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Beyond the Electronic Connection: The Technologically Manufactured Cyber-Human and Its Physical Human Counterpart in Performance: A Theory Related to Convergence Identities

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Beyond the Electronic Connection
**The Technologically Manufactured Cyber-Human and Its Physical
Human Counterpart in Performance:
A Theory Related to Convergence Identities**

by

Yacov Sharir

A thesis submitted to the University of Plymouth
in partial fulfillment for the degree of

Doctor of Philosophy

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Faculty of Arts

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Beyond the Electronic Connection
**The Technologically Manufactured Cyber-Human and Its Physical Human
Counterpart in Performance: A Theory Related to Convergence Identities**

This thesis is an investigation of the complex processes and relationships between the physical human performer and the technologically manufactured cyber-human counterpart. I acted as both researcher and the physical human performer, deeply engaged in the moment-to-moment creation of events unfolding within a shared virtual reality environment. As the primary instigator and activator of the cyber-human partner, I maintained a balance between the live and technological performance elements, prioritizing the production of content and meaning. By way of using practice as research, this thesis argues that in considering interactions between cyber-human and human performers, it is crucial to move beyond discussions of technology when considering interactions between cyber-humans and human performers to an analysis of emotional content, the powers of poetic imagery, the trust that is developed through sensory perception and the evocation of complex relationships. A theoretical model is constructed to describe the relationship between a cyber-human and a human performer in the five works created specifically for this thesis, which is not substantially different from that between human performers. Technological exploration allows for the observation and analysis of various relationships, furthering an expanded understanding of ‘movement as content’ beyond the electronic connection.

Each of the works created for this research used new and innovative technologies, including virtual reality, multiple interactive systems, six generations of wearable computers, motion capture technology, high-end digital lighting projectors, various projection screens, smart electronically charged fabrics, multiple sensory sensitive devices and intelligent sensory charged alternative performance spaces. They were most often collaboratively created in order to augment all aspects of the performance and create the sense of community found in digital live dance performances/events. These works are identified as one continuous line of energy and discovery, each representing a slight variation on the premise that a working, caring, visceral and poetic content occurs beyond the technological tools. Consequently, a

shift in the physical human's psyche overwhelms the act of performance. Scholarship and reflection on the works have been integral to my creative process throughout.

The goals of this thesis, the works created and the resulting methodologies are to investigate performance to heighten the multiple ways we experience and interact with the world. This maximizes connection and results in a highly interactive, improvisational, dynamic, non-linear, immediate, accessible, agential, reciprocal, emotional, visceral and transformative experience without boundaries between the virtual and physical for physical humans, cyborgs and cyber-humans alike.

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AUTHOR'S DECLARATION

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Sharir, Yacov. "How Contemporary Dance Performance/Image is Affected with the Use of Alternative Projection Means." Paper at *Ciber@rt Bilbao: Challenges for a Ubiquitous Identity*, Bilbao, Spain, April 26-29, 2004.

Williams, Holly, Kent DeSpain and Yacov Sharir. "Wires and Bodies, Pedagogy, Technology, and the Dance Classroom." Collaborative lecture and presentation at the National Dance Association's *A Moving Landscape: Dance Pedagogy for the 21st Century Conference*, Dallas, Texas, January 16-19, 2004.

Sharir, Yacov. "*IntelligentCITY*." Lecture and paper at *Consciousness Reframed Public Symposium*, Fortaleza, Brazil, November, 29-30, 2003.

Sharir, Yacov. "The Function of Art in Restructuring Experience in Virtual Environments." Paper in The 9th International Conference on Hybrid Reality *Virtual Systems and Multimedia (VSMM)*, Montreal Science Center, Canada, October 15-17, 2003.

Sharir, Yacov. "I Have No Face." Lecture and presentation at the Dance/USA Roundtable *NIPAD*, Miami, Florida, June 19-23, 2002.

Sharir, Yacov. "Wearable Computer." Lecture and presentation at the Dance/USA Roundtable *NIPAD*, Miami, Florida, June 19-23, 2002.

Sharir, Yacov. "Wearable Computer Project." Presentation in the *SXSW Multimedia/Interactive Festival*, Austin, Texas, February 24, 2002.

Panels & Roundtables:

Sharir, Yacov. *Resolving Order in Chaos: Navigation in Complex Data Sets*. Poster session and abstract presentation at the *Toward a Science of Consciousness Conference*, Center for Consciousness Studies, University of Arizona, April 5, 2006.

Sharir, Yacov. "Experimental Jews, Projecting Jewish Identity in the New Millennium." Panel at the Center for Jewish Studies, University of Wisconsin-Madison, March 25, 2004.

Sharir, Yacov. "Blurry Edge Between Physical and Virtual Space." Panel and debate at *RESPOND Inter-Change: body>data>space*, University of Cambridge, UK, April 2-5, 2003.

Sharir, Yacov. "Dance and Technology Panel." Panel at *NIPAD 2002*. Miami, Florida, June 19-23, 2002.

Sharir, Yacov. "Dance/USA Roundtable." Roundtable at *NIPAD 2002*. Miami, Florida, June 19-23, 2002.

Sharir, Yacov. "Planning Panel for the International Robotic Conference." Panel planning the International Robotic Conference to take place at Nottingham Trent University Campus in the fall of 2003, UK, May 23, 2002.

Workshops:

Sharir, Yacov. "Wearable Computers as They Apply to Theatrical Performance." Transdisciplinary workshop and laboratory as a part of the Distinguished Lecture Series Program, School of Engineering, Sabanci University, Istanbul, Turkey, October 15-23, 2005.

Sharir, Yacov. "The Austin Film Festival Summer Workshop." Two week workshop on *Computer Animation and 3D Modeling*, School of Communications, University of Texas at Austin, June 14-25, 2004.

Sharir, Yacov. "Emergent Electronic Technologies and How They Influence Artistic Processes Related to the Experience of Work." Workshop in the Summer Dance and Technology, (SDAT 04) @Arizona State University, Arizona, May 17-28, 2004.

Sharir, Yacov. "Dance and Technology in the Classroom and in Performance Residency." Master classes at Ohio State University, Ohio, February 25-28, 2004.

