of course means taking chances and relying heavily on everything working well, but that *liveness* is an important aspect of the work.
- 57 see the Michigan State University psychoacoustic website (<http://www.pa.msu.edu/acoustics/loc.htm>), and the *Journal of the Acoustical Society of America* available online at <http://asa.aip.org/jasa.html> amongst others.
- 58 originally cited in Koehler, *Über unbermerkte Empfindungen und Urteilstäuschungen*. *Ztschr. f. Psychologie*, 1913 pp. 57-58
- 59 Most of the research in this area has been done by telephone companies as they strove to design a telephonic system that could support multiple streams of voice information (this long before digital technologies). A single phone line is divided up into a number of frequency allocations, and any particular voice shifted to fill that particular hole (and then shifted back to make it intelligible at the other end). The task of the phone company was to determine the *minimum* frequency bandwidth that a human voice requires and still remain intelligible. This turns out to be quite a narrow band, around the 6Khz to 8Khz range. Remove all other frequencies from the human voice and it still remains intelligible.
- 60 Radio stations and other broadcast media overcome this by using compression on the voice, which is why the spoken voice on pop radio sounds so “punchy”. The loudness of the voice is squeezed, which has the effect of making the voice appear much louder than it actually is, thus allowing it to compete. This is why adverts on television are suddenly much louder than the programme they are interrupting, even though we have not adjusted the volume level. Adverts, particularly the speaking voice, are heavily compressed so that we cannot fail to hear them.
- 61 This number does not include the calls the operating system is also putting on the system, so that some significant headroom needs to be left in order for the computer to function. Most audio systems will not allow CPU utilisation of more than 60% or 65%.
- 62 The computer on which most of the environments were built was a Macintosh G4 running at 400Hz; the laptop is a Macintosh Powerbook, also with a G4 processor, running at 500Hz. The expectation, then, was that material built on the studio system would run on the laptop. The audio interface turned out to be the weak link.
- 63 I also experimented with Eric Singer’s *Cydops*, which is designed to run as a Max patch. I found this system fell into all the traps discussed elsewhere in this thesis about being too strictly concerned with position above all else. The system simply didn’t seem capable of searching out those invisible data that are so crucial to our work. Attempting to use this system only underlined just how important the subjectivity of the system (or its ability to be not too objective) was.

- 
- 64 *Eyes* is not available commercially, but was given to me as beta software by Rob Lovell when we were working together at a residency at Bore Place in Kent. However, I should note that I have now switched again, this time to *SoftVNS*, which has been referred to (as the Very Nervous System) elsewhere in this thesis. It is so far proving to be faster and more stable than *Eyes*.
- 65 This is one major limitation of using video-based systems, and one that we aim to look at in future research. We are hoping that using infrared may solve visible light dependency issues.
- 66 Chanan (1994 p.71) even goes so far as to suggest that the musical score is paradigmatic of the critical literary theorist's suggestion that the text is always open to interpretation.
- 67 This, too, is a learned system of tuning. Since around the middle of the 19<sup>th</sup> century, equal temperament (which divides the octave into twelve equal semitones) has been the tuning language of western music. As a result, it is entirely ingrained in us, and anything else sounds "wrong", even though in fact equal temperament itself is a compromise tuning system in which tones are, in fact, mathematically "wrong". Had I grown up listening, say, to Indian classical music, then equal temperament would not only sound "wrong" but very colourless and dull.

# Appendices

## **Appendix 1:** **BigEye**

## The Software

---

First written in 1995, when processing realtime video was an entirely more problematic issue than it is now, programmer Tom DeMeyer described the programme thus:

*'BigEye is a computer program designed to take real-time video information and convert it into MIDI messages....It is also possible to use pre-recorded QuickTime movies as a video input source.'*

The user configures the program to extract objects of interest, based on colour, brightness and size. These objects are tracked (up to 16 simultaneously) and their position is checked against a user-defined series of 'hot zones'. These 'hot zones' are drawn by the user and are grouped in 'screens'.

Objects and 'hot zones' interact in three distinct ways: a zone sees a new object, a zone sees an old object moving, and a zone sees an object disappear. Each of these three 'events' can generate MIDI or cause internal program parameters to change. A simple example: the new event causes a note to be switched on, a move event causes a MIDI pitchbend and a disappear event causes the note to be switched off.

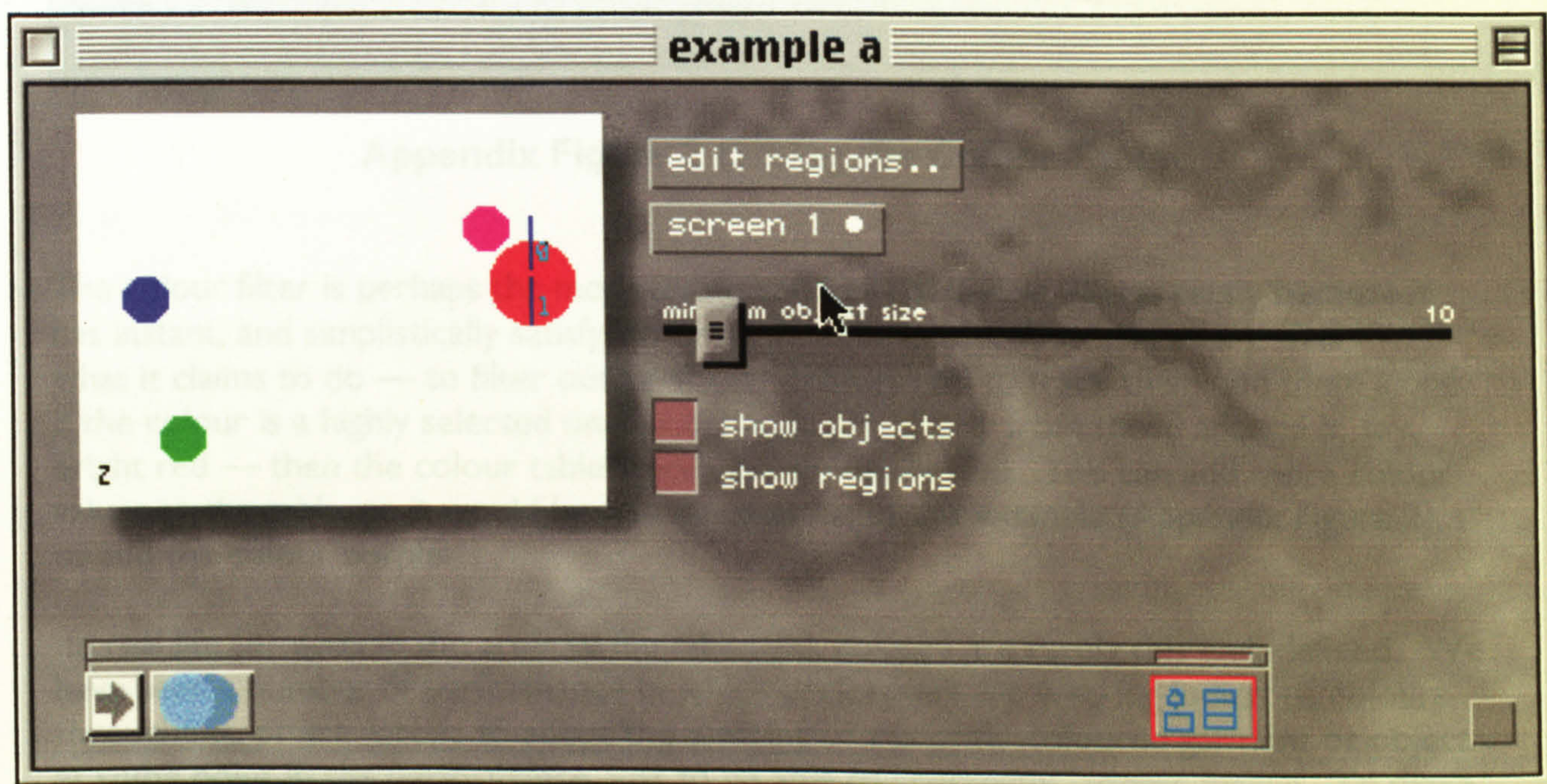
To specify the MIDI messages to be sent out the program provides two distinct modes: a simple mode in which the user can specify MIDI parameters and screen changes; and a powerful, complete scripting language that includes a real time scheduler, conditionals and loops. In the simpler environment one can quickly link to MIDI most of the causing object's parameters, such as position, speed and size. In scripting mode one has many more parameters available.

BigEye provides for 16 independent 'channels' which can analyse the incoming image in different ways, allowing, for instance, green objects to act completely differently from objects of other colours.

Thus, the incoming video signal is first filtered, looking either at difference (see below) or at colour properties. This filtered information is sent to the scripting engine, which calls on a library of predefined behavioural properties, assembled into scripts by the user. There is also a 'simple' level of using the programme, in which all of the behaviours are pre-defined, requiring no scripting at all from the user. Despite the extremely limited possibility of this mode, it is, in fact, used this way by the vast majority of users. Data gathered by Steim indicates that the program has been largely used for museum-based or alternative installations, rather than for performance-based work, and that the programme has been run in its non-scripting form. Version 2.0 is now under development, with an anticipated release date no earlier than Spring 2001. This version is a bottom-up rewrite of the original programme, and will build in many more pre-defined behaviours, and allow users to link behaviours together via drag-and-drop, still obviating the need for individual users to learn the scripting language, but allowing for a much more complex mode of operation.

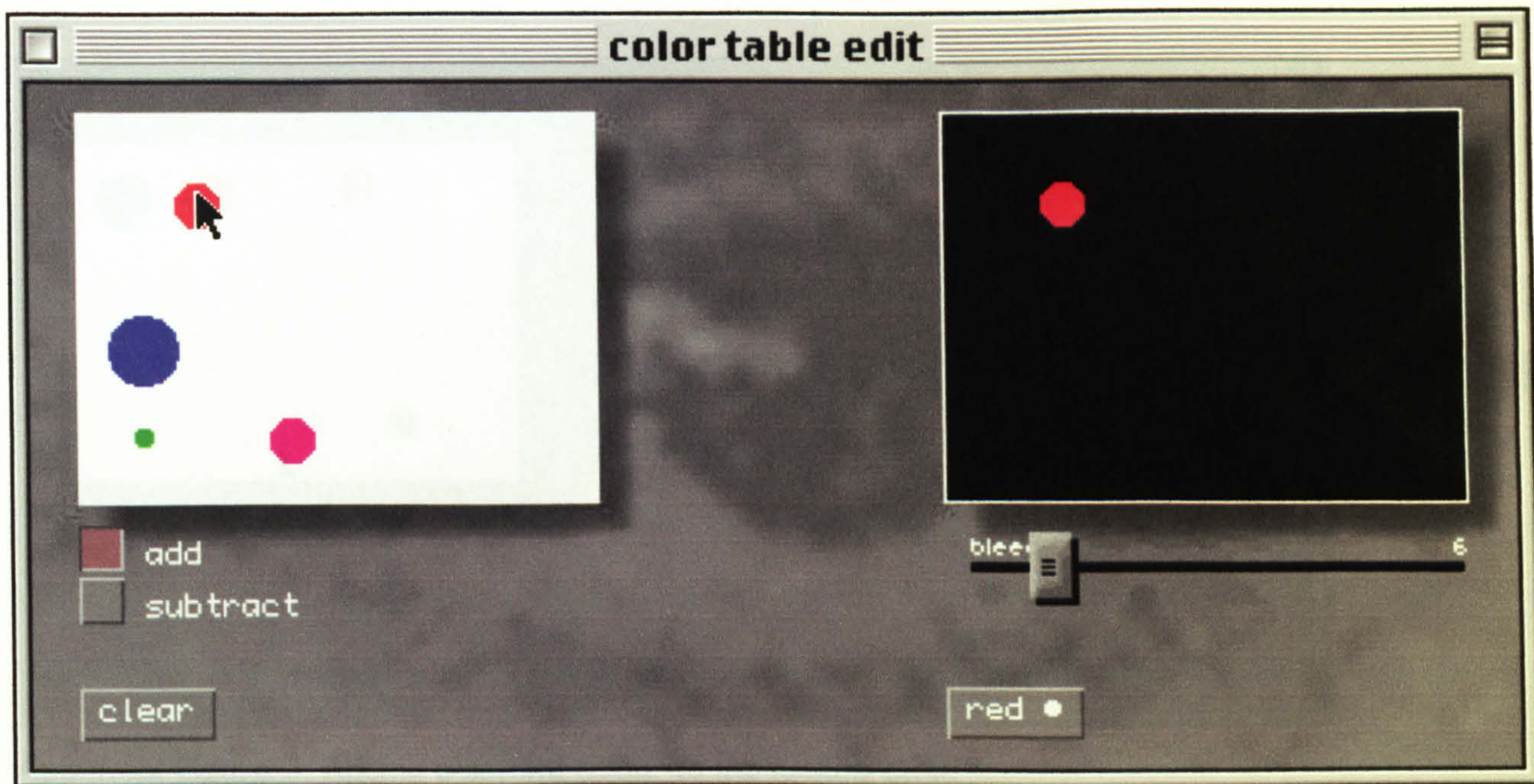
In describing BigEye, I will for the sake of ease use the little animation programme that comes built into the main programme. This animation is very good for testing and troubleshooting purposes, and makes clear what moving human bodies might not. Because the behaviour is entirely predictable, it allows for clearer descriptions of what is happening.

## The Colour Filter



Appendix Figure 1 Main screen of BigEye, with test animation showing

This filter allows you to single out objects in the video image on basis of their colour, allowing you to look, for instance, only at the green and blue objects in a scene, or just at the red objects. It can also be used to single out colours you don't want to look at, where you have for instance a background of a particular colour (or couple of colours) that you're not interested in, and want too interpret at all other colours. (see colour table edit, p 12, 36). When selected in the module bar you are presented with a shortcut button to the colour table editor, and with a pop-up menu which allows you to select the current colour table.



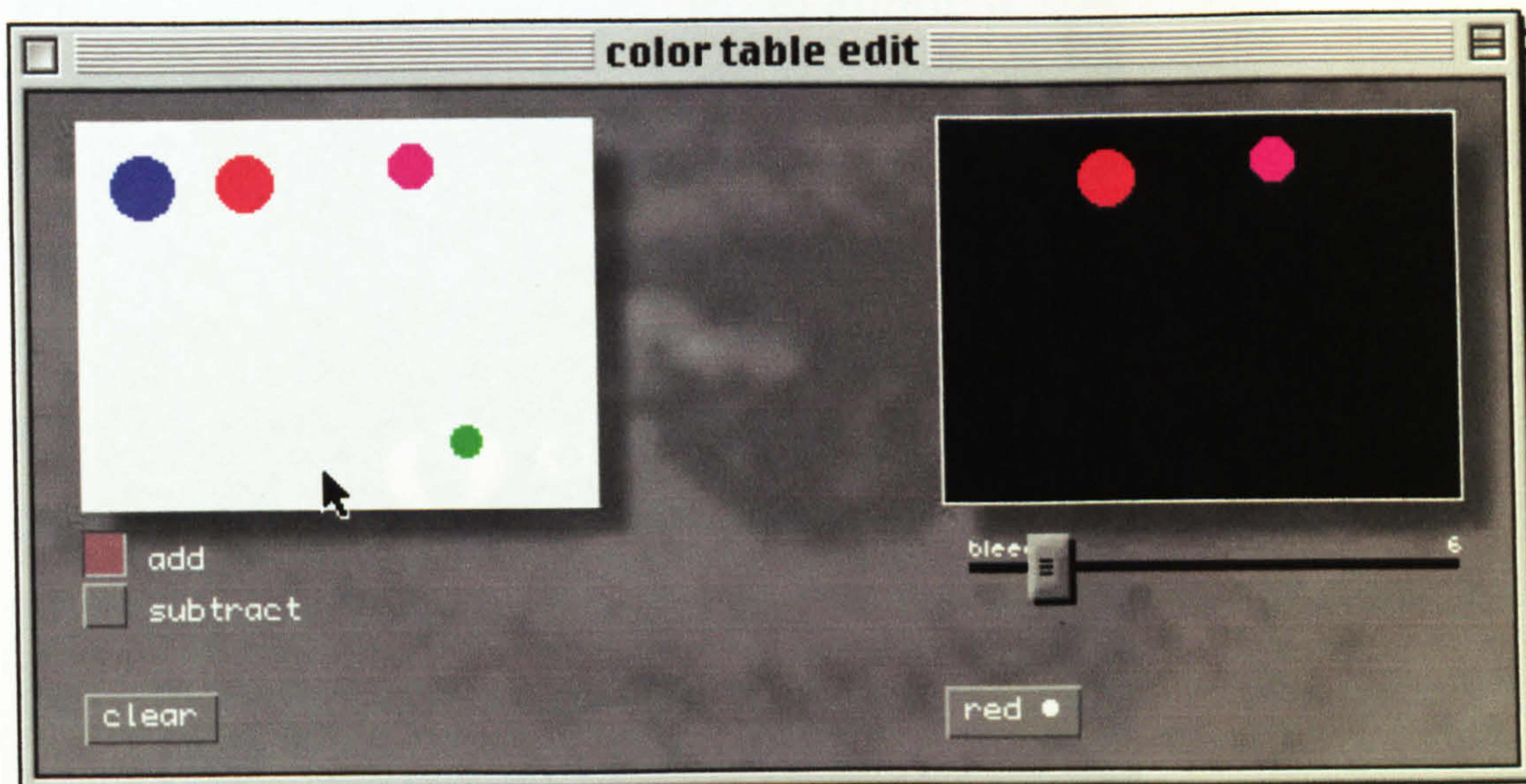
**Appendix Figure 2 *Editing the Colour Table***

*What you do you want to track?*

The colour filter is perhaps the most widely used of the BigEye filters, partly because it has instant, and simplistically satisfying, rewards. The colour filter does very well what it claims to do — to filter out particular colours and to track them and them alone. If the colour is a highly selected one — it stands out clearly from those around it, say, bright red — then the colour table works exceptionally well. You can add more colour values to the table, so it would be a simple matter, in this example (Appendix Figure 2), to add the colour purple:

In real life (or even in the artificial life on stage), colours are rarely this well-defined. We have seen a number of performance in which performers are wearing ludicrous colours throughout, or are forced to adopt the wearing of a brightly-coloured garment or object at some point in the performance, just to be able to “correctly” trigger BigEye. To make life more complex, the colour values you select to be within the table rarely remain constant under the stresses and strains of a stage that is unlikely to be lit uniformly. Thus, as a red glove, for example, passes from one part of the stage to another, the particular red visible to the camera will change, depending on the light. One way around this is to choose a number of closely-related reds when setting up the colour table. This is fine as long as there are no closely-coloured objects on the

*and this means only the differences between the two frames, which will be the edges of moving objects. The reason that this module is less useful than the above two is twofold: firstly, there is no continuity when an object is temporarily stationary it will disappear, generating a 'gone' message. Second: a moving object always generates two 'edges' perpendicular to the direction of the motion. BigEye will use these edges as two separate objects, even though they are generated by only one moving object. The distance module has just one parameter, a threshold value, which forces to black brightness values of the difference below a certain value. Just slide it up and down a bit to see the effect it has in your application. From the BigEye Reference Manual.*



Appendix Figure 3 Adding a second colour to the lookup table

Appendix Figure 4 The Difference Filter

stage you do *not* want to track!