Gromala, Diane and Yacov Sharir. "Wearable Computers." Residency, presentation and master classes at the Department of the Arts, Communications, and Literature of Georgia Tech University, Atlanta, Georgia, September 4-7, 2003.

Sharir, Yacov. "Body Automatic." Workshop at the Théâtre L'échangeur, Paris, France, May 2000.

EXHIBITIONS & PERFORMANCES

Too & For. Dance Repertory Theatre's "Catalyst," University of Texas at Austin, March 23-25, 2012.

Blurred Boundaries: Bags and Blurred Boundaries: More. Dance Repertory Theatre's "Physical Language," University of Texas at Austin, March 4-6, 2011.

Blurred Boundaries. Co-choreographed with Andrea Beckham, Dance Repertory Theatre's "Fall Showing," University of Texas at Austin, December 3-4, 2010.

Twining Project: Wearable Computer version 3.0. Collaboration with Barbara Layne and Hesam Khoshnevis. Montreal, Canada, May 19-24, 2010.

Zoominn. Dance Repertory Theatre's "Canción Del Cuerpo," University of Texas at Austin, March 5-7 2010.

Yet Untitled. Dance Repertory Theatre's "Fall Showing," University of Texas at Austin, December 4-5, 2009.

Trocola - Espectaculos Poliartísticos Viernes. Co-choreographed with Alejandra Giménez Chiscano, Huesca 2009, La Ignorancia Dance Company, Huesca Palacio De Congresos, Spain, October 2, 2009.

Sextet. Dance Repertory Theatre's "Adventures in Motion," University of Texas at Austin, February 20-21, 2009.

Virtual Physical Bodies – Serious Play/Games. Contribution to the "Live Performance with Virtual Avatars" exhibit, the Centre des Arts, Enghien-les-Bains, Paris, France, from October 9, 2008-January 11, 2009.

Unity. Contribution to "Myth and Reality" a retrospective exhibit of The Ten Plus Group, Tel Aviv Museum of Art, Israel, March 6-June 31, 2008.

Nothing was Left But White Fragments. Co-choreographed with Carolyn Pavlik, Western Michigan University's "Spring Showing," Kalamazoo, Michigan, February 8-9, 2008.

Rina's Cloth. Rina Schenfeld Dance Theatre at the Suzzane Dellal Dance Centre, Tel Aviv, Israel, July 21, 2007.

Ears, Eyes, and Feet. School of Music and the Department of Theatre & Dance's Electro Acoustic Music Series' "Annual Spring Event," University of Texas at Austin, May 3-4, 2007.

Parade. Dance Repertory Theatre's "Ways to Get There," University of Texas at Austin, March 30-April 1, 2007.

Parade 1. Dance Repertory Theatre's "Fall Showing," University of Texas at Austin, December 7-8, 2006.

Twining 2. Co-choreographed with Ray Schwartz, School of Music and the Department of Theatre and Dance Electro Acoustic Music Series' Annual Spring event "Ears, Eyes, and Feet," University of Texas at Austin, May 5-6, 2006.

Twining 1. Dance Repertory Theatre's "Proof," University of Texas at Austin, April 29-30, 2006.

Twining 1. Dance Repertory Theatre's "SUM PARTS," University of Texas at Austin, December 8-9, 2005.

Silence Erupted. Sharir + Bustamante Dance Works' 21st Anniversary Gala Event "Reflex," University of Texas at Austin, May 14-15, 2004.

Sex, Lies, and Fairy Tales. Sharir + Bustamante Dance Works' "Regarding Reflections," University of Texas at Austin, January 30-31, 2004.

The Absent Body. Sharir + Bustamante Dance Works' "20th Anniversary Gala Event," University of Texas at Austin, May 9-10, 2003.

Dancing with the Virtual Dervish: Virtual Bodies. National Museum of Contemporary Art's "Synopsis II – Theologies," Athens, Greece, October 16, 2002-January 15, 2003.

I Have No Face: Ten Stories. Sharir + Bustamante Dance Works' "19th Anniversary Gala Event," University of Texas at Austin, May 10-12, 2002.

The Automated Body Project. Dance Repertory Theatre and Sharir + Bustamante Dance Works' "18th Anniversary Spring Event," University of Texas at Austin, April 22-29, 2001.

The Glide Project and The Wearable Computer. Collaboration with Diana Slattery and Pauline Oliveros, "The Techno Poetry Festival 2002," Georgia Tech University, Atlanta, Georgia, April 1-3, 2002.

AutomatedBodyOne. Dance Repertory Theatre's "Fall Event," University of Texas at Austin, December 1-2, 2000.

DrumSuite. Sharir + Bustamante Dance Works, University of Texas at Austin, November 17-19, 2000.

Currents and Streams. Utah Repertory Dance Theatre's 30th anniversary "Spring Event," Salt Lake City, Utah, April 28-May 7, 2000.

D_U_O_S. Sharir + Bustamante Dance Works, University of Texas at Austin, November 20-22, 1999.

Quartet for Now. Boston Ballet Academy's Summer Program, Boston, Massachusetts, August 4-6, 1999.

Amber. "Keresh Kfitza." Jerusalem Rubin Academy of Music and Dance, Jerusalem, Israel, July 14, 1999.

Here... in This Place. Co-choreographed with Jeffrey N. Bullock, American Choreographers' Showcase at the Vienna Festival, Schlosspark Schonbrunn, Austria, 1999.

Here... in This Place. Co-choreographed with Jeffrey N. Bullock, American Choreographers' Showcase Musical Theater, Kaunas, Lithuania, May 23-24, 1999.

D-U-O-S. Dance Repertory Theatre, University of Texas at Austin, April 29-May 2, 1999.

A Cart with Apples. Sharir + Bustamante Dance Works, University of Texas at Austin, May 14-16, 1999.

More about Love. Utah Repertory Dance Theatre, Salt Lake City, Utah, November 27-29, 1998.

Body Electric. Boston Ballet School, August 5-8, 1998.

Dancing with the Virtual Dervish: Virtual Bodies. Fourth International Cyberspace Conference in Canada, May 1994.

Dancing with the Virtual Dervish: Virtual Bodies. University of Texas at Austin, May 1994.

Reviews of Performances:

van Ryzin, Jeanne Claire. "S+B Floats Buoyant Dance." *Austin American-Statesman* (Austin, Texas), May 20, 2004.

Barnes, Michael. "Perfect Fusion of Dance, Technology." *Austin American-Statesman* (Austin, Texas), Monday, May 12, 2003.

Barnes, Michael. "New Dances Lift Sharir Into Another 20 Years." *Austin American-Statesman* (Austin, Texas), Monday, January 20, 2003.

Egner, Jeremy. "Amazing Grace from Sharir+Bustamante." *Austin American-Statesman* (Austin, Texas), Saturday, January 19, 2003.

Barnes, Michael. "Danceworks' Beauty Surprises, Delights." *Austin American Statesman* (Austin, Texas), November 20, 2000.

Lomax, Sondra. "New Season of Cultural Fusion." *Austin American Statesman* (Austin, Texas), November 14, 2000.

Iwasaki, Scott. "RDT reaches cyber-high with Currents, Streams." *Desert News SLC* (Salt Lake City, Utah), May 19, 2000.

Webb, Karen. "Repertory Dance Theatre Looks to the Future." *City Lights SLC* (Salt Lake City, Utah), May 15, 2000.

"Choreographer from Texas, RDT Team Up in Concert." *Desert News SLC* (Salt Lake City, Utah), May 7, 2000.

"Computer-Generated Dance is Coming to Life." *Desert News SLC* (Salt Lake City, Utah), May 7, 2000.

Morgan, Scott. "Two Universities Collaborated to Create Virtual Environment for RDT Dancers." *The Salt Lake City Tribune* (Salt Lake City, Utah), May 6, 2000.

Lomax, Sondra. "Sharir Opener Soars with Humor, Imagination." *Austin American-Statesman* (Austin, Texas), November 16, 1999.

Lomax, Sondra. "Sharir Returns to Basics of Dance; After Mixing Art With Technology." *Austin American-Statesman* (Austin, Texas), November 10, 1999.

Klym, Kendall. "Dancers Honor Spirit of Flight, Friendship." *Austin American-Statesman*. (Austin, Texas), May 13, 1999.

Marshall, Cari. "Duos Danceworks: Double The Pleasure." *The Austin Chronicle* (Austin, Texas), December 4, 1998.

Lomax, Sondra. "'DUOS' Dancers Work Well in Pairs." *Austin American-Statesman* (Austin, Texas), November 23, 1998.

Forsberg, Helen. "Utah Repertory Dance Theatre Just Getting Better." *The Salt Lake City Tribune* (Salt Lake City, Utah), October 2, 1998.

HONORS, AWARDS, & TITLES

Co-Artistic Director (with Andrea Beckham), University of Texas at Austin Dance Repertory Theatre, 2010-2011

Supervisor, Art and Technology Program at the Center for International Studies Kibbutzim College of Education in Tel Aviv, Israel, 2010-present

Co-Artistic Director (with Lyn Wiltshire), University of Texas at Austin Dance Repertory Theatre, 2009-2010

Second Editor, *Metaverse Creativity* (Intellect Journals), March 2009-present

Co-Artistic Director (with David Justin), University of Texas at Austin Dance Repertory Theatre, 2008-2009

Appointee to the Ohio Arts Council's (OAC) Individual Excellence Award Panel in Choreography, 2008

Co-Artistic Director (with Holly Williams), University of Texas at Austin Dance Repertory Theatre, 2006-07

The University of Texas College of Fine Arts Student Council Teaching Excellence Award, 2005-2006

Co-Artistic Director (with David Justin), University of Texas at Austin Dance Repertory Theatre, 2005-06

Yokohama Dance Council member, Yokohama Dance Collection R, 2005-06

Austin Arts Hall of Fame Class of 2005

Visiting Research Scholar in Residence, Nottingham Trent University, UK, 2002

Austin Children's Museum Committee of Visitors, 1999-2000

Career Research Excellence Award in the Robert W. Hamilton Faculty Authors Award competition, University of Texas at Austin, 1998

Innovative Use of Instructional Technology "Virtual Reality & Cyberspace in the Arts" award, University of Texas at Austin, 1997

Director of the Dance program Department of Theatre & Dance, University of Texas at Austin, 1996-2000

National Foundation for Advancement in the Arts Award, 1995-1996

Member of the Arts Council, Certamen Coreográfico de Madrid, 1994

The Suzanne Dellal International Choreography Competition Honorary Award, 1993-1994

University of Texas at Austin College of Fine Arts Student Council Teaching Excellence Award, 1991

Founder/Artistic Director, Sharir Dance Company, University of Texas at Austin, 1982-present

Founder/Artistic Director, American Deaf Dance Company, 1977-82

Rehearsal Director, Kol Demama/Moshe Efrati Dance Company, 1974-1977

Artistic Director & Set/Costume Designer, Ballet School of Kiron, Kol Demama/Moshe Efrati Dance Company, 1973-1976

Founder, Kol Demama/Moshe Efrati Dance Company, 1974-76

Member of the Batsheva Dance Company, 1966-74

Service:

Texas Commission on the Arts Dance Panel

Mid-America Arts Alliance Dance On Tour Panel

National Endowment for the Arts Choreography Fellowship Panel

Appointed to the Leonardo/The International Society Board of Directors for Art, Science and Technology Network, 2005-2006

Concours Chorégraphique International de Bagnolet Arts Council, 1994-2000

Grants:

E. W. Doty Faculty Fellow in the Fine Arts, College of Fine Arts, University of Texas at Austin, 2012

Walter & Gina Ducloux Fine Arts Research Fellowship, University of Texas at Austin, 2008

Walter & Gina Ducloux Fine Arts Research Fellowship, University of Texas at Austin, 2007

Texas Commission on the Arts award to Sharir + Bustamante DanceWorks, 2006-2007

City of Austin Cultural Arts Division award to Sharir + Bustamante DanceWorks 2006-2007

Walter & Gina Ducloux Fine Arts Research Fellowship, University of Texas at Austin, 2006

Walter & Gina Ducloux Fine Arts Research Fellowship, University of Texas at Austin, 2005

City of Austin's Cultural Arts Division award to Sharir + Bustamante DanceWorks 2005-2006

Texas Commission on the Arts award to Sharir + Bustamante DanceWorks, 2005-2006

Walter & Gina Ducloux Fine Arts Research Fellowship, University of Texas at Austin, 2004