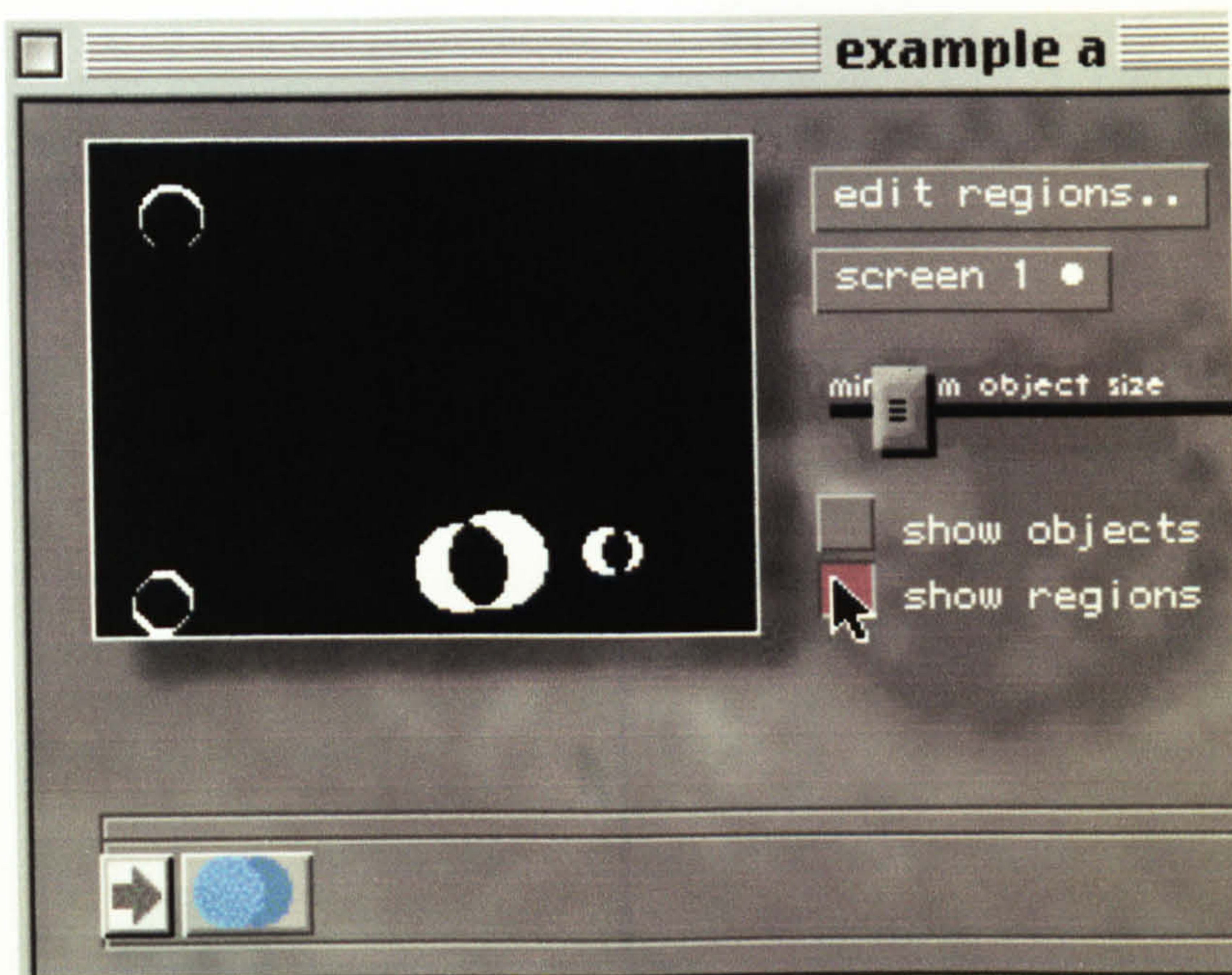
The colour table, however, seems to represent everything that BigEye otherwise seems to countermand. It demands restrictions, be they aesthetic or merely practical, on the performers that can only detract from at least some kinds of work. The colour filter has been used very effectively in installation settings, but I have yet to see it used effectively or subtly in a performance environment.

## The Difference Filter

The difference filter gives you an instrument to pick only moving elements out of an otherwise quite complex scene, independent of colour or brightness characteristics. The filter subtracts two consecutive frames from each other

and thus retains only the differences between the two frames, which will be the edges of moving objects. The reasons that this module is less useful than the above two is twofold; firstly, there is no continuity: when an object is temporarily stationary it will disappear, generating a 'gone' message. Second: a moving object always generates two 'edges', perpendicular to the direction of the motion. BigEye will see these edges as two separate objects, even though they are generated by only one moving object. The difference module has just one parameter, a threshold value, which forces to black brightness values of the difference below a certain value. Just slide it up and down a bit to see the effect it has in your application. From the BigEye Reference Manual.



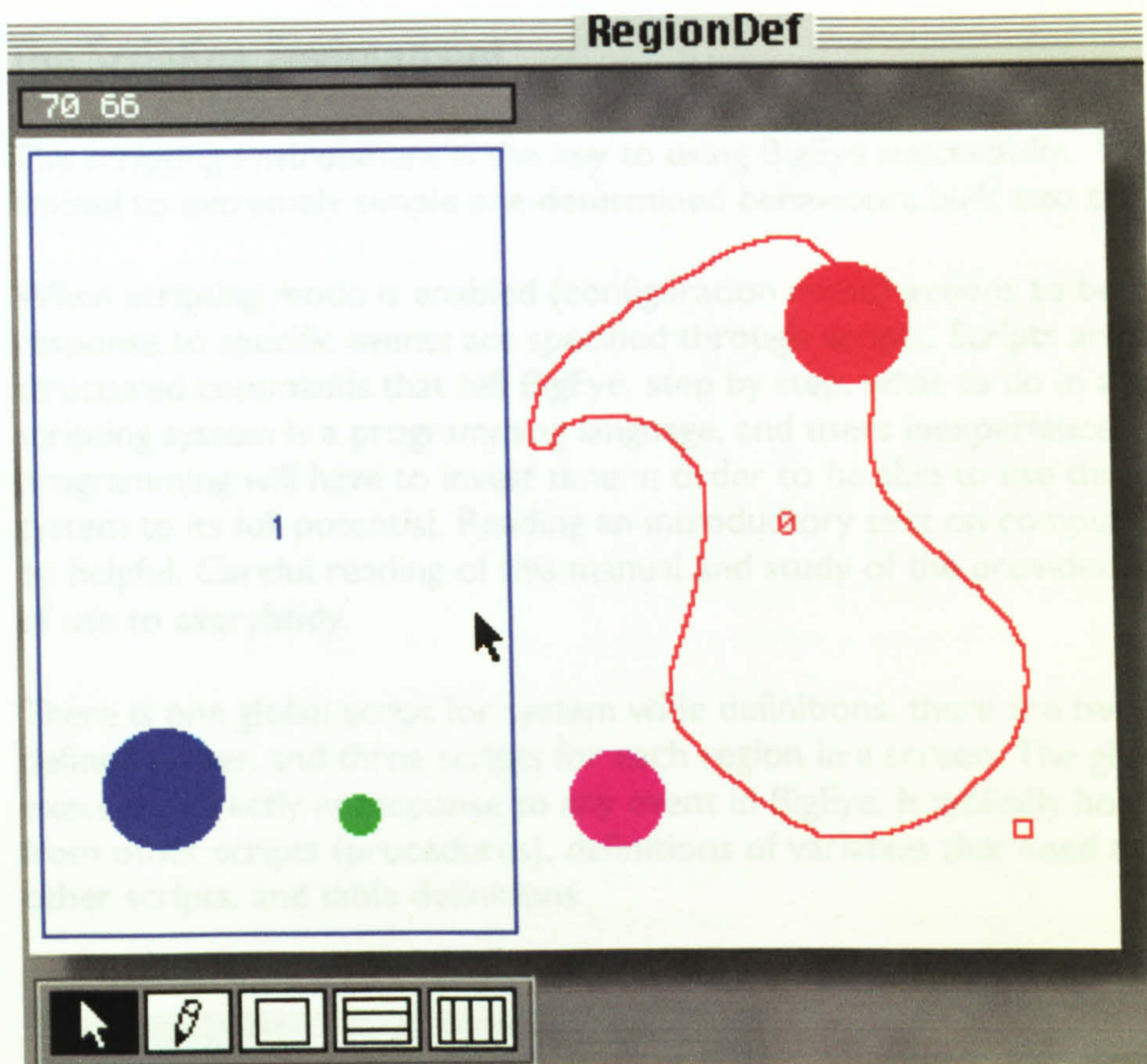


Appendix Figure 4 *The Difference Filter*

The difference filter behaves very differently from the colour filter — its action is a much simpler one that simply compares like moment to like moment. Combined with the scripting environment, however (see below), this filter has the potential to be an extremely powerful sensor of motion. I believe it is capable of seeing not just the physical motion that exists on the surface, but to go lower and deeper inside the meaning of the gesture.

## Overview of regions

Each screen (there can be up to 99 screens in each BigEye file) can divide the video window into up to sixteen regions, which can overlap one another if desired. Critically, each region can behave entirely independently, can run its own scripts, and can develop its own behaviours. In this way, the BigEye environment can become fiercely complex, with many different, overlapping regions all behaving differently. Moreover, scripts can be called on when an object *enters*, *moves within*, or *leaves* a region. An action, such as sensing a *play* command to a MIDI file, for example, might be triggered as an object enters region, and a corresponding action, such as stopping the playback of the MIDI file, as the same object leaves the region.



Appendix Figure 5 Rectangular and freeform regions

In practice, this complexity does not become a huge benefit, and begins to take us into some of the core questions about the use of this kind of software: to what extent must the audience/viewer be able to conceive what is happening? To what extent must the interaction between input and output in this kind of system be clear. Certainly if that interaction or relationship is too clear (ie an arm goes up, a pitch goes up), then that quickly becomes uninteresting. If the relationship is too complex, however, then there is no way the audience will grasp it. In a situation where the stage is divided into multiple regions, each of which has its own complex behavioural structures, that is clearly difficult for an audience to perceive.

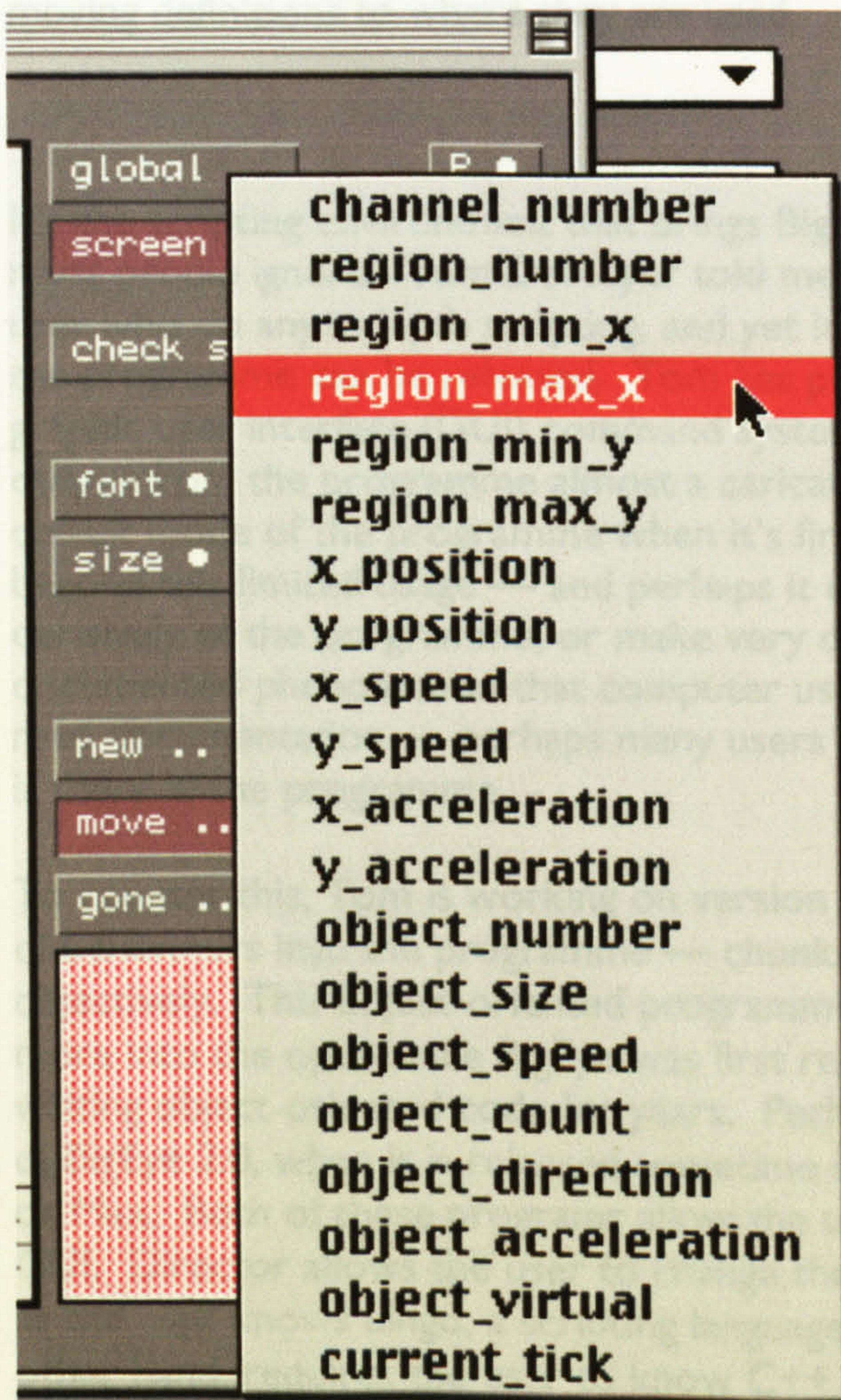
Almost without exception in my work, I use one single region covering the entire stage. I do this because it defines the behaviours within the performance area very clearly. It is problematic enough that I often cannot cover the entire stage with the video camera (if I do, the objects on the stage are so small that they become hard to track — this will become less of a problem in the future. In version 2, the *minimum* window size will be 320X240 (pixels) ; in the current version, the *maximum* window size is only 180X160 .

## The Scripting Environment

The scripting environment is the key to using BigEye successfully. Without it, the user is limited to extremely simple pre-determined behaviours built into the programme.

When scripting mode is enabled (configuration menu) actions to be taken by BigEye in response to specific events are specified through scripts. Scripts are basically a series of structured commands that tell BigEye, step by step, what to do in a specific situation. The scripting system is a programming language, and users inexperienced in computer programming will have to invest time in order to be able to use the BigEye scripting system to its full potential. Reading an introductory text on computer programming may be helpful. Careful reading of this manual and study of the provided example files will be of use to everybody.

There is one global script for system wide definitions, there are two scripts for each defined screen and three scripts for each region in a screen. The global script is never executed directly in response to any event in BigEye. It typically holds code that is called from other scripts (procedures), definitions of variables that need to be available to all other scripts, and table definitions.



Appendix Figure 6 Pull-down menu of available key words

The two screen scripts, called the start-script and the stop-script hold definitions for variables which need to be available to these two scripts and to the region scripts defined

in this screen. These scripts are executed: the start-script is executed when a screen is selected through a screen command in another script or through the screen select pop-up menu in the channel windows. The start-scripts of the screens selected in the channel windows are also executed after a successful init & run command. The stop-script is executed whenever the screen to which it belongs is replaced by another screen, either through a screen command in another script or through the screen select pop-up in the channel window. A typical use of start-scripts is for instance to use them to send program changes to connected synthesizers when new screens are selected.

The three region scripts are called the new-script, the move-script and the gone-script. These scripts strictly belong to the region to which they are attached; variables which are declared in either one of these scripts are available to all three, but nowhere else. See variables (p 27) for a more thorough explanation of these variable validity issues. The new-script is executed whenever an object either materializes in the region or when an object moves into the region from the outside. The move-script is called when an existing object, already in the region, moves. The gone-script is called when an object previously seen in the region either crosses the border and moves outside the region, or the object simply disappears. The simplest approach to programming BigEye is probably to define variables, tables and procedures in the global script and, in the other scripts, to concentrate on the actions to be performed. Once the concept of variables local to a region and variables local to a screen become clear one can 'unclutter' the global script by moving definitions to where they are used.

It's the scripting environment that brings BigEye to life — it's unfortunately the area that most people ignore. Tom DeMeyer told me in conversation that he knows of few BigEye user who do any indepth scripting, and yet it is only through scripting that the power of the programme can be released. Tom has provided the beginning user with a simple graphic user interface (GUI) command system, but it is incredibly limited, and makes any output from the programme almost a caricature of itself. Perhaps it's because this is the default mode of the programme when it's first run that causes most users never to go beyond this limited usage — and perhaps it explains why many people either speak derisively of the programme, or make very dull and uninspired work with it. It's a clearly documented phenomenon that computer users (particularly Apple Mac users) do not read documentation — perhaps many users do not even know the scripting environment is there in the programme.

To counter this, Tom is working on version 2 changes that will essentially build in a series of behaviours into the programme — chunks of scripted code that can be used objectively. This object-oriented programming style is something that has come much more into the open since BigEye was first released, although programmers have been writing object-oriented code for years. Perhaps the closest analogies to the look and feel of BigEye 2.0, when it is released sometime in 2001, will be recent versions of Director, or Max. Both of these programs allow the user to manipulate chunks of code through a GUI. Director allows the user to change the code within the object fairly simply (as long as the user knows Lingo, a scripting language very similar to that of BigEye). Max, on the other hand, requires the user to know C++ in order to write or modify objects.

Crucially, it's the scripting environment that becomes my composing environment — becomes, in fact, the composition. This will be discussed in much more details in Chapters 3 and 4, but it's essential to stress that it is the scripting environment of BigEye that makes it feasible as a creative tool, and as a composing environment. Few users may

be using it in quite the way that I use it in the performance work, but this is part of its strength — the scripting environment makes the programme ultimately flexible enough to support many different uses.

**APPENDIX 2  
MISSING  
FROM  
ORIGINAL**

**PAGE**

**NUMBERING**

**AS ORIGINAL**

## **Appendix 8: Published Essay**



# A Little Technology is a Dangerous Thing...

Published in Dils, A. & Cooper-Albright, A. 2001 (Eds.) *Moving History/Dancing Cultures: A Dance History Reader* Wesleyan University Press, Middletown (USA). 2001 ISBN 0-8195-6464-8

Technology is with us — it's a part of our daily life and culture, and while some fear and decry the technocrats, we also consciously or otherwise revel in their works and indulge their perceived control over us. Computers have made life simpler and better for all of us, whether we are performing artists, academics, theorists or historians. Artists have used technology for centuries, for millennia, even. Artists, in fact, have often been creators of new technologies, refusing to be satisfied by currently available tools. There is a received wisdom amongst the dance community, however, that technology is a dangerous thing — that to use technology as an integral element in a work is to detract from the body, from the choreography and design, from the core of what is dance. It is a thing to be feared. We don't discuss the dangers of using increasingly high-tech lighting systems; we don't question that computers can at some level be used to help choreographers make work; we don't doubt that computers can help us refine and develop notation systems and that video cameras are at least partially successful in their ability to capture work for later retrieval and analysis (that the video camera has become, in fact, an invisible yet essential day-to-day tool for many choreographers).

But what I want to talk about is the use of technology as a creative partner — the use of interactive technologies as an integral part of performance. In the context of my own work to use interactive technology is to use tools for making performance environments in which the motion of the performer can directly influence the sonic or visual environment in the moment. I use the work environment here because, well, there really is no more appropriate word. These environments live only when a body is moving within them — without movement they are silent and dark and lifeless. Similarly, the performance itself cannot happen without the environment. The environment *is* the stage, as well as the instrument upon which the performer is playing. So in an attempt to define our terms, perhaps we can say that *interactive technology* or *performance technology* is that which exists only in an integral (symbiotic?) relationship with the performer, and with all the other elements that go into making a performance.

I'm a composer, trained as a classical musician, with about as much bodily sense as the keyboard I'm using to write this essay. I've used technology in my artmaking for twenty years. I don't question it's validity, I don't doubt it's efficacy; I do constantly question it's appropriateness and value with every piece I make. I've worked with dancers and choreographers for many years, and with interactive technologies for most of this decade — but more importantly I've now worked with the same primary collaborator for five years, which builds an entirely different relationship than the kind that happens in the context of making a single piece. My use of technology, and the art I make, is entirely influenced and affected by the input I receive from my choreographer/writer/collaborator, Jools Gilson-Ellis. I'm not very good anymore at creating work without a computer. I can't really sit down in front of a piece of manuscript paper and "write" a piece a music. The muses just don't speak to me in those terms anymore. Is this a loss? Of course. My long relationship with fickle and ever-changing tools, however, has been rewarding, albeit not without pain. So, given that I cannot question the place of technology within performance making, I will attempt to talk about what I see to be the positive and negative aspects of using these technologies, and how our relationship to them might change as they, and we, mature.

5 Jaron Lanier *1000 Words on Why I Don't Believe in Machine Consciousness*. Originally published in *The Sunday Times* (London), but date unknown.

- 
- 1 'The project has two large components. First, Pinkston and Sharir are developing a new prototype of the Touch Sensitive Dance Floor, an earlier, cruder version of which already exists. To enhance the new prototype, Pinkston and Sharir must program the dance floor to react precisely and locate the exact placement of a particular trigger on the floor. Moreover, the floor must be able to report some movements and ignore others, such as other dancers the floor is not "listening to." In addition, several other existing technologies for motion sensing and tracking will augment the motion sensing capabilities of the dance floor. Each type of sensor has its own advantages and disadvantages, but by using several types of sensors simultaneously, Professors Pinkston and Sharir hope to maximize their ability to track the motions of the dancers without significantly limiting the scope of the performance. Professor Pinkston will develop the software for integrating the various sensors into a single control system.

The second objective is "the work itself," the creation of a new interactive work through the use of the floor and its periphera. The new work will be a structured improvisation involving dance, music, video projection of computer-generated "cyber" figures created by professor Sharir, and possibly robotic lighting. Meanwhile, because of the processing limitations that will remain, the choreographer must develop movement which appears free and unrestricted and can work with the technology without overloading the sensors. If all these challenges are met, says Professor Pinkston, "the work will explore interactivity between movement of the dancer and a system which can detect movement and react to it, generating or affecting music, lighting, and visual images." ' <http://www.utexas.edu/cofa/casa/>

- 2 [http://art.net/~troika/works\\_inplane.html](http://art.net/~troika/works_inplane.html)

**Appendix 3:**  
**Article from *The New York Times***

# Computer Nerds Meet Tutus: A Pas de Deux for Dancers and Technology

By Jennifer Dunning

The New York Times 3/3/99

TEMPE, Ariz. March 1 — The Audio Ballerina's tutu got lost in transit from Germany. The Audio Geisha's kimono emitted sudden, terrifying sounds of an opening coffin when a press photographer's flash went off. There was some worry about what might happen if a dancer perspired with 220 volts of electricity strapped to his body.

But the International Dance and Technology 99 conference went off without a hitch, with four days of nonstop, intense exploration of the meeting point of "human modes and digital codes," as one conference essay put it.

More than 300 participants from 18 nations descended on this sunny, palm-dotted town, the home of Arizona State University, this year's host ("Just schedule it in Arizona in February and everyone will come," an administrator reassured a worried planner early on.)

The biennial Dance and Technology conference began in 1991 at the University of Wisconsin at Madison, but this was the first to aggressively seek international participation.

By Sunday, when the conference ended, some 70 events had sped by. Plugged-in performers were everywhere, demonstrating everything from speakers to the uses of electrodes in dance.

Off-the-shelf technology and software were the tools in most sessions, which ranged from a talk on "Cunningham, Collage and the Computer" and one by the veteran choreographer Denial Nagrin exploring the "uncomfortable fit" of the competing visual forms of dance and camera to such esoteric topics as "Escape Velocity" and "The Desire of the Vern: Inverting Cartesian Space."

Participants also learned how to design on-line Internet courses and studies CD-Roms on teaching ballet, on music for dancers and on codifying Bharata Natyam dance.

One popular spot was the on-campus Web Café, furnished with comfortable chairs, tables, computer work stations and a dance floor. On the floor, a video camera, sensing moving bodies, fed information that triggered the projection onto a screen of Web pages with material pertinent to dance, technology and the conference.

Even lunch time was not sacrosanct, accompanied as it was by keynote speeches by Bob Bejan, a former dancer who is the director of sales and operations on-line at the Microsoft Corporation, and by Lowry Burgess, a professor of art and former dean of the College of Fine Arts at Carnegie Mellon University (The conference Web site is <http://isa.fa.asu.edu/IDAT99>.)

While the technology seemed at least a dysfunctional as the most difficult ballet star or accident-prone modern dancer, much of what was on view suggested that the opportunity for play in the field of dance technology is enormous, for the viewer and the creator.

“I got a little laughter on my right toe,” Robert Wechsler said impishly but with undisguised delight in a demonstration of the Touchlines program developed by his Palindrome Performance Systems, based in Nuremberg, Germany. The movement of his toe, caught by the camera and transmitted to a computer, had triggered a portion of a musical score that included children’s laughter.

In interactive installation by Sarah Rubidge and Gretchen Schiller, for example, the audience became the creator in a limited way. Seductive dances of video imagery were “choreographed” by viewers walking and shifting on surfaces embedded with pressure pads that triggered reactions in the electronic systems controlling the images.

“Falling to Earth”, an electronically mediated, collaborative multimedia piece by Ellen Bromberg, John D. Mitchell and Douglas Rosenberg, and Seth Riskin’s “Light Dance” created the sense not so much of new ways of performing or looking at movement, but of a plunge into a theatrical experience and even a physical space unbounded by the normal parameters of live performing.

Valerie Alpert’s “Wearing Me Out” incorporated technology that included morphing to drop the viewer into the mind of a woman comically dissatisfied with her appearance.

And the delicacy of Jools Gilson Ellis’s performance in “The Secret Project,” created with Richard Povall, suggested that motion-sensor technology could sometimes create effects as subtle as live dancing.

One popular topic was the ideal degree of connection between artist and machine. It was easy, Mr Wechsler dais, to lose “the fine line between honest artistic goals and tricks.”

One the other hand, the techno-choreographer Isabelle Choinière suggested, a more refined and sophisticated approach to the use of technology in dance requires that artists become familiar enough with the technology to develop a relationship as intimate as that between dance partners.

There were heated discussions about the redefining of the roles of dancer, choreographer and audience — and of the nature of performance — inherent in much of the technological work. Most of the participant stressed that the field was new. The biggest audience hit of the conference’s two formal proscenium-stage programs was a low-tech work by Sean Curran, who confessed in a panel discussion that he didn’t even own a computer.

There were heated discussions about the redefining of the roles of dancer, choreographer and audience — and of the nature of performance — inherent in much of the technological work. Most of the participant stressed that the field was new. The biggest audience hit of the conference’s two formal proscenium-stage programs was a low-tech work by Sean Curran, who confessed in a panel discussion that he didn’t own a computer

**Appendix 4:**  
**All BigEye scripts (The Secret Project)**

```

: //lingua proc
proc scalex()
    var x,regionwidth;
    regionwidth = region_max_x-region_min_x
    x = x_position-region_min_x
    scalex=(x*127)/regionwidth
endproc

// ----- chorda ----- //

// -- m -- //
var markCh=0 // declared timer var

display(object_speed)

if(object_speed>30&&current_tick>(markCh+80)) {
    note(0, 50, object_speed*1.5, 4)
    markCh=current_tick
}

end

// ----- twice turning ----- //

// -- m -- //
var dur=0
var window=48
var checking, count, accum // this is for the bassoon voice control
count=current_tick-checking
if(count<20) accum=accum+1 // allows the accumulator to grow

chan=int((x_position/158*2)+9)
dur=(1/1+abs(object_speed))
    if(dur>80) window=(window+0.25)
    if(dur>60) dur=dur*20
    if(accum>650 && (random(600)<15)) note((random(16/8)+11),
random(36)+48, random(40)+80, random(5)*6+5)
    if(accum>1000 && (random(600)<15)) note((random(16/8)+11),
random(36)+48, random(40)+80, random(5)*6+5)
    if(accum>2500 && (random(600)<15)) note((random(16/8)+11),
random(36)+48, random(40)+80, random(5)*10+5)

    if(count>80) accum=0

display() // piece ends when window is around 94
note(random(16/8)+9, (x_position/158*3+window), object_acceleration*10,
dur/5)

checking=current_tick
display(window)
end

// this is still very problematic in that we seem to have lost the
// durations of the text that were working
// so well before. Look at the original script again.
// we also seem to have lost the window on the text!

```



```

// ----- lingua french ----- //

// -- m -- //
var mark=0
var markL=0
var markR=0
var xwidth=0
var ch=0

xwidth=scalex()
display(xwidth/127*41+36)

if(object_speed>1&&current_tick>(markR+250)) {
    ch=(random(8)/4)
    ctr(ch, 10, xwidth)
    note(ch, ((xwidth/127)*41)+36, random(30)+70, 500)
    markR=current_tick
}

end

// ----- murmuring ----- //

// -- m -- //
var checking, count, scaledx, thresh, accum
//checking collects the time at the end of the event
//count calculates the time since the last event
//accum is an accumulator for the number of short events. The
accumulator //continues to count until there has been a long gap between
events. Once it //reaches thresh, the second voice is triggered thresh
is a threshold for adding //a new voice

scaledx=(x_position/(region_max_x-region_min_x)*127) //sets scaled
x_position
count = current_tick-checking

if(object_speed>6) {
    note(1,object_speed*1.5,object_acceleration*4,5)
    ctr(1,10,random(120)) //pan of voice
    note(0,object_speed*1.5,object_acceleration*4,5)
}

if(count<20) accum=accum+1 //if the time since the last event is short,
then //accum is incremented

if(accum>100 && object_speed>15)
note(2,scaledx,random(64)+64,object_speed/4)
if(accum>250 && object_speed>15)
note(3,scaledx,random(64)+64,object_speed/2)
if(accum>450 && object_speed>15)
note(4,scaledx,random(64)+48,object_speed/6) // bassoon voice

if(count>80) accum=0

checking = current_tick //collects time at end of event

display(accum)
end

// ----- lingua-irish ----- //

```

```

// -- m -- //
var mark=0
var markL=0
var markR=0
var xwidth=0
xwidth=scalex()
display(xwidth/127*37+54)

if(object_speed>1&&current_tick>(markR+250)) {
    ctr(14, 10, random(127))
    note(14, ((xwidth/127)*37)+54, random(24)+76, 500)
    markR=current_tick
}

end

// ----- breath ----- //

// -- n -- //

// -- m -- //
var chan=0
var rang=0

chan=int(object_speed/8)
if(chan==1) rang=10
    else if(chan==2) rang=24
    else if(chan==3) rang=20
    else if(chan==4) rang=22
    else if(chan==5) rang=14
    else if(chan>6) chan=6
    else rang=1
if(object_number==1&&object_speed>2) note(chan, x_position/158*rang+48,
object_speed*5, 1/1+chan)

display(chan)

```

Appendix 5:  
**Article from *animated***

# The Secret Project

A quiet revolution in new media work by **Sophie Hansen**

Interdisciplinary collaborations, especially those involving new technologies, are flavour of the month for dancemakers, audiences, critics and theorists alike. And whilst a frenzy of cross-artform fervour unites choreographers with artists of every hue, much of the dialogue feels more like a clash than a collaboration.

In this attention-grabbing context it is hard to spot the value of quiet companies like *half/angel*, based in England and Ireland under the direction of Jools Gilson-Ellis and Richard Povall. Born in 1995, from a synthesis of their skills as, respectively, choreographer, dancer and writer, and composer and digital artist, *half/angel* has evolved organically over a series of projects into a company with a body of knowledge which is giving rise to subtle shifts in performance paradigms. Yet *half/angel* work outside the spotlight of much contemporary creation, perhaps because both partners are also academics, (Gilson-Ellis currently lectures in English at University College, Cork and Povall is the senior fellow at Middlesex University's RESCEN, the newly created Centre for Research into Creation in the Performing Arts, he also teaches part-time at Oberlin Conservatory of Music in the United States). Perhaps however, it is more due to these artists' slow and thorough creative process which led to the publication of the CD-Rom, *mouthplace*, in 1997, and progressed into live performance only after years of research at international new media centres. *The Secret Project*, the new dance theatre performance, installation and website which the group previews at The Banff Centre for the Arts, Canada with the world premiere at The Firkin Crane, Eire, is a paradigm of *half/angel*'s exhaustive

approach and may finally lead to a wider recognition of their work. This production is such a clear expression of their aims and such a logical evolution of the ideas explored within the CD-ROM, that it has been applauded wherever it has previewed, even before such expert audiences as those gathered at the International Dance & Technology Conference in Arizona early this year.

*The Secret Project* is the synthesis of extensive research into interactive technologies. In the CD-Rom, Gilson-Ellis and Povall unpicked their personal skills and built them back together in an exploration of the relationship between text, image and sound. Fascinated by the quest to mediate experience through technology, the artists built a number of complex interfaces which confounded typical linear on/off approaches to interactivity and created a confused and confusing series of liberating relationships between virtual and physical worlds. The experience of this complexity led to a desire to further explore the human/digital relationship and the artists plunged into experimentation with MIDI software which converts motion into information which can be processed in a number of other ways. Exploring the potential for movement to trigger pre-recorded and live sound, video, still images and lighting, set up a further set of challenges to *half/angel*'s attempts to redefine the body in space. Instead of pursuing the immediate gratification of the spectacular effects available to choreographers of responsive environments, they focused upon the refinement of their subtle techniques. In 1996, residencies at the Studio for Electronic and Instrumental Music (STEIM) in Amsterdam, and Firkin

Crane Dance Development Agency in Cork, began the creation of the live production which is now coming to a close in a pre-production residency in Banff.

*half/angel* adapted the BigEye motion capture software to find ways of responding to the quality of movement and the relationships between more than one body in the space. Having gained a certain fluency with the interfaces between text, sound and image in their screen-based work, Gilson Ellis and Povall were clear that live performance provided the logical progression of their explorations into the human dynamic driving all interactive technology. The addition of live manipulation of environmental effects such as sound and light offered the "entanglements" where *half/angel* locate the key to creative explorations of space. Povall says: "In such work, odd corporeal confusions arise between whether one moves in space or utters text. We are interested in what these new technologies conjure as 'secret' and how our other (Irish and French) secrets might bleed into such a performative tool. Such secrets are corporeal, cultural, wrought from pleasures and repressions. This shifting sense of the 'secret' continues to orient our thinking on the making of this work, where the utterance of text can control movement and movement can control the utterance of the text." In the performance, personalities merge with digital environments in ways that are utterly inter-dependent. The nature of the movement triggers the nature of the sound, which in turn has an effect upon the movement of the performer. Povall is clear that, "this represents a different kind of compositional paradigm in which

traditional notions of composition - building whole, complex structures that are reproduced or interpreted by performers - are fundamentally challenged. As the artists adapt the technology to meet their demands, the software becomes extension of the body, with all the invisible nuances of human motivation. Quiet, moving, and modestly unspectacular, *The Secret Project* which I observed was an inspirational obliteration of much new media work, where ideas and emotions prevailed over the modes of their communication.

In the hour long performance, Gilson-Ellis will dance with fellow Irish based choreographers Cindy Cummings and Mary Nunan. There will be performances in Cork in November 1999 before further Irish and English touring in Spring 2000. In other spaces the work will be shown as an installation, where the audience discovers secrets of the production through their own movement. A series of "haptic" touch-sensitive sculptural boxes, linked by ethernet to digitised sound files, are activated by the movement of the audience's hands, releasing "sonic ghosts" in fragments of text, breaths and sounds responsive to the quality of the movement. The website: [www.adpa.mdx.ac.uk/rescen/rp/secret/secret.html](http://www.adpa.mdx.ac.uk/rescen/rp/secret/secret.html) gives further opportunities for individual interaction and takes the project to the worldwide audience it deserves. It now remains for *The Secret Project* to find its audiences before Povall and Gilson-Ellis move with their ideas into another protracted period of research, leaving us to roll with the punches of less measured new media explosions.