City of Austin Cultural Contracts Program award to Sharir + Bustamante DanceWorks, 2003-2004

Texas Commission on the Arts award to Sharir + Bustamante DanceWorks, 2003-2004

Still Water Foundation, award to Sharir + Bustamante DanceWorks, 2002-2003

City of Austin Cultural Contracts award to Sharir + Bustamante DanceWorks, 2002-2003

Texas Commission on the Arts award to Sharir + Bustamante DanceWorks, 2002-2003

City of Austin Cultural Contracts award to Sharir + Bustamante DanceWorks, 2001-2002

Texas Commission on the Arts award to Sharir + Bustamante DanceWorks, 2001-2002

Cullen Trust for the Performing Arts, 2001

City of Austin Cultural Contracts award to Sharir + Bustamante DanceWorks, 2000-2001

Texas Commission on the Arts award to Sharir + Bustamante DanceWorks, 2000-2001

National Endowment for the Arts award to Sharir + Bustamante DanceWorks, 2000

Summer Fellowship Research Grant, University of Texas at Austin, 1999

Concours Chorégraphique International de Bagnolet Arts new work award commission, 1993-94

Fellowship in the Arts and Virtual Environments, Banff Centre for the Arts, 1992-1994

Advancement Grant, National Endowment for the Arts, 1988-1994

Meet the Composer/Choreographer National Grant with composer Pauline Oliveros, 1989-1990

National Endowment for the Arts Choreographic Fellowships, multiple years (1979-1982)

EXTERNAL CONTACTS

Elif Ayiter: Sabanci University, Istanbul

Julio Bermudez: University of Utah

Margaret Dolinsky: Indiana University at Bloomington

Diane Gromala: Simon Fraser University, Vancouver

Barbara Lane: Concordia University, Montreal

Marcos Novak: University of California at Santa Barbara

Thecla Schiphorst: Simon Fraser University, Vancouver

Diana Slattery: California, USA

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CHAPTER 1: Introduction

My artistic training began with my violin lessons at age eleven in Israel in the late 1950's. My violin teacher immigrated to Israel from Romania. His way of teaching and playing his instrument embodied the gypsy way of experiencing music, which is to say you are wearing the music over and on you, as if it has become your second skin. Music was his way of life, all day, every day.

The value of my first art teacher's pedagogy came from his insistence on instilling in me – and all of his students – the importance of overall mood, atmosphere and colors of the music, as well as an appreciation of/for meaning. “Tell me your story,” he would say. If all I was looking for was to survive – to just clearly deliver my notes – he would comment, “This is not very interesting.” His lessons weren't predetermined. Instead, and despite the difference in our experiences, he took a workshop-like approach, as if we were in a lab. This collaborative method forced me to pay close attention to his instructional messages with all of their multiple meanings, instead of simply receiving basic information. The impact of my first encounter with music/art studies was immeasurable. This experience didn't simply teach me about playing music; I also learned about aesthetics and playing style, and crucially, about teaching styles as well. My violin teacher's instruction became coherent through his blending of demonstration and the impact of his emotional demonstrations.

Looking for the mood, the atmosphere, the colors, the meaning and the story deeply influenced my artistic development and my ways of working and teaching. Time and time again, I find that I am occupied with exploring how my various collaborators and I can mutually build content and meaning before we embark on the pursuit of our technologically mediated collaborative works.

This thesis draws on my experience as a student, practitioner, scholar and teacher. As such, the following chapters interrogate and reflect upon particular works. The field of technology and art inherently and necessarily blurs the boundaries between disciplines and

has also been the site of significant communal and collaborative work models. Two important concepts which describe these truly collaborative methodologies are zero point methodology and deep listening. In these works, we utilize technology as a means to an end, just as we use improvisation, mushi technologies and chance dance to generate movement material. We strive to streamline technologies to aid in our efforts to close the gaps between the mind, body and emotions and to increase possibilities, understandings, interactivity and agency and to expand our notions of choreography.



Figure 1: (*Convergence Identities*, 2005) An image from *Absent Body* wherein two computer generated cyber-human performers are intertwined while engaged in a contact improvisation session. The primary focus of this work is related to how the disembodied self is re-embodied in cyber-human bodies occupying increasingly immersive cyber-worlds.

1.1 Introduction

By way of using practice as research, this thesis argues that in considering the interactions between cyber-human and human performers, it is crucial to move beyond discussions of

technology to an analysis of emotional content, the powers of poetic imagery, the trust that is developed through sensory perception and the evocation of complex relationships.

It is within this context that my technological exploration draws upon my own lifelong quest as an artist and educator to understand this complex, multidisciplinary, trans-cultural methodology and its implications for making new technologically mediated dance/art. The artistic journey from creating ceramic sculptures to dance, from choreography to digital animation, from collaboration to interactivity and from Israel to Texas, shaped my work as an artist and my passion for addressing the remarkable growth in experimental, interactive, multidisciplinary research as it relates to artistic, human and social issues.

My practice did not exist in a void nor did it exist in a state without a linkage to a greater community of practitioners from multiple disciplines. In the late 1980's, the quest to look at 'what is beyond the electronic connection' led me to look for other practitioners and ultimately collaborators from a variety of fields, including electrical engineers, computer scientists, architects, art designers, electronic music composers and researcher affiliates. Clearly, as technological exploration became more common, a new way of fostering targeted, well-focused working efforts and a new way of conducting related conversations has been collaboratively integrated. It made us better understand the scope, the technical dimensions and parameters of how to create transdisciplinary interactive dance works in general, and subsequently, the works on which this thesis is based. The initial exploration was to continually question the present state of the live human body with its gravitational, kinesthetic and tactile abilities placed in live performance situations vis-à-vis multi-site, collaborative, technologically-based research.

I was set to investigate how other artists and scientists structured their own experiences that informed the content and the making of future works. At the time, very little resources were available to those of us that were willing to explore, work together, share ideas and challenge the conventional ways of conducting research. Dance, electronic music, visual art and real time interactive performance were emerging from a variety of sources, and it was then that we began to notice the beginnings of a pattern related to the formation of digitally charged dance, live art and how it was shaping the field in general. Specific artists working in this vein include John Cage, Merce Cunningham, Mark Coniglio and Dawn Stoppello,

William Forsythe, John McCormick and Hellen Sky, Marcos Novak, Thecla Schiphorst, Diane Gromala and Stelarc. These artists will be discussed in greater detail later in this Introduction.