*Sophie Hansen, freelance writer* animated autumn 1999 pp36-7

## **Appendix 6: Sample of Generated Text**

Sample of generated text, based on English translations of Ovid's retelling of the Arachne myth. **(extrapolated from a Markov chain of the original text)**

*...and stupidly confident and eager for victory, she rushes on her fate. For Jove's daughter refuses not, nor again warns her or puts off the contest any longer. They both set up the looms in different places without delay and they stretch the fine warp upon them. The web is bound upon the beam, the reed separates the threads of the hammering slay tap it into place. They speed on the work with their mantles close girt about their breasts and move back and forth their well-trained Then Athena assumed the form of an old woman, put false locks of grey upon her head, took a staff in her face she answered the disguised Athena: Doting in mind, you come to me, and spent with old age; and it is too long life that is your bane.*

*Go, talk to your daughter-in-law, or to your daughter-in-law, or to your daughter-in-law, or to your daughter-in-law, or to your daughter, if such you have. I am quite able to advise myself. To show that you have done no good by your advice, we are both of the hammering slay tap it into place. They speed on the work with their mantles close girt about their breasts and move back and forth their well-trained Then Athena assumed the form of an old woman, put false locks of grey upon her head, took a staff in her face she answered the disguised Athena: Doting in mind, you come to me, and spent with old age; and it is too long life that is your bane. Go, talk to your daughter-in-law, or to your daughter-in-law, or to your daughter, if such you have. I am quite able to advise myself.*

*To show that you have done no good by your advice, we are both of the warp, the woof is then threaded through them by the sharp shuttles which their busy fingers ply, and when shot through the threads of the warp, the notched teeth of the hammering slay tap it into place.*

*They speed on the work with their mantles close girt about their breasts and move back and forth their well-trained Then Athena assumed the form of an old woman, put false locks of grey upon her head, took a staff in her hand to sustain her tottering limbs, and thus she began: Old age has some things at least that are not to be despised; experience comes with riper years. Do not scorn my advice: seek all the fame you will among mortal men for handling wool; but yield place to the goddess, and with humble prayer beg her pardon for your words, reckless girl.*

*She will grant you pardon if you ask it.*

*But she regarded the old woman with sullen eyes, dropped the threads she was working, and, scarce holding her hand to sustain her tottering limbs, and thus she began: Old age has some things at least that are not to be despised.*

## **Appendix 7: Published Paper**



# Making Emotional Spaces in *The Secret Project*.

## building emotional interactive spaces

Richard Povall

Rescen (Middlesex University) & half/angel

Published in

Ed. Ascott, R. 2000 'Art, Technology, Consciousness: mind@large'

intellect Press, Exeter UK ISBN 1-84150-041-0

***Abstract:*** We (half/angel<sup>1</sup>) have chosen to move beyond the purely mechanistic methodologies that are so often found within interactive performance systems, which typically have adopted the language and physicality of the machine — buttons and triggers and virtual switches — as their basis of operation. We found that approach too limiting on the expressive content of the movement languages we were working with, generating a very poor relationship between content and performative expression. Instead, we have found ways to look inside the body, inside the *intention* of a movement — to work with emotional rather than purely physical space.

**Keywords:** *emotional computing, kansei, interaction, motion-sensing, performance, machine consciousness*

*For better or worse, in reality we are not centred in our head. We are not centred in our mind... Bodies and minds blur across each other's supposed boundaries. Bodies and minds are not that different from one another. They are both composed of swarms of sub-level things."* Kevin Kelly, *Out of Control* p. 64.<sup>2</sup>

The work of *half/angel* is based in transparent interactive spaces that are physically and emotionally intelligent. What do I mean by this? Our interactive performance work, developed only after several years of practice-based research, attempts to work with the

consciousness of the living body as an emotional entity. In using motion-sensing systems to create a live, interactive environment, I try to programme our systems to capture not literal movement, but overall movement content and impulse. I have rejected the more common methodologies of moving further and further towards a literal, accurate, detailed interpretation of the physical body, and instead use speed, direction, acceleration, and size of moving objects to gain an *approximation* of the kind of movement that is occurring in the performance space. Although I am able to sense an object's position in space, I rarely use this data, usually considering it irrelevant or unnecessary. Instead, I am looking instead for information from the movement that tells me *how*, and therefore possibly *why* the performer is moving. I am searching as much for the emotional intentionality of the movement as I am attempting to map the actual, literal physical movement.

In this I am helped by a wonderful feature in Tom DeMeyer's software package, BigEye<sup>3</sup>, which provides me with 'virtual objects'. In *BigEye* I am trying to identify, and then track, moving 'objects' within the performance space. These objects can be a whole human body, or a small part — a finger or a foot, for example — my choice, even my choice on the fly during a performance. The virtual object simply carries on where the physical object left off. So, if a live object is travelling leftward on the stage at a given acceleration, and then stops — the virtual object will keep on going for a little while longer. This gives my data a roundness, a fluidity, that it would not otherwise have. The data flow doesn't just stop when the body stops, it sort of gently fades and dies (like we all do, I suppose). I have no idea why Tom built the virtual object — but I bless him every day I work with this system. Last time I spoke with him, I mentioned this, and he was amazed to hear that anyone was actually using this feature — it was the first time he had come across it actually being used.

There has been some recent debate challenging the simplistic notion that all human emotions and mental phenomena are rooted purely in the chemical reactions of the brain — that the brain is not the be-all and end-all of human existence — that there is some thing *other* that is involved in the process. This, too, may ultimately be a chemical process, but one that is more ephemeral and unknown than the calculations of the conscious and sub-conscious. The emotion engine that drives our humanity is still extraordinarily undefined, and will perhaps remain so. If an interactive performance system can be designed that shows an awareness of the emotion engine, and *cares* that it exists in addition to the more objective processes of the body, then perhaps we have a direction that will yield a more successful machine consciousness.

When working with interactive technologies and dance, we are indeed challenging the notion that all thought and emotion originates in the brain, with a consequent filtering out to the mouth, the vocal cords, and the limbs and other muscle groups in order to express it. No, we are challenging an inversion of that idea — that all physical acts reside in the body, not the brain, echoing the separation of mind-state and body-state that has become fashionable in consciousness research. In dance we tend to think, in our desire for a kind of Puritanism that is still remarkably pervasive, that the trained body is making beautiful shapes because it has been told to make beautiful shapes, and has then rehearsed those beautiful shapes until is capable of reproducing them *without thought*. It can be argued however that much of modern dance, particularly when there is an element of improvisation in the work, is a highly cerebral and emotional (these two are not necessarily

in opposition) activity, and that the emotional content of the movement is overtly presented to the viewer. When we try to look at these movements with a computer eye, though, we ignore all the subliminal information (however overt it may be) and choose to concentrate purely on the physical activity of the body — we try (in vain) to assess the movement of each performing body with a deadly accuracy, only to miss the point entirely on most occasions. Better that we should try to look beyond, or underneath the skin of, the overt physical act.

Pepperell says:

*Consciousness can only be considered as an emergent property that arises from the coincidence of a number of complex events. In this sense it is like boiling. Given sufficient heat, gravity and air pressure the water in a kettle will start to boil. We can see what boiling is, we can recognise it as something to which we give a name. We do not consider it mysterious, yet we cannot isolate it from the conditions that produced it. We cannot isolate consciousness from the conditions that produce it any more than we can isolate boiling. Consciousness is a property that emerges from a given set of conditions. Pepperell The Post-Human Condition p.6. <sup>4</sup>*

So, too, the physical manifestation of a choreographed or improvised movement is more than its physical manifestations — and we see all the implicit work of the emotion engine in each physical movement of the body. How do we ask a computer to see the same?

When attempting to analyse or capture movement on the stage, we must remember that there is more to movement than the movement. Lanier has pointed out that *consciousness is the thing we share that we don't share objectively. We only experience it subjectively, but that does not mean it does not exist* <sup>5</sup> Similarly, it can be argued that dance movement exists not just within a single body, but within the entire context of what is happening within the performance space, and within the emotional space of the work. Much of what is communicated to the audience is implicit in the movement, not overt. Ever watched dance on video? How rarely it is successful — dance is arguably the performing art that translates the least successfully to the screen, particularly the small screen. This is at least partially a function of what the camera — the objective electronic eye — cannot see.

In our interactive performance work, we make performance spaces that are live spaces, conscious spaces, in which the work is made in the moment. It is not possible to set a choreography for this work, because there must be a *constant* link between performer and the interactive system — the performer listens, moves, creates changes to the soundscape, listens, and moves again, and so on. This cycle is an essential one, and a conscious one. If the connection within this feedback loop between performer and machine is broken (if, for example, the performer forgets to listen, or loses concentration on the sound environment that is being made, or if the computer fails in its part) the core essence of the work is lost, and it begins to fall apart. Herein lies the inherent subtlety that makes these kind of systems work. The connection between live body and insensate computer is intimate and emotional — we have a desire therefore to label what is happening here as a form of machine consciousness, because we want somehow to recognise and even honour the fact that something special is taking place. We want to be able to tell ourselves that the

machine is 'conscious' in order to give a name to what Ghislaine Boddington has referred to as 'the fifth dimension' within this work.

The confusion of gestures between mover and machine is remarkable and extraordinary, what my partner Jools Gilson-Ellis describes as a *corporeal confusion*. When the system is working well, there is no clear, literal, boringly obvious connection between performer and machine, but instead an almost subliminal connection that an audience senses rather than sees. Thus, we are inviting the audience to partake of our consciousness — our dynamic bond between machine and performer — even though we choose at the same time to make the technology itself entirely transparent and invisible. Take that vital link between human and machine away, however, and an audience is well aware that it is *not* there.

Has it become possible, then, to design a human/machine interface that is *about* the body or the mind? Rather than trying to design a machine that can mimic the human brain, with all the impossibilities of defining human consciousness implicit in that notion, can we not instead design a computer system that is so sensitive to human-ness, to emotional being, that it is *de facto* intelligent? In our work, we have found that this can be done with a fairly simple system, but one that can, despite its simplicity, begin to have a sense of *why* a human is doing what it is doing, rather than simply what it is doing. Perhaps we have designed a system that in some way *cares* what data it is gathering? Rather than attempting to build a system that is objectively human-like, we have attempted instead to design a system that is subjectively human-like — a system that has a vested interest in the data it gathers, and is therefore capable of imputing gaps in that data (this is partly where BigEye's virtual objects come into play). The simplicity of the interface is actually not insignificant. I would suggest that the ultra-accurate movement-data-gathering systems such as the ones emerging from the MIT Media Lab and other such research centres around the globe are ultra-complex systems that are extremely clever, but which have no innate sense of the data they are gathering. Their complexity, in the end, serves them no purpose. In talking to these researchers, it seems clear that their research is entirely focussed on gathering supremely accurate and detailed data about a moving body. Rarely, however, do they know what to do with this data, or even how to develop evaluative mechanisms for assessing its usefulness. The typical response when they see our work is "wow — how can you do all that with so little information?". The New York Times has said that our work is "as subtle as live dancing". The irony of the fact that it is, of course, live dancing can be overlooked in favour of the fact that this technologically inexperienced critic recognised the bond between performer and machine — even if she didn't know how to put it into words.

So, we can now posit that when trying to build a motion-sensing system, we need to look less at the objective body-state. Instead we should be looking at the subjective body, observing how it is moving, and attempting to extrapolate the reasons why it is moving how it is moving. This does not necessarily involve minutely accurate readings of each of the physiological phenomena that go to make up a particular movement. Instead, we need a way to observe the emotion engine at work, as it drives the human body to move. Within an improvisational framework, emotion is playing a large part. Even within a set choreography, emotion is and should be a large part of what we are watching (this is admittedly a way-post-Cunningham post-post-modern notion). The objective physical phenomena of movement are just a tiny part of what we see when we watch dance — and what the computer needs to see when it watches movement is the hidden parts, as much as the overt parts. Just as the human ear hears in a totally different way when compared to a microphone, because it is capable of making many filtering and discriminatory decisions in

an instant, so the human eye sees differently from a camera. The camera is insensitive to content — the human eye is minutely sensitive to all the implied information it is not seeing. We need to design software environments that can supplement the dumb obeisance of the camera to the absolutely overt, and begin instead to let the machine see, and enjoy, the implied action and the emotional state that is driving the overt action.

We are trying to focus as much on the brain-power behind a physical act as we are the muscle-power. If we want our machines to capture movement and we want the data to reflect the holistic sense of the movement — not just the physical acts — then we have to attempt to give the machine an understanding of the implied — a consciousness if you will. This, of course, is all highly subjective (surprise!) and it impossible to “prove” that we have allowed the computer to begin to understand the implicit that lies behind the overt physical action. I will argue that what comes out the other end — what I actually do with the data I receive — *does* reflect the implicit, the emotional content of the movement, the content ideas of the work. Of course, there’s no equivalent of the Turing test that will prove that an audience is fooled into believing that the computer is intelligent — that, in fact, misses the point entirely. No, the proof of the pudding is in the work itself. There is an emotional wholeness that exists within this work, precisely because I am choosing to discard purely physical phenomena, and concentrating instead on the implied action, the virtual movement, the hidden gesture that is not necessarily ever made flesh.

Is this consciousness? Who knows? Who knows (still) what we mean by that term. It is, however, sensitivity. I want to make systems that are humanly sensitive, and sensitive to human emotion and emotional content. I want to build systems where there is a genuine sense of communication between the machine and the human. These systems are not intelligent in any sense of the word as we understand it — but perhaps they do have an innate emotional intelligence. I want to treat the machine as a cohort in the making of a performance work — an almost-being that strives along with me to be increasingly sensitive to the moving bodies on the stage, able to listen, and hear, what they are saying through their overt and implicit movement.

### **Endnotes:**

1 half/angel is a performance research company directed by Richard Povall and Jools Gilson-Ellis. Their most recent performance project is The Secret Project, and currently in early development is The Desire Project.

2 Kevin Kelly, *Out of Control, The new biology of machines*. London: Fourth Estate. 1994

3 *BigEye*, the software that came out of the STEIM stable in 1996, is the tool I have been using for the past three years. It is a relatively simple programme that looks at a video space in real time, and attempts to analyse what is happening in the space, either through difference (motion), or colour tracking. For more information, visit <http://www.steim.nl>

4 Robert Pepperell, *The Post-Human Condition*. Exeter (UK): intellect. 1995

## **Appendix 7: Published Paper**

# Making Emotional Spaces in *The Secret Project*:

## building emotional interactive spaces

**Richard Povall**

**Rescen (Middlesex University) & half/angel**

**Published in**

Ed. Ascott, R. 2000 'Art, Technology, Consciousness: mind@large'

intellect Press, Exeter UK ISBN 1-84150-041-0

***Abstract:*** We (half/angel<sup>1</sup>) have chosen to move beyond the purely mechanistic methodologies that are so often found within interactive performance systems, which typically have adopted the language and physicality of the machine — buttons and triggers and virtual switches — as their basis of operation. We found that approach too limiting on the expressive content of the movement languages we were working with, generating a very poor relationship between content and performative expression. Instead, we have found ways to look inside the body, inside the *intention* of a movement — to work with emotional rather than purely physical space.

**Keywords:** *emotional computing, kansei, interaction, motion-sensing, performance, machine consciousness*

*For better or worse, in reality we are not centred in our head. We are not centred in our mind... Bodies and minds blur across each other's supposed boundaries. Bodies and minds are not that different from one another. They are both composed of swarms of sub-level things."* Kevin Kelly, *Out of Control* p. 64.<sup>2</sup>

The work of *half/angel* is based in transparent interactive spaces that are physically and emotionally intelligent. What do I mean by this? Our interactive performance work, developed only after several years of practice-based research, attempts to work with the

consciousness of the living body as an emotional entity. In using motion-sensing systems to create a live, interactive environment, I try to programme our systems to capture not literal movement, but overall movement content and impulse. I have rejected the more common methodologies of moving further and further towards a literal, accurate, detailed interpretation of the physical body, and instead use speed, direction, acceleration, and size of moving objects to gain an *approximation* of the kind of movement that is occurring in the performance space. Although I am able to sense an object's position in space, I rarely use this data, usually considering it irrelevant or unnecessary. Instead, I am looking instead for information from the movement that tells me *how*, and therefore possibly *why* the performer is moving. I am searching as much for the emotional intentionality of the movement as I am attempting to map the actual, literal physical movement.

In this I am helped by a wonderful feature in Tom DeMeyer's software package, BigEye<sup>3</sup>, which provides me with 'virtual objects'. In *BigEye* I am trying to identify, and then track, moving 'objects' within the performance space. These objects can be a whole human body, or a small part — a finger or a foot, for example — my choice, even my choice on the fly during a performance. The virtual object simply carries on where the physical object left off. So, if a live object is travelling leftward on the stage at a given acceleration, and then stops — the virtual object will keep on going for a little while longer. This gives my data a roundness, a fluidity, that it would not otherwise have. The data flow doesn't just stop when the body stops, it sort of gently fades and dies (like we all do, I suppose). I have no idea why Tom built the virtual object — but I bless him every day I work with this system. Last time I spoke with him, I mentioned this, and he was amazed to hear that anyone was actually using this feature — it was the first time he had come across it actually being used.

There has been some recent debate challenging the simplistic notion that all human emotions and mental phenomena are rooted purely in the chemical reactions of the brain — that the brain is not the be-all and end-all of human existence — that there is some thing *other* that is involved in the process. This, too, may ultimately be a chemical process, but one that is more ephemeral and unknown than the calculations of the conscious and sub-conscious. The emotion engine that drives our humanity is still extraordinarily undefined, and will perhaps remain so. If an interactive performance system can be designed that shows an awareness of the emotion engine, and *cares* that it exists in addition to the more objective processes of the body, then perhaps we have a direction that will yield a more successful machine consciousness.

When working with interactive technologies and dance, we are indeed challenging the notion that all thought and emotion originates in the brain, with a consequent filtering out to the mouth, the vocal cords, and the limbs and other muscle groups in order to express it. No, we are challenging an inversion of that idea — that all physical acts reside in the body, not the brain, echoing the separation of mind-state and body-state that has become fashionable in consciousness research. In dance we tend to think, in our desire for a kind of Puritanism that is still remarkably pervasive, that the trained body is making beautiful shapes because it has been told to make beautiful shapes, and has then rehearsed those beautiful shapes until is capable of reproducing them *without thought*. It can be argued however that much of modern dance, particularly when there is an element of improvisation in the work, is a highly cerebral and emotional (these two are not necessarily



in opposition) activity, and that the emotional content of the movement is overtly presented to the viewer. When we try to look at these movements with a computer eye, though, we ignore all the subliminal information (however overt it may be) and choose to concentrate purely on the physical activity of the body — we try (in vain) to assess the movement of each performing body with a deadly accuracy, only to miss the point entirely on most occasions. Better that we should try to look beyond, or underneath the skin of, the overt physical act.

Pepperell says:

*Consciousness can only be considered as an emergent property that arises from the coincidence of a number of complex events. In this sense it is like boiling. Given sufficient heat, gravity and air pressure the water in a kettle will start to boil. We can see what boiling is, we can recognise it as something to which we give a name. We do not consider it mysterious, yet we cannot isolate it from the conditions that produced it. We cannot isolate consciousness from the conditions that produce it any more than we can isolate boiling. Consciousness is a property that emerges from a given set of conditions. Pepperell The Post-Human Condition p.6. <sup>4</sup>*

So, too, the physical manifestation of a choreographed or improvised movement is more than its physical manifestations — and we see all the implicit work of the emotion engine in each physical movement of the body. How do we ask a computer to see the same?