For our collaborative teams, we were continually drawn to experience and explore how the specificity of digital technologies may be used to change our past habits of thinking, altering long-term tendencies, organizational patterns and our ways of seeing and work making in quite dramatic ways. The inherent newness, trepidation and jubilation lie in the way we embedded contextual and thematic information in order to discover what is possible within this mixed environment. We determined that technology (if used moderately and intelligently) facilitates a way of blurring the boundaries between our respected disciplines.

Artist and scientist Jeni Wightman describes a process for which she had to “create abstractions of the world in order to comprehend the world we see” (“Visualizing Meaning”). In her essay entitled “With 100 billion neurons, I am an ion-transport troubadour,” this trend is best described with the following passage:

I am simply fond of how we see, and how we interpret what we see, and how we explain what we see, and how what we explain is then interpreted by those with whom we share the ideas. Tell me, what do you think I just said? Magritte is the ultimate in this game; Borges gets it too. What is this thing we all try to capture? And isn't it damn beautiful and elusive and beautiful, always at the edge but never there? Neurons are currency exchange masters and they're hungry for all kinds of information.

Clearly, the commonality centered on the experience gained from the creation of successful works inevitably caused the simplification, flexibility and mutability of these technologies. It proved to be very helpful at the time when we were attempting to remove the cables, wires, projectors, sensory devices and video cameras from the performance space, as it allowed the performers to roam freely about the space.

To date, these technologies typically respond to our direct commands for well-formed and fluid actions, but not yet to our spontaneously evolving inner desires, emergent ideas and heterogeneous innovation that can make the technology more human via responses to our specific and familiar behavioral patterns. How do we mature in our understanding and skill

so that we can develop such responsive, intuitive and sensitive systems? One possible option that I address in this work suggests that it can be achieved through the development of a highly sensitive, human, gestural, recombinant knowledge and space visualization system comprised of video motion, image tracking devices and multiple sensitive detectors that are inclusive of additional sensory touch-based devices.



Figure 2: (*CyberPRINT* 2004) Sharir as ‘cyborg,’ an architecture of being, constructing the virtual space and images in real time. The data is collected from sensory devices placed directly on to my skin, the image appearing on the scrim changes in direct relation to my physical moves. In this work I am interchangeably both a physical human performer and a cyborg. As such, I possess certain physiological processes controlled by mechanical, electronic and sensorial devices (EEG and EKG).¹

1.2 Personal Background

My work as a dancer, choreographer, media artist and researcher in the late 1980s and early 1990s was in the forefront of technological development in dance. I was set – as the

¹ In the work *CyberPRINT* (created in collaboration with architect Julio Bermudez) physiological data is collected from the physical body to serve as its fluid/liquid building material, architectural design serves as its expressive intent, digital space as its medium, data screen projection as its enveloping and viewing technique, user interactivity and performance as its partner and serious collaborative cross disciplinary efforts between architecture, dance/movement, bio-engineering, anesthesiology, computer science and electronic music, as its creative context.

performer and creator – to conceive, manufacture and interact with cyber-humans by employing multiple technological systems in live arts events. The research and creative works presented in this thesis are all works which I have conceived and participated in making; my analysis is based on direct experience. My performance projects – then and now – continue to explore physical and performance mediation in virtual reality/environments. The creation of computer-generated counterpart (cyber-human) is one of the most important aspects of my work and to this research. They not only continue to serve as performance partners, but also they played a central role in the process, which facilitated the examining of our mutual behavioral patterns. We have discovered that they possess astonishing physical abilities, such as forming and deforming their bodies, undulating in such liquid-like moves, demonstrating extreme generosity and grace in mutually sharing their given space in cyberspace. They are also perfectly able to respond to touch and to the manipulation of their physical human partner. These relationships and experiences lead me to my central research question, which is: *What is beyond the electronic connection?*

In *New Visions In Performance*, Theatre Director, author and Professor at Brunel University in the UK Steve Dixon writes about my cyber-human dancers:

Yacov Sharir combines *LifeForms*, *Poser*, and *3DStudioMax* software to choreograph beautiful virtual dancers, which are created from start to finish within the computer itself, without any digital input taken from human dancers. He calls his screen figures cyber-human dancers, which defy gravity to float; pivot and fly through dramatically colored and rendered three-dimensional virtual spaces. Live performers have also used computer technologies to convert their own physical bodies to the condition of a manipulable mannequin (26).

Dance practitioners and choreographers are traditionally engaged in a continual effort to discover how the human body can be challenged to move in an ever-wider variety of ways, some of which have yet to be imagined. This ongoing practice and research also takes place in the virtual world. For this purpose, it has been practiced in various specially designed physical spaces, whether in rehearsal rooms, theatrical, alternative, or site-specific locations. The technologically-charged mediation employed in the pursuit of this research – such as the use of multiple sensory devices, motion capture technologies, wearable garments, smart intelligent textiles and computation – is dramatically affecting the outcome of what we currently know as formal dance. It is difficult today to conceive – beyond what we already know – what the post-human body will look like, how it will function, or

whether it will continually cause us to re-examine how the bodies, physical and virtual, can be re-organized in cyberspace, physical space, or question our relation to rhythm, time and space in general. It is equally premature to foresee the final outcome of the extensive work being done currently in this field. However, we do know that with the experience gained from each new work and performance opportunity, new possibilities present themselves and are practiced. As a consequence, the resulting new questions deserve exploration – and ultimately, answers.

During this exploratory process, I am questioning whether our own perception of what the physical body is capable of and how far it could be manipulated strictly in relation to its elusive cyber-human partner. This process allows myself and my collaborators to greatly contribute to this very important effort by continually discovering new ways of moving of we could have never conceived on our own. Bonnie Bainbridge Cohen is the developer of Body-Mind Centering, an embodied and integrated approach to movement, touch and repatterning techniques. I am inspired by her following remarks in *Sensing, Feeling, and Action: The Experiential Anatomy of Body-Mind Centering*:

Our body moves as our mind moves. The qualities of any movement are a manifestation of how the mind is expressing through the body at that moment. Changes in movement qualities indicate that the mind has shifted focus in the body. Conversely, when we direct the mind or attention to different areas of the body and initiate movement from those areas, we change the quality of our movement. So we find that movement can be a way to observe the expression of mind through the body, and it can also be a way to affect changes in the body-mind relationship (1).