When attempting to analyse or capture movement on the stage, we must remember that there is more to movement than the movement. Lanier has pointed out that *consciousness is the thing we share that we don't share objectively. We only experience it subjectively, but that does not mean it does not exist* <sup>5</sup> Similarly, it can be argued that dance movement exists not just within a single body, but within the entire context of what is happening within the performance space, and within the emotional space of the work. Much of what is communicated to the audience is implicit in the movement, not overt. Ever watched dance on video? How rarely it is successful — dance is arguably the performing art that translates the least successfully to the screen, particularly the small screen. This is at least partially a function of what the camera — the objective electronic eye — cannot see.

In our interactive performance work, we make performance spaces that are live spaces, conscious spaces, in which the work is made in the moment. It is not possible to set a choreography for this work, because there must be a *constant* link between performer and the interactive system — the performer listens, moves, creates changes to the soundscape, listens, and moves again, and so on. This cycle is an essential one, and a conscious one. If the connection within this feedback loop between performer and machine is broken (if, for example, the performer forgets to listen, or loses concentration on the sound environment that is being made, or if the computer fails in its part) the core essence of the work is lost, and it begins to fall apart. Herein lies the inherent subtlety that makes these kind of systems work. The connection between live body and insensate computer is intimate and emotional — we have a desire therefore to label what is happening here as a form of machine consciousness, because we want somehow to recognise and even honour the fact that something special is taking place. We want to be able to tell ourselves that the

machine is 'conscious' in order to give a name to what Ghislaine Boddington has referred to as 'the fifth dimension' within this work.

The confusion of gestures between mover and machine is remarkable and extraordinary, what my partner Jools Gilson-Ellis describes as a *corporeal confusion*. When the system is working well, there is no clear, literal, boringly obvious connection between performer and machine, but instead an almost subliminal connection that an audience senses rather than sees. Thus, we are inviting the audience to partake of our consciousness — our dynamic bond between machine and performer — even though we choose at the same time to make the technology itself entirely transparent and invisible. Take that vital link between human and machine away, however, and an audience is well aware that it is *not* there.

Has it become possible, then, to design a human/machine interface that is *about* the body or the mind? Rather than trying to design a machine that can mimic the human brain, with all the impossibilities of defining human consciousness implicit in that notion, can we not instead design a computer system that is so sensitive to human-ness, to emotional being, that it is *de facto* intelligent? In our work, we have found that this can be done with a fairly simple system, but one that can, despite its simplicity, begin to have a sense of *why* a human is doing what it is doing, rather than simply what it is doing. Perhaps we have designed a system that in some way *cares* what data it is gathering? Rather than attempting to build a system that is objectively human-like, we have attempted instead to design a system that is subjectively human-like — a system that has a vested interest in the data it gathers, and is therefore capable of imputing gaps in that data (this is partly where BigEye's virtual objects come into play). The simplicity of the interface is actually not insignificant. I would suggest that the ultra-accurate movement-data-gathering systems such as the ones emerging from the MIT Media Lab and other such research centres around the globe are ultra-complex systems that are extremely clever, but which have no innate sense of the data they are gathering. Their complexity, in the end, serves them no purpose. In talking to these researchers, it seems clear that their research is entirely focussed on gathering supremely accurate and detailed data about a moving body. Rarely, however, do they know what to do with this data, or even how to develop evaluative mechanisms for assessing its usefulness. The typical response when they see our work is "wow — how can you do all that with so little information?". The New York Times has said that our work is "as subtle as live dancing". The irony of the fact that it is, of course, live dancing can be overlooked in favour of the fact that this technologically inexperienced critic recognised the bond between performer and machine — even if she didn't know how to put it into words.

So, we can now posit that when trying to build a motion-sensing system, we need to look less at the objective body-state. Instead we should be looking at the subjective body, observing how it is moving, and attempting to extrapolate the reasons why it is moving how it is moving. This does not necessarily involve minutely accurate readings of each of the physiological phenomena that go to make up a particular movement. Instead, we need a way to observe the emotion engine at work, as it drives the human body to move. Within an improvisational framework, emotion is playing a large part. Even within a set choreography, emotion is and should be a large part of what we are watching (this is admittedly a way-post-Cunningham post-post-modern notion). The objective physical phenomena of movement are just a tiny part of what we see when we watch dance — and what the computer needs to see when it watches movement is the hidden parts, as much as the overt parts. Just as the human ear hears in a totally different way when compared to a microphone, because it is capable of making many filtering and discriminatory decisions in

an instant, so the human eye sees differently from a camera. The camera is insensitive to content — the human eye is minutely sensitive to all the implied information it is not seeing. We need to design software environments that can supplement the dumb obeisance of the camera to the absolutely overt, and begin instead to let the machine see, and enjoy, the implied action and the emotional state that is driving the overt action.

We are trying to focus as much on the brain-power behind a physical act as we are the muscle-power. If we want our machines to capture movement and we want the data to reflect the holistic sense of the movement — not just the physical acts — then we have to attempt to give the machine an understanding of the implied — a consciousness if you will. This, of course, is all highly subjective (surprise!) and it impossible to “prove” that we have allowed the computer to begin to understand the implicit that lies behind the overt physical action. I will argue that what comes out the other end — what I actually do with the data I receive — *does* reflect the implicit, the emotional content of the movement, the content ideas of the work. Of course, there’s no equivalent of the Turing test that will prove that an audience is fooled into believing that the computer is intelligent — that, in fact, misses the point entirely. No, the proof of the pudding is in the work itself. There is an emotional wholeness that exists within this work, precisely because I am choosing to discard purely physical phenomena, and concentrating instead on the implied action, the virtual movement, the hidden gesture that is not necessarily ever made flesh.

Is this consciousness? Who knows? Who knows (still) what we mean by that term. It is, however, sensitivity. I want to make systems that are humanly sensitive, and sensitive to human emotion and emotional content. I want to build systems where there is a genuine sense of communication between the machine and the human. These systems are not intelligent in any sense of the word as we understand it — but perhaps they do have an innate emotional intelligence. I want to treat the machine as a cohort in the making of a performance work — an almost-being that strives along with me to be increasingly sensitive to the moving bodies on the stage, able to listen, and hear, what they are saying through their overt and implicit movement.

### **Endnotes:**

1 half/angel is a performance research company directed by Richard Povall and Jools Gilson-Ellis. Their most recent performance project is The Secret Project, and currently in early development is The Desire Project.

2 Kevin Kelly, *Out of Control, The new biology of machines*. London: Fourth Estate. 1994

3 *BigEye*, the software that came out of the STEIM stable in 1996, is the tool I have been using for the past three years. It is a relatively simple programme that looks at a video space in real time, and attempts to analyse what is happening in the space, either through difference (motion), or colour tracking. For more information, visit <http://www.steim.nl>

4 Robert Pepperell, *The Post-Human Condition*. Exeter (UK): intellect. 1995

**Appendix 9:  
Interview with Bill Seaman**

## Interview with Bill Seaman

---

Seaman's work explores text, image and/or sound relationships through technological installation, virtual reality, linear video, computer controlled laserdisc and other computer-based media, photography, and studio based audio compositions. He is a Professor in the Department of Design | Media Arts at UCLA<sup>1</sup>, where he is exploring issues related to the continuum between physical and virtual/media space. His current research includes the creation of a *Hybrid Invention Generator*, exploring a machinic genetics. His work is almost exclusively screen-based (although he has worked with Ballet Frankfurt in the creation of a video-based set, and with other performers), and the centre of his research he has labelled as *recombinant poetics*. I spoke to him in Los Angeles in September 2000.

[Exchange Fields] was a v. interesting piece made with Regine Van Burkel, and we had a long exchange and I developed a set of furniture, sculpture, there were these thirteen pieces of furniture sculpture, and you would position the participant...I was thinking a lot about computer/human relations and wanted to get very physical and bring the body in and really activate that level of interaction...So these furniture sculptures were very physical. You position your body, but then each position would then trigger a dance that relates to the part of the body. So there's this direct kind of feedback loop... There's a kind of uncanniness about it because when...you might call this furniture sculpture a poetic constraint as a kind of pun that...you actually don't move your body but then you watch your body moving. So there's this uncanny kind of mirror of yourself — an abstraction of yourself and something other that you can't quite describe. But this very interesting energy exchange.

You encode these energy states and then you bring them out and that's where the emotional or felt meaning and the content would come out. And that's also why video is still a strong way to go because it can capture very particular kinds of energy states or just the qualities of the physical environment.

Almost all of my works have an image and a text, or poetic component, and a sound or music component as well. So in that particular one there's this techno or ambient score, and then each of the objects would trigger a kind of tonal line that would mix on top of it, and up to four could come in at a time. So it was very seamless the way the music was being generated. But this goes back to my recombinant poetics idea which is really what I've been thinking about and writing about — emergent meaning through combinatorial relations of differing media elements. And I'm really thinking about that almost as a new approach to linguistics...as a new language, or mixed semiotic, er...that's what I wrote about in my PhD thesis.

One of the main ideas is this notion of fields of meaning — that image communicates differently from text which communicates differently than music. And that all of them have a kind of evocative meaning force and we bring a history of our embodied relation to past meaning forces. And there's a kind of

ongoing summing of meaning production. Which is very different from this signifies this. It's much more about what comes out of this set of forces. And since it's combinatoric you have this emergence. Instead of saying this will always mean this it's more like these probabilities that you load the work with and certain meaning arise out of using it.

I've always been interested in interface, and interested in the image, and how the image and the meaning relate to one another, and I was living in Australia and there was a kind of pragmatics about making pieces that would be easy to do. So for a while I was working with very...the easiest kind of interface, like you would just have a trackball...where the kind of meaning side of the interface would be in the image you were navigating, or the sounds you were triggering and so on. So it would be very much...a room that you would go in and have these projections and now I'm shifting much more towards making these physical interfaces and thinking about how they might work, or interfaces that might be spoken language or interfaces that might be, I mean, there's a whole set of things, like camera and gesture recognition and voice recognition and these physical things. So that's really the next five years of research.

[The screen] is much more elastic than you would think because, you know, a piece like Passage Sets had more than 150 images and you could literally pull it apart and bring it back together and...So although I was using that kind of interface I took a very non-hierarchical approach as to how they would move through it. So it ended up being more rhizomatic than branching-like.

The question about poetic constraint...is a very interesting one, and the World Generator gave a lot of freedom over to the participant to make what they would out of it, which was different from the earlier interactive ones, that were more about branching, with a huge amount of potential branches.

RP: I'm trying to get at the degree to which the viewer is engaged by a purely visual interface?

When you have this potential of navigation and choice and fields of potential meaning, then the participant takes an active role in decoding that. So even if it is only an image you can still become highly engaged in it. I mean, if anything, it's too big to see the whole thing. You see a part of it and get a feeling for the whole thing.

...One the one hand you have a very linear trance-like kind of space [video and sound] and on the other you have this navigated, modular, combinatorial space.

I hate the idea of people thinking of me as a fascist (author) that's controlling, on the other hand you can have these emotional states that are about listening to a drone for a certain period of time. Now I wouldn't say that that's a fascist thing, I would say that's a valuable thing. But because the computer become involved people have a way of jumping on these things in a certain way and seeing them in a certain way, which I don't necessarily think is the best way to look at it. But the question of the constraints...you know, what is it that makes a good work of art? Especially when you hand the interactivity over and the participant or viewer, which is this word that I've made up...In each of the works they take a very active role, but differing so. And that's also an interesting question. For example if I took the World Generator and removed all of the images and let them load any images they wanted and so on, would that then be my artwork anymore, or would it just be a tool or then what it be?

[about the World Generator]

The word inter-authorship is one I use. I'll create a system, and then somebody else will then use that to generate something else. And because someone becomes engaged in that process there is this desire mechanism that gets called up, but hopefully it gets called up in a positive way as opposed to a manipulative way. In the sense that it's a meta-desiring mechanism, then it makes you aware of how desire is invoked in the experience, which I think is valuable because it then gets you to begin to think how that's happening on other experiences. Possibly. You know, this kind of displacement illuminates placement [idea] is something I'm really interested in. You have this set of things, you position them, and so there's a kind of playful aspect to it. But it becomes a very serious kind of play when you start thinking "wait a minute, this is how actually I'm learning to communicate about the world" We see an image, there's a text next to it, a piece of music qualifies the way we read it, and they're all operating as meaning forces.

You know, when you're making a virtual world, they can be very cold. They can be very cold and very intensive. So the question was how can I bring the warmth, the feeling, emotive qualities which I had a pretty clear grasp on [in

the] video [pieces] and bring those across to this very different rhizomatic space or not-totally non-hierarchic space because literally one can navigate anywhere. It's not modular — it's paradoxically modular, you know, it's this notion of complementarity — something can be a wave or a particle depending on how you're looking at it. You have these modules but then once they're placed in the environment they become completely environmentally read or understood.

Everything is being generated in real-time. What is being generated is not just a permutation, it's an inter-penetration and a layering. It's emergent in a different way than the other things.

Is it valuable to have this piece [the World Generator] with this high-level functionality, or should you just author things that people get into intuitively and jump into it? I think it is. The people that have taken that time to do it have found it very valuable, or many have. And also, contrary to this idea of the computer making you the lone user, you often get groups of people showing each other how to use it. An in fact we made this networked version of it where people could be in two different countries and be building a joint world. So that was interesting too, I think.

RP In your 20 years of working have you developed techniques that you know will work?

Certainly I rely on my voice and that's often a common element, and there are certain kinds of rhythmic structures and tonal structures. Because I wasn't traditionally trained as a musician I found ways of working that were more structural, almost sculptural approach to building up layers, taking away layers, and so on. And so that finds itself in a lot of pieces. But now with ProTools it's so sophisticated that there's no longer a functional difference between music and...I mean, I think I'm as much a musician as anybody now, I think. I often will do a lot of writing beforehand and try to define a kind of openness about the language, or punning language, so that's I often return to that. Or certain sound qualities of words, aspects of light, aspects of architecture.

RP Specifically??

Often I'll use drones, and quite repetitive music. I'm very interested in the suspension of time, or going into something, and for me the drone and



repetition is a way to get at that. I'll often use words that fork in different ways, but in an interesting way. So for example let's take the word "drive". In a context like this it could be a sexual drive, it could be a drive through a space, it could be a computer drive, and depending on what I'm interested in, that field gets contextualised by the context that it's adjacent to. Or you might read it one way, but as soon as you put something next to it then it shifts and becomes another or an accretive meaning. And that's something I'm very interested in.

So by loading a work with many of these words...Usually I would rather not talk about the content or unravel it but I'd rather let people do it for themselves. Sometimes there's things I choose just because of the sound of a particular word, like, "lilly-light lies" or in telling motions, "the just is missed", or "moist with a tumbling twist, telling motions" you know, it's this kind of certain sound...

### On virtual space...

We were talking about virtual space and that there was a lot of negative hype about it. I mean, basically I think it's an authored...it's a new kind of authorship and that you create of it what you bring to it. So there's huge potential. It's not easy, yet, I mean, it's still very difficult bring those things because it's...how do you make something emotive. But you have to approach it with a different mindset, that's it's an environment, an overall environment that people can move through in any different way. As opposed to a book or a linear piece of music that you write, so you just have to open out new ideas about how you author for such an environment.

### On E-phany Physics

In the last year I've coined this new term which I call E-phany Physics...The idea is that in virtual space you can author a kind of physics and author a kind of feedback which can be a very emotive thing. Instead of knocking something [down], it could fall up or whatever you authored the response to be, it could be like that. And I started re-looking at all of my video work as E-phany Physics in that I slow things down or via the sound I manipulate the way you're

understanding what you're looking at. That was a really interesting shift. That what I was really working with, you know it sort of came out of looking at these sensors that people were using, and they were using video cameras as sensors so I was saying "Now that's taking the physics, the actual physics, and translating it" And then I just started thinking "Wait a minute, every video shot I'm doing is taking the physics of a particular moment and capturing or containing some aspect of it and that's what lends the emotive quality...that you're actually playing back the physics of that environment, that moment. So that was quite meaningful for me as a way to think about things.

At a certain point I just realised how much I liked the body and shooting and working with people. And it was more about building a rapport, so it wasn't a control, there was actually a release or a synergy or energies. And so when Regina and I were working together there was just this great synergy where we understood what each other were doing so clearly that it was very dance-like but then there was the capturing of that synergy. That's very exciting. Then it's not like saying "you do this" and I'm manipulating somebody but then it's like "here's this potential energy state that we can get at by really communicating with each other". **By communicating so clearly I'm capturing the moment of those emotive physics that her physical body makes.**

There were all these metaphors of the prosthetic which I think was a wrong kind of approach. You don't want to cut off your body to extend the body. And now we're more intelligent about [knowing that] the body is in this dynamic relationship with the environment and now the environment can be global or however you want that environment to be. So you can have an extension as opposed to a prosthesis that this negative reading to it. Where the full sensual capacity of the body, which we don't even entirely understand at this point, I believe, can be used as opposed to thinking that we need to make these surrogate sensors. I don't believe we've even begun to understand the complexity of how our sensual systems are working.

I think in almost all the installations when you have this [projected] scale that you *in* a media landscape. Although it's quite abstract there's a kind of physicality about that and the music and the sound quality enhances that physicality. Although you might not be touching something...maybe the word palpable, you're having a *palpable* experience that's emotive even though with some of these earlier [installations] you're not touching anything but part of the way that I shot it was very intentionally to have a kind of visceralness about the image. I mean there's textures or there's stones in a pile or there's water in a sheet, and all of those things go back to our embodied experience. I mean, there's this book that Ann Catherine Hales came out with "How we became

posthuman". She has an interesting argument that I feel very close to which is that every experience that we have even if it's off of a computer screen is still an embodied experience. We can't have a disembodied experience, because the way we understand things is through what we are, and so instead of thinking "there's just our mind and it can float freely blah blah blah" it doesn't work that way because the way that the mind learns is all tied back to all of every instance of every physicality or every image as an experience that we've had. So it will be interesting to see how that plays itself out in the coming years.

---

## Session 2 (Santa Monica Blvd)

I found a very elegant definition of the word meaning in Charles Sanders Peirce who's considered tied to both pragmatics and semiotics. And his definition is so elegant which is: meaning is that which the sign conveys. It's very clear and very nice. And he's also very interested in how meaning arises when the sign is modified in some way. And so when you have a constellation of signs it would be what the dynamic summing of what the meaning forces of the fields convey. And I argue that in the context of that environment that music becomes a sign, that text becomes a sign, and that image becomes a sign and that they all communicate in different ways. They all are of themselves in different ways. So it was different than maybe in the past you would make a text out of everything, and you know I really don't think that way, I think there are qualities and elements that are communicated differently by each of these registers, milieus or whatever.