The notion of embodied and integrated approach to movement, touch and repatterning techniques is central to my own interaction with my cyber-human partner while mutually engaged in the act of improvised sessions in cyberspace. When physical contact is achieved during the act of performance, I use my non-linear thinking to navigate through methodologies which – in the moment – help facilitate the most creative use of flexible, mutable and comfortable ways of interaction. The primary way I can make a connection to and interact with my cyber-human is when I wear a cyber suit that allows me to possess greater and augmented physical attributes. These attributes are facilitated through an electronic connection; at this point I am no longer acting solely as the performer. Instead, I assume additional responsibilities such as becoming the chief activator and instigator of the event, continually searching for the newness of it all.

Douglas Macleod, the Virtual Environments project director at the Banff Centre for the Arts, states, “[a]rtists no longer sit on the sidelines eventually to become grateful users of borrowed tools but have become active in development, creating a disturbance in the field with new contingencies” (Moser 283).² The processes by which a technologically charged work can be accomplished have dramatically altered not only the artist’s responsibilities toward its realization but also the contributions of every member of the collaborative team. This new phenomenon has dramatically changed the working relationships of how we initially understood interdisciplinary and collaborative work making.

While I am one of very few artists creating cyber-humans which exclusively serve as performance partners, my dance artwork experience, research and technologically charged practice are nevertheless profoundly embedded within a larger trans-disciplinary community of practitioners creating technologically mediated works of art. These works were created with a clear vision of the sequence needed to make progress. This creative community is central to the work outlined in this document, providing resources that fuel the methods of my own practice and research.

In my collaborative teams, we looked for guidance in the work of artists already influencing and shaping the field; one of the most prominent artists that directly impacted our ways of thinking with his artwork and extensive writing and research about the notion of “reframing consciousness” is Roy Ascott. His early investigations in aesthetics, interactive art and the sense of self and community in the telematic world of cyberspace opened new ways of thinking about our work making. He describes this best in his following statement:

The approaches represented here are multidisciplinary and multicultural, offering many dynamic, compelling and provocative strategies, imaginative projects, and creative lines of inquiry. Their purpose is to identify key questions rather than to provide definitive answers, to pursue creative implications rather than prescriptive explanations (*Reframing Consciousness* iv).

² A two-year long residency at the Banff Centre for the Arts, from 1991 to 1993, resulted in the creation of a collaborative work between design artist Diane Gromala and myself entitled *Dancing with the Virtual Dervish, Virtual Bodies*. The precious experience gained from being one of the collaborators pursuing a work of such enormity and scope has greatly enriched our practical and artistic experience and better prepared us to understand how to pursue future works.

Clearly, at the time, we had more questions than answers. They were (and are) related to postmodern strategies, perspectives, multidisciplinary, the development of new concepts such as interactivity, performance attendees' intervention, and ultimately, how our ideas kept being recycled without apparent important product to showcase (or so we thought). However, as we did identify key questions and got over the hype surrounding the pursuit of such research and works, we concluded that the newness of the technology in combination with the work we were pursuing was indeed important and deserved to be experienced by the public at large.

Although I was the artistic director of my own Sharir Dance Company, a professional company in residence at the University of Texas at Austin for over twenty five years, most of my research was conducted due to the support mechanism I could access as a faculty member of the same major, Tier One Research Institution. It is within this environment, place and time that I locate my artwork and research, from the late 1980's to present. This sense of place, time, resources and an ongoing support mechanism has been established, and this support is the primary factor that allowed me to fully immerse myself in this ongoing process of technological exploration.

In this document, as I am seeking to illustrate an approach of writing about my work and experience, I use first person narration. However, as I write about additional works, this study is, at times, better served by other points of view in the broader context of reflective and recursive inquiry. This work includes not only my own perspective as the primary investigator, but also that of other long time collaborators and artists. In those instances, second person and/or third person ways of writing and working are also utilized in order for the reader to better balance the references to the first-person accounts. I use present tense to engage my more general, established and ongoing practices, and past tense to refer to specific works, experiments, approaches, etc.

1.3 Research Questions

Beyond the Electronic Connection is the title of this thesis that best reflects the experiential and critical aspect of my work, which is to say that I research the specificity of how my

work is constructed, as I am consciously aware of its unique structure. It is my preferred method of inquiry that consists of performative events, as they are best perceived in my personal understanding of my consciousness. The more practical aspect of the title is that it represents the technological mediation that facilitates the connection between the physical and the virtual worlds. *Convergence Identities* is the topic of this thesis, about which I address performance experiences related to the unique emotional and visceral relationships that occur between technologically manufactured cyber-humans and physical-humans while interacting in/sharing a performance space. The question asked is whether it is possible to design and create a highly intelligent, mutable, easily adaptable, responsive mover (cyber-human) which acts and performs indistinguishably from a physical human dancer. Another important consideration is: how important the goal to create this cyber-human?

This served as the driving energy and mode of investigation for the creation of several unpredictable dynamic works that are all outlined in this thesis. Based on my extensive performance experience, I have determined that there are existing operational similarities between the physical human – the live physical imperfect body – and the manufactured cyber-human – the undulating, liquid-like, graceful and elusive hollow body.

In this document, I am approaching the critical discourse that addresses performative issues of both the self (activator) and the other (virtual). The aim is to seek clarification and articulation of the theory based on all I have discovered through *Beyond the Electronic Connection*. Emphasis is placed on documenting the emotional, the visceral, the content, the meaning and ultimately, the performance experience between three principal players – the physical human, the ‘cyborg,’ and the virtual cyber-human. I will address what they are and what they have become based on my extensive, diverse experiences gained from multiple practical, live performances and as an outgrowth of continuous research. Although this self-exploration is achieved through works of art, a theoretical framework has been established which accounts for the realization of these intense, ongoing relationships, the emergence of technologically manufactured man-machine hybrids, simulated humans, post-human concepts and the manifestation of the physical body in relation to its cyber counterpart.

1.4 How Can the Act of Choreography be Enriched, Altered, Expanded?

Clearly, we understand the gained experiences that apply to the cyber-human as an autonomous performer that is free from brain function but continually shifts into and out of many levels of consciousness (a phenomenon only present when interacting with its human partner). We also observed that a cyber-human is readily responsive to its partner's commands and to improvisational movement structures during performance. However, I am still engaged in the process of assessing how the physical human dancer/performer is creatively influenced. When interacting with a cyber-partner, my physical ability is definitely augmented in a way that exceeds the physical boundaries of what is defined as physical 'dance.' I am noticing that my movements become more varied and grossly physical in ways that are new to me as a long time performer. I am also directly affected by the liquidity and fluent movement that my partner possesses; my touch and partnering activities therefore become more sensitive in order to be fully effective, and my observation intensifies and sharpens. The question then broadens to how the art of dance is enriched when we employ digital technologies which are not defined as one limited type of option such as interactive systems, hardware, software and wearable gear, to name a few. How is the art of choreography altered while immersed simultaneously in a physical space and a virtually constructed, gravity-less environment? A whole range of issues such as the loss of physical balance, dizziness and weightlessness need to be considered.

Furthermore, how we can spontaneously detect evolving inner desires? How can we consciously form creative and fluid intentions and find the ways/means for interactively expressing these intentions? What kind of an interface can be created which captures the creative, the informal and the fuzzy?

By examining this dimension, the duality between live and mediated performance begets new approaches to understanding the field of interactive dance and design. These hopes and practices extend and attend to other artistic and cultural realms.

1.5 Methodology and Aims

Before describing the methodology employed for *Beyond the Electronic Connection*, I am

seeking to provide the reader with clarity and a sense of how I came to my findings and what parameters frame the scope of the performances included within it.

As in the physical realm where the “body-mind” connection freely operates, it is similar in cyberspace, where issues such as autonomy and remembrance are investigated and tested through the presence of the physical human dancer. Methodologies therefore counted for the experience gained in the pursuit of this research. It includes the appropriate and related taxonomy, the human body, the cyber body, several interactive systems, wearable computers/devices and the realization of an artificial recombinant remembering system. This system is subsumed into the personal space of the user, controlled by the user and has both operational and interactional constancy, i.e. it is always on (if needed) and always accessible while in performance. Most notably, it is a wearable device that is always with the performer and into which the performer can always enter commands while walking in and around the performance space. These methods are intended to enable seamless, multi-dimensional expression of intention and navigation through direct human gestural interaction within a remembering, knowledge-based system by way of accumulation.

In the 1st chapter of Brian Massumi *Parables for the Virtual: Movement, Affect, Sensation* entitled *Concrete Is as Concrete Doesn't*, he writes:

When I think of my body and ask what it does to earn that name, two things stand out. It moves. It *feels*. In fact, it does both at the same time. It moves as it feels, and it feels itself moving. Can we think a body without this: an intrinsic connection between movement and sensation whereby each immediately summons the other? (emphasis in the original, 1)

The idea that a body is feeling while moving is not perpetually apparent because we are not always consciously preoccupied with this notion while moving; as Massumi writes, it is more like the two “folding into each other” (1). When put in conversation with the notion of body-mind, there is now a combination of three elements: thinking, feeling and the body. The goal of my work is to collapse the distance between the three. As operating in cyberspace requires this collapse, utilizing it in performance maximizes the potential of this methodology.

Similar to the closed distance between the mind, feelings and body, the technologically manufactured body is directly affected by its physical counterpart while sharing a mutually charged performance space. Massumi continues,

If you start from an intrinsic connection between movement and sensation, the slightest, most literal displacement convokes a qualitative difference, because as directly as it conducts itself it beckons a feeling, and feelings have a way of folding into each other, resonating together, interfering with each other, mutually intensifying, all in unqualifiable ways apt to unfold again in action, often unpredictably. Qualitative difference: immediately the issue is change. Felt and unforeseen (1).

Improvisational methods and technologies, movement sensing design and stage mapping processes are therefore central because they not only generate movement content in direct relation to technological intervention, but are also a practice of the state of being necessary to do this work. It connects the physical, the cognitive and the virtual and generates all the elements that are necessary to realize the work.

By activating this system which merges the mind, body and feelings, a vocabulary of direct gestural expressions of creative intention is recognized by an additional ‘mothership’ placed in a strategic location. This system allows for easy two-way communication so that a choreographed set of gestures and movement can map the experiential state of each gesture to corresponding system actions. The result is an expression set, instead of a command set, through which the interactor (the wearer) communicates with, rather than controls, the system. The technology employed includes the use of several smart, fully charged fabrics and wearable computers that embodied multiple capabilities depending on the works, content and thematic ideas. They allowed events/actions directed onto the physical stage to be manufactured, stored, remembered and (when needed) endlessly repeated, ultimately facilitating the operation of a shared, projected and conventional performance space. A complex set of projection screens and transparent scrims were employed for this purpose and placed in and around the performance area, which allowed the smooth convergence of virtual partnering between the physical body and the manufactured cyber-human body in real time.

Additional technological support was made possible with the use of sophisticated high-end robotic lighting instruments that produced multiple illuminated projected information and

images which were instantly utilized and transported to strategic locations in and out of the performance space. It served the overall magic of augmented performance and the illusion of coexistence of the manufactured cyber-human, the cyborg and the physical performer(s).

My ultimate intention and aim for these sets of works is that all the characters involved take a life of their own, recognizing their community of cyber performers/dancers, continually examining their ageless bodies and superb condition and that bodies will stop at a specified magnification of desired size, speed and astonishing liquidity and grace. The bodies will be placed against or adjacent to each other, they will gracefully and naturally (by way of being) defy gravity and introduce a whole new vocabulary of raw movement material that is yet unexplored. It will take on a life of its own, 'a way of moving' that is organic in nature and can co-exist 'by choice' in peace and harmony with its physical human counterparts generously attending to issues related to how mutual performance space can or should be shared with each other.