[In writing about my work] I took two approaches: one is from Derrida and his notion of *difference* where meaning is both where the context is made different, but it also defers back to an earlier state of meaning, which I find very interesting. And his writings about grammatology. And then on the opposite side I was dealing with Deleuze and Guattari writing about what they called mixed semiotic milieus. Where one will call image and sound language, the other one won't. But the jist of the thing was that by loading up menu systems or by loading up navigational arenas or environments that the participant in the system would engage with media elements that would be differently juxtaposed. You could even look back to someone like Eisenstein writing about montage — that there's actually this dynamic participation by the person who's in those environments.

The important thing is that the participant brings their mindset and brings their associations and builds a dynamic bridge between these elements.

I work very modularly, and each module has its own potential — on its own it already has a set of readings. So the emergence comes via the juxtaposition of these different fields. And so you might be looking at one thing that you might be reading a certain way, that might be evocative in a certain way, but as you call up a different sound you might re-understand it. I think of this example from “A Clockwork Orange” where the music from Singin’ in the Rain is juxtaposed with this very violent scene and it makes both things totally change. So context is important in that sense. So emergence...there’s almost a certain surprise element. I can’t control what arises out of it. I can say that there’s this of probability that certain kinds of things are going to arise, but it’s also the interest in the surprise that arises out of the juxtaposition, the combinatorics.

### About “tone”

There’s certainly an overall aesthetic that I know...Since I’m working on the different parts and I’m authoring those parts, I can have a certain range of how the elements are going to be. Like I might not have the noisiest noisy sound, the most humorous chuckling sound or something...it might be more within a range. And that’s something I’m really interested in is this kind of using ranges where chance within a range will call up something but because there’s already a kind of field and it’s already constrained the probability is that it will work quite well in that space.

You know, Cage always talked about chance and indeterminacy and so on, but you know, he sure loaded up the systems with very rich material. And so, instead of denying that side of it I recognise that’s what I’m doing.

The artistic constraints are the media elements I load into the systems and your ability to operate on those also being authored into the system.

I think there is an element of seduction in my work...In early days I was very involved in conceptual art, but there was a certain point at which I said "OK, beauty is allowed" and so now I'm interested in having both - something that's very beautiful or erotic or seductive, and a set of ideas as well that are engaging. It might appear that it's postmodern, but I think it's a kind of post-postmodern idea.

I would say in my work it becomes a kind of meta-seduction. You know that it will be seductive and it's drawing you in, but then it's asking you to think about what's doing that.

---

University of California at Los Angeles

**Appendix 10:  
Interview with Susan Kozel**

Susan Kozel is a performer, choreographer and writer whose research centres on the physical and philosophical vocabularies emerging from the convergence between dance and media technologies. Recent projects include *Contours* and *Figments*, and a project with Gretchen Schiller co-produced by the Banff Centre for the Arts called *Trajèts*<sup>1</sup>. I spoke with her at the Royal Festival Hall (London) in October 2000 about her work and experiences as a choreographer/performer with numerous interactive systems.

## Trajèts

---

Trajèts began as a camera and movement experiment between myself and Gretchen. And we were just very interested in seeing how we could capture the impulse of movement, the trace of movement without emphasising the manipulation of the dance form. And our goal when we decided to do an installation rather than just simply a video projection on the wall, our goal was to instil in our audience members a visceral, a sort of a gut response to the pathways of the trajectories of the imagery. We wanted people to just feel it with their bellies rather than visually integrate it.

We wanted the space to move as well as the imagery.

Two pieces of software make the space responsive. One is Rob's (Lovell) Eyes software which uses cameras to detect where the public is as they walk through the installation, then that sends position information to Scott Wilson's software which attributes a location and a forcefield around each of the screens. So as people approach the screens, the screens will then respond either with attraction or repelling.

The choreography is obviously the sense that you've got three...at least three layers of what's going on. One is the trajectories through the space of the public, the next is the positionality of the screens in relation to the public but also in relation to each other, and the third is the video — which video sequence is called up at what time. And what we really need to craft this is time. We need the installation to be up and need to observe people as they walk through it. So what we started to map...were regions in the space because we would dearly love everyone to just head straight for the centre of the screen and have this wonderful interactive experience but we have to accept that people will be wary of it and some people might want to stand on the outside, and then the experience would be almost more like cinema looking on and looking at the other people walk around.

Then she described the mapped areas...

The idea would be you might provide something that's slightly more coherent when people are on the outside so that they have a sense of it being bodies in space, and then the thing that fascinates me is the idea of pulling them in, luring them in, so, with the screens open. Would there be a sort of corridor effect? Would the dynamic imagery be a pulling rather than a traversal or a dropping? Would colour influence it? The idea would be that once they're in it, then it would be much more abstract and much more about dynamic impulse.

Our idea right from the start was to link networked spaces and web spaces also involved with the physical space of the installation. And the metaphor I like to use is that one trajectory has a far-flung component. So you've got the trajectories of the people at the screens, of the imagery and it's as if one understanding of the kinetic patterns of the installation is then thrown by way of networked systems out onto a dedicated terminal in the same gallery space or ideally through the web into a remote site.

People understood it (a video projection of the installation shown outside the installation space) after they'd been in. It was more of a deepening of their experience as they left rather than...[a drawing in].

RP: What's the experience that you're trying to bring to the audience?

We didn't want to have a sense of "they must experience this" so it's not about, like, flight necessarily or falling, but what we would like is for them to have a sense of their environment as being kinetic and shifting and have a sense of them being affected by and also in turn effecting a multi-layered kinetic structure. And then of course to have a different sense of the visual pull, er, of the quite abstracted imagery so they feel a sense of dropping, feel a sense of weight, weight was important. It was important that some of the imagery feel like they have a lift...a sort of heady feeling so they feel they're more rooted to the ground. Does some imagery make them want to move fast?, make them want to move slow? And what emerged which I found quite compelling that first week (when the work was shown at Banff) was that people found it very engrossing, very hypnotic, which is largely assisted by the ambient music. And one person said that facing a screen and waiting it to exhibit a response was like tai chi. So there was this shared energy flow, and I'm quite into anthropomorphism of objects anyway so I quite liked that idea — the screens are like...performers, so that effectively the subjectivity of the performers is dispersed across the screens and the audience.



I wasn't the only dancer and I wasn't just the dancer. Robb (Lovell) was filmed... We used climbing walls, we used harnesses, we managed to swim in clay (that's a story in itself). We filmed underwater we wanted to avoid just filming upright dance movement, lots of rolls, lots of diving onto mats, falling off ladders...and then Gretchen would process the imagery and edit it so that it was dealing with...where the bodies were falling. If you take a body that's filmed to fall and then you have it float upwards you've got a weird sense of it seeming visually that the body is falling when it's actually floating up.

RP: So that sense of the kinetic is really strong in the imagery?

Yeah...

RP ..and when you talked to people who were in it that the physical movement of the screens worked together with the imagery on the screens?

Probably not, in the sense of an organic whole. Right now the screens are operating only as responsive to the individuals in the installation and I think we're still working on a maximum of three to five people at one time in the installation.

What we're interested in too is just basic, overall states so that is the screens are all lined up or are all pointed north-south or ...one of the states is where they just all spin...We worked on getting them to shudder and jitter...and ultimately we'd like to attribute individual characteristics to screens...

RP So what kind of responses did you get?

...People often wanted to know whether it was clear enough that they were causing the screens to respond...And since we opened Robb and Scott worked further on that so it will be more crisp. But somebody equally said they liked that fact that there was a lag in response because he said it drew you

much more into the process. You weren't just able to see in a self-evident way what was going on. So he felt you had to engage with it.

...Before (the system was adjusted) there were times when a screen wouldn't really respond, so it couldn't really tell where you were...it would sort of shudder a bit and it might have swayed a bit and then if you shifted slightly suddenly it would move....[That's] interesting, because it makes them seem really, erm, eccentric, like little creatures that may want to respond or may not.

Some people were just happy to sit for a long time and watch others engage in the installation because it became a sort of hypnotic dance where people would work through...some people felt very self-conscious about walking through.

Inevitably, it's funny with this type of work but when you've got it dark with lights and movement and sort of pleasing soundtrack, people will always say it's beautiful. Oh, it's so beautiful. Oh, it's so beautiful. And you think, well, OK, but...

(further development) One of the other possibilities, too, is to try, instead of using cameras for the sensing system, is to try a laser sweep. So we wouldn't want to use hardware sensors, so no touchpads, laser beams, any of that kind of thing.

RP: Because?

Because it would...that's a good question...errm, right now the screens float off the ground, about a foot off the ground, and if we had anything like that on the ground that would root the installation more. Errm, we work a lot with inversions and shifts in perspective so we wouldn't want to overemphasise the down. And regarding laser beams...I dunno...why don't we want to do it...well we'd need, we would have needed to work more with more intensity, you know we were probably in the position where we would have needed 50 or 60...

You want people to go a journey, you don't want them to go on a fact-finding mission.

The imagery's quite inspired by a lot of Futurist experimentation...or a lot of the abstracts of the sixties...errm and in some cases people don't necessarily recognise the human form. There is always a trace of bodies or a body whether it's a hand or an arm...there's some fairly clear imagery of Robb

reaching across, or feet dropping down, or feet walking....But getting that play across recognisable physical form and sheer just sort of abstract kinetic play is really where we're at with the development of the quicktimes.

We like the idea of maybe the installation becoming thermal so that if there are a lot of people in it, can it feel like it's heating up?

One of the responses we got...He loved the idea of it being a space for which people could write, so they could create their own narratives...and their own quicktimes and their own music and send it into the space. That's not necessarily what Gretchen and I would wish to do but...

Richard White and I did quite an interesting experiment because he was...a bit baffled by the music, the choice of music, and it's...quite minimal, a bit spacey. So one night after the installation had closed we went back in and he had a range of CDs, and we tried different music...we tried er Mahler, one of Strauss's songs and some very Erik Satie sounding piano and one other piece that was a bit more rocky/poppy, and it was a fascinating exercise because we left thinking that the music that...the composer had compiled was the best. And, for me, it brought me into opera and cinema and it made me much more passive because...something about the build of the score, the musical score, led you to expect something to happen, you felt something was about to unfold, and once you anticipated an external narrative it made you not experiment as much on your own. You're passive...even though you're working around you were passively waiting to be guided or taken by the hand to the next experience. Whereas...if the music is much more restrained, maybe more abstract, more minimal even, erm, you're drawn into your own engagement. So the Mahler and Strauss were reminiscent of opera and the Satie made you think of the film "Diva".

---

### Contours (performance piece)

We always called Contours a performance installation, in some way transforming the relationship between the audience and the performers was at the heart of it as well as Trajets, although we...knew we weren't going to get rid of live performers because there's this sense in which it's valuable for people to make their own way sometimes, but equally if you've got software

it's good to have someone who's well versed with that software, who's embodied that software, that interactive software, in order to display it at its best, and to really be able to take the audience on a journey. So the idea behind Contours was a chance for Kirk and myself to work together...

Central to the idea of Contours was the idea of the circular structure. We wanted to have effectively what we called an ecosystem... This ecosystem is a wooden structure six metres high, eight metres in diameter. We wanted the audience to have a variety of sight lines on the activity, on the movement, the performance, so the audience clambers up onto platforms with handrails... The movement starts on the floor, then climbs, raises up through the volume of the space, across the performance, and we encourage people to walk around during it... The structure had a 360° circular screen, and it [the piece] was about... it was about... We didn't intend to have a narrative... it was interacting with your software, with the images produced by your software. Some of them were more overtly anthropomorphic and some of them were more abstract. So the first one for instance was the one that Kirk had written before we started to work together. It's very simple differencing so by subtracting one frame from another, obtained... images obtained through a camera... you're able to identify parts of the body that are moving, and then those parts of the body are projected out. So if you're just moving your hand you just have the hand projected out.

...so as you dance, you are dancing with your own image appearing and disappearing like it was another dancer. And it was this play across the self and, and the other that I was really interested because when you dance like this it's not like dancing in a mirror, it's not like dancing with your own video image, it's like somehow evoking a different being next to you and then having an engagement with that. And of course Kirk will say that he writes the software so that it behaves like an instrument, which means he's able to play it.... he could change the resolution, brightness, er, he could make it freeze, he could move in a limited way, he could move the figure around the space... so if it started on the dancer's left and if the dancer didn't really move then it could end up on her right after a while. And that software was very fluid and very soft, and we deliberately wanted to avoid saturated colours, we wanted to avoid a lot of the drum'n'bass or techno music that was associated with performance and technology... because when we came up for the idea of this... which was 1998, it was important to change the tone a little and show that computers didn't have to end up with a video game aesthetic... it could be sensitive it could be...

RP Do you remember the first time you...actually made that other body move?

We were fortunate enough to have some time at ZKM, and that was a fantastic experience because using the good projector and having the floor as a wonderful projection surface, it created a totally immersive feeling. And so for me that was like swimming, and it was like being in water, light that was water and it was incredibly powerful and very very magical. And that was where it was like swimming in water with another being. And that was when we discovered some of the most important dynamics like if you moved faster the image would appear more brightly; if you moved slower you could get just the fingertips, just the top of the head; if you rolled and Kirk froze the image you could get the image in mid-roll, and then once you released the image, the image, it's as if it would leap and catch up with you. So there would be a skidding across the floor...

The initial stage was what I think is always the case with interactive software — you have to understand it through your eyes. You have to know, if I do this, what's it doing. And then, that stage is rapidly replaced by a bodily comprehension, obviously still accessed and facilitated through the visual but it's then bodily and that's when the interesting movement comes out, and that's when you develop a relationship with the image you're creating. And then of course discover things like you're projecting down onto the floor [so] you can project onto yourself, so you can end up playing across touch, the image ends up touching you or if you're dancing with another dancer erm you can touch each other by having your image project onto the other person. And you can also create rather hybrid imagery by joining your bodies — contact improvisation under the software, under the cameras is quite interesting because you generate, again, a lapping of two bodies.

The second sections was a curious sections because it was the last piece of software to be written...So what happened with that section is that the movement principles came first. So Ruth Gibson and I worked and I wanted this idea of a harness that was used in a very different way from most harness work so it wasn't about flying, even when we are higher up in the air in the harness it's not about flying it's more about hanging and curling and rotating. But what I wanted to do for the second section which is the middle portion of the travelling in the space was to have the harness slung in such a way that our toes could still touch the ground, but only just. So you were in a harness but you also had connection with the floor. The movement negotiation was that shift between being in contact with the floor and losing that contact with the floor. So it was all about destabilising and inverting and falling and spilling and then stopping. And the spinning, if you got yourself quite off balance, the spinning was unexpected so you didn't have a sense of whether you would fall to the left or to the right. And we definitely wanted to keep that, so there wasn't control, there wasn't a sense of pulling back and diving to the right, it was pulling back pulling back and I honestly don't know where I'm going to go. So the movement dynamic was one really of erm thwarting you own body's sense of its control over itself in space. And the next important thing after these spills and then swings...to try and stop was the challenge. And you could start [to stop] by putting your foot down, or you could stop by putting your hand down...And then how do you try to go from the dynamic burst of movement to stillness as quickly as possible. So it was very very unsettling.

RP So you're dealing with all these movement ideas, what happens when you're also having to deal with this other thing?

What the other thing is in this case is a flow of particles. So in its still state its like a river of particles travelling from left to right and when there is a movement impulse detected the particles spray apart. So it's like throwing a rock of various sizes into a river and the ripples move outwards. And when there's a tremendous amount of movement the particles splay very very widely apart...And what we're doing there, we're less...it's not that we're not as concentrated on the imagery but we're concentrated on the imagery in a different way from the first section. Because the first section is a play, it's much more controlled. This section, we have a lot more going on in our bodies. But when we have our moments of stillness, moments of stopping, the idea is to hold as long as you can even though it might even be an awkward angle at which to stop and let the particles quieten down. And then Kirk is able to freeze the patterns, so sometimes, it's a most peculiar thing, it's like your whole universe is frozen because in that one the projection is on the floor as well as on the screens.

The metaphor for that...at the beginning of this description, thinking about Contours was about, I said it wasn't really about something but through the improvisation process, as you know, the about will emerge. And it seemed to me that the first section was about creating your body, creating yourself, almost the whole Narcissus myth of who am I, what am I, what it this, how does my arm connect to my shoulder, how does my shoulder ripple through my spine. Those were a lot of the movement metaphors, and the aquatic metaphor. The second section, if anything, was adolescence where you don't know your own body, where your bones have grown and you bash into things and you're falling over things, and it's a highly anxious time of being....It goes on a little longer for both the audience and the performers. And there is...we thought a lot about whether to shorten it, and in the end once our strength increased to match the strength required we were able to keep it up for that long, but we would end up visibly tired and just not wanting to do another inversion or another swing.

The software [for the third section] was the one that we developed in conjunction with the movement, so effectively the first piece of software Kirk

had prepared beforehand, and he fine-tuned it once we were working with it; the second piece of software was prepared after the movement vocabulary, and this third piece of software was the one that was created in tandem with its own movement. This was is one Kirk had wanted to work on for a long time. This was basic surveillance software...so once we were in the harness the cameras were no longer cameras from the top down but were cameras from the side and the cameras were just trying to identify which part of the body was moving fastest. So it could be a hand, it could be a head. If you were still there was always a slight sway on the rope, it would just be your spine moving, and what it tried to do then, the computer tried to do is send out a grid, vertical and horizontal lines that were repeatedly drawn that would lock into what it saw was moving the most quickly. And then if that hand that was moving the most quickly was travelling in space, say, from left to right, the software had enough intelligence to think that perhaps it was going to carry on moving from left to right. So if the movement was initiated it assumed it would carry on, which meant that the image would then, if you played it right, the imagery would leave your body and then you could snap it back into another position. So if you sent your right arm moving out to the right and then froze that arm and had your left hand to a burst of movement the computer would have to snap back and catch the left. So there was a bit more, almost elasticity, a bit more play involved with that. And of course as you moved, you're in the harness, you had a sense that it was this weird shift in dynamic...There were times when I felt like I was being carved and when I didn't understand the software very well...it was quite an aggressive one because it's, it's a repeating grid, like crosshairs in a rifle, and it did make you feel quite vulnerable because you're there in a harness, you can't really control your movement that well and you've this software just repeatedly carving you up. So the challenge then was to be still enough so that the grid would disappear — because if it didn't detect movement it would just quieten down for a while — and then how could you control it? So then, how do you bring it back into existence? Can you do it with just a toe or does it have to be a foot? Can it be an elbow?... This was the piece of software I think that was most sensitive to light and to the performance dynamic was most effected by the lighting conditions. The tiniest shift in lighting conditions would mean that the grid could go wild or that you would really have to work to get it to even stay around. So the times when it was very sensitive it would flicker on with the slightest movement and it would disappear with the slightest stillness, the first intimations of stillness. And that meant as a performer you really had to work to keep the imagery present and with you and it was much more like being an orchestra conductor.

At one point, as ever, the software is late in arriving...or something...and I decided to do what I don't normally do, which is to try to prepare movement in advance based on working with the music [which is not interactive] and understanding what it was about. And, of course, it didn't work. It didn't work because, because it was disconnected. And we didn't know why we were then in the software. For me there's always got to be a why, you have to be there for a reason [when you're] using interactive software. Otherwise...just pre-programme it, you know, it's easier on everyone!

Choreography in these contexts is a sliding process, and it's a delayed process. And I think believing that choreography has to be hard and fast and pose patterns right from day one is perhaps...a misconstrual. Choreography can be many things. It can be soft and much more fluid. I think one of the problems with the dance world is that we tend to assume that things are *either* improvisatory or set. And a lot of us are dealing with places in between.

---

1 See <http://ccii.banff.org/trajets>



**Appendix 11 :**  
**Interview with Mark Coniglio**

Composer/Artist Mark Coniglio focuses on the creation of works that combine music, dance, theatre and interactive media. With choreographer Dawn Stoppiello he is co-founder of Troika Ranch, a New York City based dance theatre company committed to creating multidisciplinary works. Coniglio's research is particularly concerned with creating custom interactive instruments specifically designed to be used in the performance of his pieces. Since he has primarily been interested in creating music for dance, many of these instruments focus on monitoring the movements or vocalisations of dancers, and on using that information to allow performative control of synthesizers and other media. Of these, the most notable is *MIDI Dancer*, a device created in 1988 that measures the angular change at several joints on the dancer's body. This information is sent over a wireless link to a computer where the data is used to control the generation of sound, manipulation of video imagery, and changes in theatrical lighting. I spoke with him in New York in September 2000.

They (the alchemists) didn't separate spirituality and technology. This was a unified thing — it was really three elements: technology, spirituality and a relationship with nature.

The way that we've been approaching technology lately is that it's purely at the service of whatever the story and I don't really typically, anymore, start thinking about technological ideas and then start building a piece around them, which I think is the way I could have worked in the past. I think a lot of times I just had ideas for things I wanted to do because they were just fun from a technological point of view, but oftentimes the pieces really wouldn't support it because it was really a technological idea and not an aesthetic one.

...We don't put it in the programme notes anymore, anything about the technology, and it's odd you know because we have this Board of Directors, and we've had some relatively intense discussions because they're saying "you've got to put it in because no one gets it" and I just told them I can't do it. I'll promote our work by...I'll get stuff in the papers that way, I don't mind if it gets people to see our piece, it's perfectly fine with me, and this is one thing I know Dawn was talking about with Curtis Bahn and others, but I'm not going to put it in the programmes because it just puts the focus in the wrong place. ...Like I did in *Vera's Body* (1998?) I'm using those laser beams, but they go right through the space now, there's several of them, and Dawn is triggering musical stuff as she's dancing the solo. And people see the red dots on her dress and they wonder what's going on, and then they start trying to work out the relationship. I did get several comments from people wanting to know about how it was working. And so I feel then...I don't mind satisfying the curiosity of people in the audience, but I want to do it in an aesthetic way that works, so that means that maybe we need to do it, to just expose the technology a little bit more and let them understand how the instrument's being played and then make that part of the piece. But I don't want to put it in the programme notes.

RP So how important is it for the audience to see the link?

I think it is important in the sense that — I'm actually not a tremendous fan of jazz, but I hear quite a lot, and one of the reasons you go to a jazz concert is because you know they're within a framework creating that live, and that they're playing their instrument in a virtuosic way, in the moment. And the fact that I understand that they are doing that is important. It makes the performance different than if they were doing something that was either memorised or written down on paper. It's different. And so I think to say anything different about using interactive technology and live performance wouldn't be right, it's the same thing.

The think is, with an audience, if you're sitting there with a guitar player and he's like riffing and doing his thing and you can see his fingers move and hitting the strings, you know he's making the music. When Dawn [Stoppiello] is moving through the space and hitting these laser beams, and, you know, in this piece there's a musical thing that...there are these musical notes that change and lights come up and fade out, and it still isn't totally clear to them, even though it seems like it ought to be fairly obvious, although the other component is that there is a video happening live as well as a background, and she's being superimposed on that. And that's another interesting thing, you know, because now we have multiple media happening at the same time, and whenever you have video, people are transfixed by it. So actually to draw their attention down to the laser beams, to understand what's going on, I have a hard time doing it because their eyes are just riveted to the video. So really this is another issue. Really we're using multiple instruments at the same time, and so for them to understand the whole picture is very difficult because it's a complicated instrument. And so it's just because it's beyond their experience. But I think somehow giving them some sense she is actually making this happen — it's like a jazz performance, it's just adding this element of liveness. But on the other hand...it just absolutely doesn't matter because if the dancing moves them, if the music moves them, if the video content that's going with it moves them, they it works.

I guess the main thing for me is that I would like to be able to reveal that she's playing the stuff live, if possible, without making it the focus of the piece. Because the thing is I'm trying to introduce them to an instrument that they don't know and don't understand, and this is a piece of art, so you can only go so far, and if they don't get it, they don't get it. But the other thing is that, as more and more people do this kind of work and it becomes more familiar, this will become much less of an issue. But...even at this late date (2000) there aren't a lot of people doing it, and it's beyond a lot of people's experience.

There was an interesting article in the Village Voice dance section a couple of weeks ago about the avant-garde, because the White Oak Dance Project right now is doing all the postmoderns. They're doing a big concert of the postmodern stuff. A lot of the audience members are bored and walk out, like, you know, it's not typical White Oak fare. And she spends a lot of time talking about the avant-garde, and interviewing Steve Paxton, and Yvonne Rainier. And at the end of the piece talks about how communication seems much more important in art today than it was when those pieces were made. I think that's correct....I think people [artists] at the moment are less concerned with breaking new ground, and more concerned with communication with their audience, and I think probably we [Troika Ranch] fall into the latter category.

It always used to be that we were scrambling to get whatever technology we were using done before the piece, but over the years...you know, we have these sort of "Troika Rules", and one of the Troika Rules is that we won't make a piece involving technology until the technology is built and finished and really working. So if I do have some idea for a piece of technology I want to use, then I have to get myself disciplined enough — sometimes it hard with everything going on in life — to build it, try it out, make sure it works and also have some time to play with it, to figure out what it is that it does. I mean, this is always so key. We're pretty good about that rule — it's not perfect, but it's such an important part of it because so many times... anybody who's done this kind of work knows that you're always dashing at the end to get something working that was working yesterday but you wanted to make this little tweak to it and suddenly it's not working anymore...But because Dawn has grown up with me doing this work, and we've grown together doing it, she understands it so well that she thinks with media in mind as a choreographer. And so that's part of her mentality as she creates, and so it's really just about me providing whatever tools, if there's a sensory system to be used providing that, helping make the relationships. And you know, she'll say, I need it to do this, and then if programming needs to be done that isn't her thing I'll do that to make it happen. And also in the playing process I think that I have a fairly good eye for seeing what...since I know the devices I know where to lead the dancers to explore, to find things that really make this stuff work. So it's a pretty integrated thing that we do, in the sense that we're bouncing ideas off one another all the time, I'm always present in the studio, in the pieces (rehearsal), and now I'm performing in the pieces too.

The MIDIDancer is still the instrument that means to best to me. It's just so clear and the way it works, and it means a lot to the performer to perform with it. I mean the laser beams really work, too, but there's only a certain level of control you can get with them, and it also forces you to be in a particular

space. Even though, at least going across the space you can be anywhere across that beam, so there is quite an option where you can be, but you still have to line up with it, and this is always sort of tricky. So the MIDIDancer is still a great instrument. I'm finally going to make a circuit board design so that I can actually have three or four to work with instead of just one which is what we've always had. So that we can actually get more dancers working with it and make it into something that can really be used by the entire group, or at least several people.

The MIDIDancer is a system I first came up with in 1988 when I was at CalArts. It uses sensors to measure changes, to measure the flexion of joints of the body. So places like the elbow, the wrist, the knee, the hip, anyplace that has an angular bend in it can be measured. It uses small plastic flexible sensors to measure that change. There are wires going to a box centrally located on the body of the dancer, typically in the small of the back. And that information is then sent on a wireless link to a receiver which then puts it into the computer.. It's basically MIDI information which tells me the position of each of those joints... Wherever you put that box, they can never roll there and there's all kind of constraints on the dancers by the physical interface.

There's basically eight streams of information. It's like a slider on a mixing console that goes from 0 to 100 and up and down like that, if you can visualise it that way. I mean, that's the trick, is figuring out how to make use of this in a meaningful way. There's basically two ways you can use that data: you can use it to control something that can be changed continuously, like the volume of a sound is a choice. [In "Chemical Wedding" there are channels of sound being controlled by the MIDIDancer]. I've linked these four channels of sound to her four limbs. So when her limbs are straight, you don't hear, well actually it's always there, but it's quite soft, and then when her limbs are bent, those particular channels will get loud. So she's sort of acting as a live interactive mixing console. But because of the way that I've composed the music, and I composed it with the intention of her controlling it, it really allows her to be the person who take the final step in the act of composition. She know the music, she knows what's there, and she knows what she can do to manipulate it live.

[When Dawn first began to use MIDIDancer] From a mover's perspective it was really thrilling to feel this sense of being bigger than your body. We talked about that a long time ago — we want to make the dancers bigger than their bodies...Somehow she felt her limbs extended all the way out to the corners of the space because she was controlling these other things. Every performer who tries it has this feeling. We give demonstrations a lot and we always show the MIDIDancer. And it used to be that we always had Dawn demonstrate, but recently we just called someone up from the audience and had them do it. And as it happened, they were an audience of dancers, and not only was that

person just loved the experience, because the first time is always such fun, but actually because we were forced into teaching this person how to do it in front of everyone in the lecture, they actually understood it better. But, there's just this magic. It's very basic, and it's part of the appeal of technology in general...When you first put on this device, suddenly things that you never thought of as being possible are suddenly possible. And, it's *tactile*. And that's the other thing, I mean, it's not intellectual, it's tactile. You move your body, and you see or you hear a response. That kind of bodily connection is even stronger than just an intellectual one.

RP Isn't this a key evaluator?

Yes. One of the problems with the laser beams, which work fine, but there's no feedback, you don't always exactly where they are — we've often resorted to putting tape down on the floor, so they know where the beams are because they're invisible. What we actually did in this piece with one of the dancers smoking up the space with frankincense, not only because it's a great smell to put in a space, but you can see the beams for a while. But the tactile part of it is very important. And that's part of why MIDIDancer really works — for the dancer and for the audience. They can see that arm bend, I mean, that's part of what you look at when you're looking at a dancer, you look at the actual composite shape of their body, and if that composite shape of their body is reinforced by the media that's around it then it starts to make sense.

[When we were first working with the laser beams] we had triggering lights, so that you would break the beam and the light would turn on and then gradually fade out. And we did that, and it totally didn't work. It was completely unclear what was going on. And so then, I started triggering samples. I gave up on the lights and started triggering samples. That sort of worked better, but it's so discrete -- these were just samples, I don't even know what they were, some sort of musical thing — but it didn't really work either because the sample also continued, it would just change what sample it was playing, which wasn't the right way to go. Then we put the lights and the sound triggering at the same time...That was a very interesting transformation because the synchronicity of the light and the sound changing at the same time absolutely changed it and made it much much better. Suddenly you could perceive that they were triggering it. I can't tell you exactly why that is, but I absolutely know as soon we did that...then the final step was instead of actually triggering these samples I came up with...a chord sequence of eight chords, and there were four notes in each chord, and what would happen is the computer was playing this chord just on a sixteenth note pattern so it was just doing de de de de de de de de de and you can imagine the four notes happening at the same time. Well each of the four notes is associated with one of the four laser beams, it's like SATB. So when you hit the soprano one, then that one stays in rhythm but begins to fade — it mimics what's happening with the lights. And each time you trigger a note it advances to the next chord. By

making that pattern of musical volume match the brightness of the light, and with the very final step being that we got some real lights that could be focussed in a very precise way, and we actually made very narrow beams of light and lined them up with the laser beams...then that's when it was done. Then everything came together because we understood that when the dancer broke the beam we saw that light come on and we heard the sound and she was in the light...and all of these things working together, finally that instrument, that environment worked.

We called those first pieces we made [with the MIDIDancer] the bleep bloop pieces. And that's kind of what they were because you moved an arm and you went BLEEP and you moved your other arm and it BLOOPed. There wasn't much more to it than that. That's what we [the interactive community] were all doing, because we didn't know what it meant. We were unsatisfied with that, we wanted it to do something more. In the next piece, [which was done telematically with the Electronic Café in Santa Monica] I was trying to get MIDIDancer to look at the entire body. I think I realised at that that when we look at a performance we look at a dancer in toto, we don't look at their individual limbs, so part of what this device should be able to do is to look at the whole body, as a thing. I don't think we took advantage of that aesthetically at that time but I think I realised it at that time. So now it's about 1992 and we start to work with "In Plane" [which used MIDIDancer to control video playback]. We discovered a lot in that piece.... I think we were trying the past to make a dancer a dancer and a musician absolutely simultaneously, and I think I realised that it really wasn't possible. If you wanted to play music, in the way that a musician plays music, where there's a lot of freedom about choice of pitches, and all that sort of thing, and subtlety of control, that the body wasn't going to be moving around the way that you want some sort of hardcore dance phrase that really moves big with a lot of energy, you're not going to be a musician at that point. The interface is completely different, I mean, I just don't know if it's possible...It may be possible, but I still haven't achieved that. I haven't really aiming for it, but I haven't achieved where making a phrase that is purely about dance somehow produces this performance of music that is influenced in just the right way. I haven't quite figured out how to make that happen yet. It would be interesting to make it happen, but the thing is is that you start giving up stuff...I mean maybe it's the lack of the interface, I'm not sure, but you start giving up stuff if you try and do that, try and make the dancer move in a big way and make music. Suddenly the choreography begins to get modulated just to get the device to work well, right...

Recorded in New York 19 Sept 2000

With **Mark Coniglio**, co-artistic Director of **Troika Ranch**.

They (the alchemists) didn't separate spirituality and technology. This was a unified thing — it was really three elements: technology, spirituality and a relationship with nature.

The way that we've been approaching technology lately is that it's purely at the service of whatever the story and I don't really typically, anymore, start thinking about technological ideas and then start building a piece around them, which I think is the way I could have worked in the past. I think a lot of times I just had ideas for things I wanted to do because they were just fun from a technological point of view, but oftentimes the pieces really wouldn't support it because it was really a technological idea and not an aesthetic one.

...We don't put it in the programme notes anymore, anything about the technology, and it's odd you know because we have this Board of Directors, and we've had some relatively intense discussions because they're saying "you've got to put it in because no one gets it" and I just told them I can't do it. I'll promote our work by...I'll get stuff in the papers that way, I don't mind if it gets people to see our piece, it's perfectly fine with me, and this is one thing I know Dawn was talking about with Curtis Bahn and others, but I'm not going to put it in the programmes because it just puts the focus in the wrong place. ...Like I did in Vera's Body (1998?) I'm using those laser beams, but they go right through the space now, there's several of them, and Dawn is triggering musical stuff as she's dancing the solo. And people see the red dots on her dress and they wonder what's going on, and then they start trying to work out the relationship. I did get several comments from people wanting to know about how it was working. And so I feel then...I don't mind satisfying the curiosity of people in the audience, but I want to do it in an aesthetic way that works, so that means that maybe we need to do it, to just expose the technology a little bit more and let them understand how the instrument's being played and then make that part of the piece. But I don't want to put it in the programme notes.



RP So how important is it for the audience to see the link?

I think it is important in the sense that — I'm actually not a tremendous fan of jazz, but I hear quite a lot, and one of the reasons you go to a jazz concert is because you know they're within a framework creating that live, and that they're playing their instrument in a virtuosic way, in the moment. And the fact that I understand that they are doing that is important. It makes the performance different than if they were doing something that was either memorised or written down on paper. It's different. And so I think to say anything different about using interactive technology and live performance wouldn't be right, it's the same thing.

The think is, with an audience, if you're sitting there with a guitar player and he's like riffing and doing his thing and you can see his fingers move and hitting the strings, you know he's making the music. When Dawn [Stoppiello] is moving through the space and hitting these laser beams, and, you know, in this piece there's a musical thing that...there are these musical notes that change and lights come up and fade out, and it still isn't totally clear to them, even though it seems like it ought to be fairly obvious, although the other component is that there is a video happening live as well as a background, and she's being superimposed on that. And that's another interesting thing, you know, because now we have multiple media happening at the same time, and whenever you have video, people are transfixed by it. So actually to draw their attention down to the laser beams, to understand what's going on, I have a hard time doing it because their eyes are just riveted to the video. So really this is another issue. Really we're using multiple instruments at the same time, and so for them to understand the whole picture is very difficult because it's a complicated instrument. And so it's just because it's beyond their experience. But I think somehow giving them some sense she is actually making this happen — it's like a jazz performance, it's just adding this element of liveness. But on the other hand...it just absolutely doesn't matter because if the dancing moves them, if the music moves them, if the video content that's going with it moves them, they it works.

I guess the main thing for me is that I would like to be able to reveal that she's playing the stuff live, if possible, without making it the focus of the piece. Because the thing is I'm trying to introduce them to an instrument that they don't know and don't understand, and this is a piece of art, so you can only go so far, and if they don't get it, they don't get it. But the other thing is that, as more and more people do this kind of work and it becomes more familiar, this will become much less of an issue. But...even at this late date (2000) there aren't a lot of people doing it, and it's beyond a lot of people's experience.

There was an interesting article in the Village Voice dance section a couple of weeks ago about the avant-garde, because the White Oak Dance Project right now is doing all the postmoderns. They're doing a big concert of the postmodern stuff. A lot of the audience members are bored and walk out, like, you know, it's not typical White Oak fare. And she spends a lot of time talking about the avant-garde, and interviewing Steve Paxton, and Yvonne Rainier. And at the end of the piece talks about how communication seems much more important in art today than it was when those pieces were made. I think that's correct....I think people [artists] at the moment are less concerned with breaking new ground, and more concerned with communication with their audience, and I think probably we [Troika Ranch] fall into the latter category.

It always used to be that we were scrambling to get whatever technology we were using done before the piece, but over the years...you know, we have these sort of "Troika Rules", and one of the Troika Rules is that we won't make a piece involving technology until the technology is built and finished and really working. So if I do have some idea for a piece of technology I want to use, then I have to get myself disciplined enough — sometimes it hard with everything going on in life — to build it, try it out, make sure it works and also have some time to play with it, to figure out what it is that it does. I mean, this is always so key. We're pretty good about that rule — it's not perfect, but it's such an important part of it because so many times... anybody who's done this kind of work knows that you're always dashing at the end to get something working that was working yesterday but you wanted to make this little tweak to it and suddenly it's not working anymore...But because Dawn has grown up with me doing this work, and we've grown together doing it, she understands it so well that she thinks with media in mind as a choreographer. And so that's part of her mentality as she creates, and so it's really just about me providing whatever tools, if there's a sensory system to be used providing that, helping make the relationships. And you know, she'll say, I need it to do this, and then if programming needs to be done that isn't her thing I'll do that to make it happen. And also in the playing process I think that I have a fairly good eye for seeing what...since I know the devices I know where to lead the dancers to explore, to find things that really make this stuff work. So it's a pretty integrated thing that we do, in the sense that we're bouncing ideas off one another all the time, I'm always present in the studio, in the pieces (rehearsal), and now I'm performing in the pieces too.

The MIDIDancer is still the instrument that means to best to me. It's just so clear and the way it works, and it means a lot to the performer to perform with it. I mean the laser beams really work, too, but there's only a certain level of control you can get with them, and it also forces you to be in a particular space. Even though, at least going across the space you can be anywhere across that beam, so there is quite an option where you can be, but you still

have to line up with it, and this is always sort of tricky. So the MIDIDancer is still a great instrument. I'm finally going to make a circuit board design so that I can actually have three or four to work with instead of just one which is what we've always had. So that we can actually get more dancers working with it and make it into something that can really be used by the entire group, or at least several people.

The MIDIDancer is a system I first came up with in 1988 when I was at CalArts. It uses sensors to measure changes, to measure the flexion of joints of the body. So places like the elbow, the wrist, the knee, the hip, anyplace that has an angular bend in it can be measured. It uses small plastic flexible sensors to measure that change. There are wires going to a box centrally located on the body of the dancer, typically in the small of the back. And that information is then sent on a wireless link to a receiver which then puts it into the computer.. It's basically MIDI information which tells me the position of each of those joints... Wherever you put that box, they can never roll there and there's all kind of constraints on the dancers by the physical interface.

There's basically eight streams of information. It's like a slider on a mixing console that goes from 0 to 100 and up and down like that, if you can visualise it that way. I mean, that's the trick, is figuring out how to make use of this in a meaningful way. There's basically two ways you can use that data: you can use it to control something that can be changed continuously, like the volume of a sound is a choice. [In "Chemical Wedding" there are channels of sound being controlled by the MIDIDancer]. I've linked these four channels of sound to her four limbs. So when her limbs are straight, you don't hear, well actually it's always there, but it's quite soft, and then when her limbs are bent, those particular channels will get loud. So she's sort of acting as a live interactive mixing console. But because of the way that I've composed the music, and I composed it with the intention of her controlling it, it really allows her to be the person who take the final step in the act of composition. She know the music, she knows what's there, and she knows what she can do to manipulate it live.

[When Dawn first began to use MIDIDancer] From a mover's perspective it was really thrilling to feel this sense of being bigger than your body. We talked about that a long time ago — we want to make the dancers bigger than their bodies... Somehow she felt her limbs extended all the way out to the corners of the space because she was controlling these other things. Every performer who tries it has this feeling. We give demonstrations a lot and we always show the MIDIDancer. And it used to be that we always had Dawn demonstrate, but recently we just called someone up from the audience and had them do it. And as it happened, they were an audience of dancers, and not only was that person just loved the experience, because the first time is always such fun, but actually because we were forced into teaching this person how to do it in front

of everyone in the lecture, they actually understood it better. But, there's just this magic. It's very basic, and it's part of the appeal of technology in general...When you first put on this device, suddenly things that you never thought of as being possible are suddenly possible. And, it's *tactile*. And that's the other thing, I mean, it's not intellectual, it's tactile. You move your body, and you see or you hear a response. That kind of bodily connection is even stronger than just an intellectual one.

RP Isn't this a key evaluator?

Yes. One of the problems with the laser beams, which work fine, but there's no feedback, you don't always exactly where they are — we've often resorted to putting tape down on the floor, so they know where the beams are because they're invisible. What we actually did in this piece with one of the dancers smoking up the space with frankincense, not only because it's a great smell to put in a space, but you can see the beams for a while. But the tactile part of it is very important. And that's part of why MIDIDancer really works — for the dancer and for the audience. They can see that arm bend, I mean, that's part of what you look at when you're looking at a dancer, you look at the actual composite shape of their body, and if that composite shape of their body is reinforced by the media that's around it then it starts to make sense.

[When we were first working with the laser beams] we had triggering lights, so that you would break the beam and the light would turn on and then gradually fade out. And we did that, and it totally didn't work. It was completely unclear what was going on. And so then, I started triggering samples. I gave up on the lights and started triggering samples. That sort of worked better, but it's so discrete -- these were just samples, I don't even know what they were, some sort of musical thing — but it didn't really work either because the sample also continued, it would just change what sample it was playing, which wasn't the right way to go. Then we put the lights and the sound triggering at the same time...That was a very interesting transformation because the synchronicity of the light and the sound changing at the same time absolutely changed it and made it much much better. Suddenly you could perceive that they were triggering it. I can't tell you exactly why that is, but I absolutely know as soon we did that...then the final step was instead of actually triggering these samples I came up with...a chord sequence of eight chords, and there were four notes in each chord, and what would happen is the computer was playing this chord just on a sixteenth note pattern so it was just doing de de de de de de de de and you can imagine the four notes happening at the same time. Well each of the four notes is associated with one

of the four laser beams, it's like SATB. So when you hit the soprano one, then that one stays in rhythm but begins to fade — it mimics what's happening with the lights. And each time you trigger a note it advances to the next chord. By making that pattern of musical volume match the brightness of the light, and with the very final step being that we got some real lights that could be focussed in a very precise way, and we actually made very narrow beams of light and lined them up with the laser beams...then that's when it was done. Then everything came together because we understood that when the dancer broke the beam we saw that light come on and we heard the sound and she was in the light...and all of these things working together, finally that instrument, that environment worked.

We called those first pieces we made [with the MIDIDancer] the bleep bloop pieces. And that's kind of what they were because you moved an arm and you went BLEEP and you moved your other arm and it BLOOPed. There wasn't much more to it than that. That's what we [the interactive community] were all doing, because we didn't know what it meant. We were unsatisfied with that, we wanted it to do something more. In the next piece, [which was done telematically with the Electronic Café in Santa Monica] I was trying to get MIDIDancer to look at the entire body. I think I realised at that that when we look at a performance we look at a dancer in toto, we don't look at their individual limbs, so part of what this device should be able to do is to look at the whole body, as a thing. I don't think we took advantage of that aesthetically at that time but I think I realised it at that time. So now it's about 1992 and we start to work with "In Plane" [which used MIDIDancer to control video playback]. We discovered a lot in that piece.... I think we were trying the past to make a dancer a dancer and a musician absolutely simultaneously, and I think I realised that it really wasn't possible. If you wanted to play music, in the way that a musician plays music, where there's a lot of freedom about choice of pitches, and all that sort of thing, and subtlety of control, that the body wasn't going to be moving around the way that you want some sort of hardcore dance phrase that really moves big with a lot of energy, you're not going to be a musician at that point. The interface is completely different, I mean, I just don't know if it's possible...It may be possible, but I still haven't achieved that. I haven't really aiming for it, but I haven't achieved where making a phrase that is purely about dance somehow produces this performance of music that is influenced in just the right way. I haven't quite figured out how to make that happen yet. It would be interesting to make it happen, but the thing is is that you start giving up stuff...I mean maybe it's the lack of the interface, I'm not sure, but you start giving up stuff if you try and do that, try and make the dancer move in a big way and make music. Suddenly the choreography begins to get modulated just to get the device to work well, right...

1. The first step in the process of creating an emotionally aware performance space is to identify the emotional goals of the performance.

2. The second step is to design the physical space to support these emotional goals. This involves considering factors such as lighting, sound, and set design.

3. The third step is to create a performance that is emotionally resonant. This involves using storytelling, music, and other techniques to engage the audience's emotions.

4. The fourth step is to evaluate the performance and make adjustments as needed. This involves gathering feedback from the audience and reflecting on the performance's emotional impact.

5. The final step is to share the performance with a wider audience. This can be done through live performances, recordings, or other means.

# List of References

- Allen, R. E. (Ed.) *The Concise Oxford Dictionary of Current English* 1990 Clarendon Press, Oxford.
- Anderson, L. with Hsin-Chien H. 1999 *Puppet Motel*. Voyager, New York
- Ascott, Roy (ed.) 1999, *Reframing Consciousness*. intellect books, Exeter UK
- Auslander, P. 1999, *Liveness: Performance in a Mediatized Culture* Routledge, London & New York
- Avison, Lau, Myers, & Nielson. 1999 *Action Research in Communications of the ACM* Vol. 42 No. 1 January 1999
- Bachelard, G. 1964 *The Poetics of Space* quoted in Hansen 2001 p.1
- Banes, S. 1994 *Writing Dancing in the Age of Postmodernism*. Wesleyan University Press, Hanover and London.
- Barrie, J.M. 1992, *Peter Pan*, New York: Everyman's Library
- Beardon, C 1999, *Cyber Art and Cyber Ethics* in Ascott 1999 pp. 273-277
- Benjamin, W. 1968, *Illuminations*. Trans. Harry Zohn. Edited and with Introduction by Arendt, H. New York: Schocken Books,. [The Work of Art in the Age of Mechanical Reproduction was originally published in 1934]
- Blackman, Lisa M. 1998, *Culture, Technology and Subjectivity* in Woods 1999 pp.132-146
- Blom, L. and Chaplin, L. J. 1988 *The Movement of Movement: Dance Improvisation*. Dance Books, London.
- Broadhurst Dixon, Joan & Cassidy, Eric J. (ed.) 1998, *Virtual Futures*. Routledge London & New York.
- Campbell, P. (Ed.) 1996 *Analysing Performance: A Critical Reader*. Manchester University Press, Manchester.
- Chanan, M. 1994 *Musica Practica: The Social Practice of Western Music from Gregorian Chant to Postmodernism* Verso, London & New York
- Charest, R. 1997, *Robert LePage: Connecting Flights* (originally *Quelques zones de liberté Editions de L'instant même*, Québec 1995) translated by Taylor, W.R. Methuen London
- Chisholm, D. *The 'Cunning Lingua' of Desire. Bodies-language and perverse performativity*. In Grosz 1995 pp.19-41

# Bibliography

- Allen, G. 2000, *Intertextuality (The New Critical Idiom)*. Routledge, London
- Altman, R. 1992, *The Material Heterogeneity of Recorded Sound*. In Altman, R. (ed.): *Sound Theory, Sound Practice*. Routledge, New York:, pp. 15-31
- Ascott, R. 2000, *Edge-Life: technoetic structures and moist media* in Ascott 2000 pp. 2-6
- (ed.) 2000 *Art, Technology, Consciousness: mind@large* intellect Press, Exeter UK.
- Ashley, R 1982, *Private Lives (recording)* Lovely Music New York USA
- Azar, B. 1998, *Why can't this man feel whether or not he's standing up?* APA Monitor (American Psychological Association) Vol. 29 No. 6 June (<http://www.apa.org/monitor/jun98/touch.html>)
- Banes, S. 1987 *Terpsichore in Sneakers*. Wesleyan University Press, USA.
- Barthes, R. 1977, *Image-Music-Text*. Fontana, London
- . 1974 *S/Z* Hill & Wang, New York
- Bateson, G. 1972, *Steps to an Ecology of Mind* Palladin St Albans UK
- Baudrillard, J. 1984, *The Precession of Simulacra* in Wallis, B. (ed.) *Art After Modernism: Rethinking Representations*, Vol. 1. Museum of Contemporary Art, New York (reprinted from *Art and Text II* (September 1983): 3-47)
- Birringer, Johannes, 1998 [online article] <http://www.art.net/~dtz/mailarchive.html>)
- , 1998 *Media and Performance: Along the Border*, Johns Hopkins University Press, Baltimore.
- Blau, H. S. 1982 *Blooded Thought, Occasions of Theatre*. Performing Arts Journal Publications, New York.
- Cage, J. 1991, *The Future of Music: Credo* in Kostelanetz, R. *John Cage: An Anthology*. New York, Da Capo Press. pp.54-57
- Cohen, S. J., 1977. *Dance As A Theatre Art: Source Readings in Dance History from 1581 to the Present*. Dance Books Ltd, London.
- Cubbitt, S. 1991, *Timeshift: On Video Culture*. London, New York, Routledge
- Deleuze, G. 1968 (tr. Patton, P.) *Difference and Repetition*. The Athole Press, London



- Derrida, J. 1978, *Writing and Difference* (trans. Bass, A.): Routledge, London and New York
- Desmond, J. C. *Engendering Dance: Feminist Inquiry and Dance Research* in Fraleigh & Hanstein, 1999.
- Dreyfus, H. 1992 *What Computers Still Can't Do*. MIT Press, Cambridge USA
- 1985 *Mind Over Machine: The Power of Human Intuition and Expertise in the Era of the Computer*. Free Press, New York, USA.
- 1979 *What Computers Can't Do*. Harper & Row, New York.
- Finley, K. 1988, *The Constant State of Desire* TDR 34, no. 2 (1988): pp.139 — 151
- Fodor, J. 2002, *Don't bet the chicken coop* London Review of Books Vol 24 No 17 5 September 2002 p 21
- Foster, S. L 1996,. *Corporealities*. Routledge, London & New York
- .. 1986 *Reading Dancing: Bodies and Subjects in Contemporary American Dance*, University of California Press, Berkeley, Calif.
- Fraleigh, S. H. 1987 *Researching Dance*. University of Pittsburgh Press, USA
- & Hanstein, P. 1999 *Researching Dance: Evolving Modes of Inquiry*. Dance Books, London.
- George, B. J. 2001, *The Bottleneck Adventures in Limen* Volume 2/2001 [online journal] at <http://limen.mi2.hr/limen2-2001/index.html> .
- Gilpin, H. 1996, *Lifelessness in Movement, or How do the Dead Move?* In Foster 1996 pp.106-128.
- Gilson-Ellis, J. 1998, *Get Your Feminism off My Floppy: Seedy Roms and Technical Tales* Journal of Lesbian Studies. Vol 2, Nos. 2/3 (1998): 95 - 109
- Goodwin, A. 1990 *Sample and hold: pop music in the digital age of reproduction*. in Auslander 1999
- Hansen, B. 1995, *The Chess Garden*. Hodder & Stoughton London. pp100-101
- Hawkes, T. 1997, *Structuralism and Semiotics*. Routledge, London
- Heidegger, M. 1977 *The Question Concerning Technology and Other Essays*. Transl. Lovett, W. Harper & Row, New York.
- Heisenberg, W. 1983, *The physical content of quantum kinematics and mechanics*. Wheeler, J.A. and Zurek, W.H., (eds.) *Quantum theory and measurement*. (Princeton Series in Physics). Princeton University Press, Princeton pp. 62-84.. English translation (translation by Wheeler and Zurek) of *Über den anschaulichen Inhalt der quantentheoretischen Kinematik und Mechanik* ZP 43, pp. 172-198. 23 March 1927.

- Husserl, E. & Laver, Q. 1965 *Phenomenology and the crisis of philosophy: philosophy as rigorous science and philosophy and the crisis of European man* Harper Torchbooks, Baltimore USA.
- Ihde, D. 1990, *Technology and the Lifeworld: From Garden to Earth*. Indiana University Press, Bloomington USA
- Kaye, N. 1994 *Postmodernism and Performance*, Macmillan, London.
- Keller, E. F. 1996, *The biological gaxel*. In *Future Natural: Nature, science, culture*. Robertson, Mash, Tickner, Bird, Curtis and Putnam (eds.). Routledge, London and New York. pp.107-121
- Kelly, K. 1994, *Out of Control, The new biology of machines*. Fourth Estate, London
- Kristeva, J. 1980, *Desire in Language: A Semiotic Approach to Literature and Art*. Columbia University Press, New York
- Lotman, Y. M. 1972 *La struttura del testo poetico*. Mursial, Milan. (English translation: *Analysis of the Poetic Text*, 1976 Michigan University Press, Ann Arbor).
- Lyotard, J. 1979 *The Postmodern Condition: A Report on Knowledge*. Theory and History of Literature, Vol. 10. University of Manchester Press, Manchester.
- Mackrell, J. 1997 *Reading Dance*, Michael Joseph, UK.
- Merleau-Ponty, M. 2002 *The Visible and the Invisible* Routledge, London and New York.
- McLuhan, M. & Quentin F. 1967 *The Medium is the Massage*. Bantam, New York
- McLuhan, M. 1970, *Counterblast*. Rapp & Whiting, London.
- Phelan, P. & Lane, J. 1998, *Performance*. New York University Press, New York & London
- Rokeby, D. 1995, *Very Nervous System*. [online article] at <http://www.interlog.com/~drokeby/vns.html>
- Rosenboom, D. [no date] *Collected Scores*. Frog Peak Music, USA Ros02
- Savran, D. 1988 *Breaking the Rules: The Wooster Group* Theatre Communications Group, New York.
- Scarry, E. 1992, *The made-up and made-real* Yale Journal of Criticism 5 (2): 239-49. Yale University Press, Yale, USA
- Schelling, F. 1774, *System of Transcendental Idealism (1800)*. transl. by Heath, P. University Press of Virginia, Charlottesville USA 1978,.
- Shanken, E. A. 1996, *Virtual Perspective and the Artistic Vision: A Genealogy of Technology, Perception, and Power*. Lecture presentation. Rotterdam: The International Society for Electronic Art (ISEA) Conference

Sparshott, F. 1982, *On the Question: 'Why do Philosophers Neglect the Aesthetics of the Dance?'* Dance Research Journal 15(1): 5-30.

Stern, T. 1997, Interview with composer Robert Ashley. [online article] at <http://www.furious.com/perfect/robertashley.html>

Stone, A. R. 1997, *In the Language of Vampire Speak: overhearing our own voices.* in Golding, S. (ed.) *The Eight Technologies of Otherness* Routledge London & New York. pp 58-67

Tuffnell, M. & Crickmay, C. 1993 *Body Space Image.* Dance Books, London.

Turner, B. S. (Ed.) 1991 *Theories of Modernity and Postmodernity.* Sage Publications, London.

Varela, F. 1991, *The Embodied Mind,* MIT Press, Cambridge Mass.

Way, R. 2000, *Collaborative Practice and the Phenomenal Dancer* in Mock, Roberta (ed.) *Performing Processes: Creating Live Performance* Intellect Books Bristol and Portland, Oregon pp. 51-61

Winkler, Todd 1995, *Making Motion Musical: Gesture Mapping Strategies for Interactive Computer Music.* Proceedings of the International Computer Music Conference, pp.261-264. Stanford, Calif.

Wood, John. (ed.) 1998, *The Virtual Embodied* Routledge, London & New York

Zicarelli, D. 1992, *Music Technology as a Form of Parasite.* Proceedings of the International Computer Music Conference, pp.69-72. Stanford, Calif.