1.5.1: Zero Point Methodology

For a collaborative multidisciplinary work to be perceived and regarded as productive and successful, an iteration of it must be shared with an audience. Most often, this concrete evidence of collaborative multidisciplinary work is not achieved. Several very well known partnerships have unraveled as a consequence of a lack of communication skills as well as issues related to how one is credited and who benefits the most from the expected outcome. This begs an examination of the collaborative, multidisciplinary methodology related to technological intervention in work making, as it is particularly complex and difficult and requires a careful and sensitive approach to how humans interact with each other.

I consider the ability to engage in a successful collaborative multidisciplinary process to be an art form that must be acquired, practiced and carefully studied over time. As digital computer technologies became more ubiquitous and early experiments in digital performance took place, I realized that a specific and unique methodology had to be developed in order to successfully initiate, move through the process of creation and complete a new work.

It has become clear to me that the most gifted and successful members of a collaborative team are the listeners who carefully note the ideas and suggestions that are expressed by the collective. These listeners place emphasis on contradictory, revolutionary positions that can be recognized as new and altogether difficult to accomplish. This force is important because team members involved in the planning process must work through emerging ideological differences and the same old model techniques, which tend to be closely guarded. These listeners help to push the collective beyond established modes of work making. In the introduction to *Digital Performance*, Steve Dixon writes:

The sense of “newness” of computer technologies is clearest when they are considered and contextualized as media of significant social, cultural, and artistic change. In this sense they can be seen to generate a genuine re-evaluation of models and a rethinking of artistic and communicational techniques and paradigms. But when computer technologies are considered more dispassionately in relation to older communications media and artistic forms, it is relatively easy to draw parallels and thereby argue the contrary (“Histories” 2).

A newly formed collaborative team capable of rethinking, re-evaluating and carefully committed to listening to each individual voice can be assured a good chance for walking the path to good and productive working relationships. Artistic and communication techniques and paradigm changes and differences are always expected to be present; they are hard to overcome. However, there is a greater collective motivational aspect that team members must attend to: the work itself. The task at hand is to mutually find the best ways to the creative integration and processing of the technologies involved, the concept, notions of interactivity and issues related to performance. A healthy process is one that embodies a coherent, common, sustained discourse that is continually providing further insight related to the periodic unfolding of the work process.

In my work I use the term ‘zero point methodology’ to describe and attend to the state that best facilitates a multidimensional, multidisciplinary, genuinely collaborative new project. The most precious asset related to this methodology is the ability to engage in careful listening, which leads to analysis and ultimately to the understanding of all the components that are necessary to engage in such an interaction. At zero point, we begin on a level playing field. Crafting this work environment involves a careful selection of the appropriate team members – individuals that possess specific and particular desired skills and a

commitment to working in a collaborative, non-hierarchical, mutually respectful working relationship.

Zero point methodology requires a recognition of and adaptation to the inherent and radical shift in paradigm. It needs to be accepted and articulated by all potential team members in addition to identifying the individual motivating factors for the work. (In other words, articulating “what’s in it for me?”) Another important conversation needs to happen around the personal and collective expected outcomes. These processes must be followed by the development of mutually agreed upon thematic ideas, content and the meaning that will serve as the driving force that eventually brings about a successful iteration to be shared with an audience. This can be achieved only through a ‘deep listening process,’ including the learning, respecting and utilization of one another’s working terminology and language, thereby continually conversing using the same, agreed upon foundation.

When each element in the creative process – from the collaborators, to the disciplines, to the media, to the technologies – is brought in at the same starting point of zero, nothing begins above or below any of the others. Any product of this work environment is truly collaborative, new and solely a result of the elements in the room.

For myself and my collaborators, these partnerships could not have been accomplished without communally embodying the principles of what composer Pauline Oliveros named “team deep listening processes,”³ which is to say, acquiring the ability of artists to converse, to learn how to listen, to conceive and conceptualize work making and respect each other’s ideas. Through this process, artist collaborators ultimately learn to create work at the intersection of art, science, technology and culture.

³ Pauline Oliveros is the founder of Deep Listening Institute based in Kingston NY. She fosters a unique approach to music, literature, art and meditation and promotes innovation among artists and audiences in creating, performing, recording and educating with a global perspective. For the year 1990 composer Pauline Oliveros and myself were awarded the Meet the Composer Choreographer National Grant Award, We have collaboratively created a work entitled “Deep listening,” It was first performed in Austin by the Sharir Dance Company and the Deep Listening Orchestra, at the University of Texas B. Iden Payne Theatre, during the Spring of 1990.

1.6 Digitized Bodies

In my work and in this thesis, I refer to a *cyber-human dancer/performer* as a computer generated cyber counterpart that is a direct result of human initiated computer animation. During the last twenty years of exploring the relationships between cyber-human dancer/performers and their physical human counterparts, six generations of cyber-human dancer/performers were created. These generations exhibit developments in technology as well as our performance methodologies.

Another important term is *avatar*, which is a digital representation of self like in ‘Second Life.’ In my work, I use the term ‘avatar’ to specifically describe a digitized body that has been generated with the use of motion capture technologies. Avatars are most often a virtual representation of the self (i.e. a representation of part of the human who is controlling the avatar, perhaps an alter ego) or the means by which that human experiences the virtual world (i.e. a type of vehicle, as the avatar can go and exist where the human cannot).

Finally, I use the term *cyborg* when I describe a physical human whose abilities are augmented by a wearable computer and/or a prosthetic. Contact must be maintained in order for the full potential of wearable computers to be reached; this is evident in my works *CyberPrint* and *Automated Body* wherein I wore clothing wired with computers and multiple sensors throughout my body. Prosthetics are often used to expand and challenge notions of physical human functionality in the work of Stelarc, such as the robotic third arm used in “Third Hand” and “Exoskeleton” wherein he moved using a six legged walking machine.

When my body is digitized during the act of performance, I am no longer the physical body, I am my digital ‘other’ body. Mentally, I feel as if I am dancing inside my on creation/body. More than any other kind of technology, I am fascinated by the way motion capture can exert itself on human movement. The digitized body can be animated, manipulated, look like its human ‘partner’ or like a moving image in an art installation. But above all, I am intrigued by the possibilities of movement invention it offers when used with skill and sensitivity.

On of the most successful collaborative works that employed these motion capture technologies included Merce Cunningham, Gavin Brayars, Paul Kaiser and Shelley Eshkar's *BIPED*, first performed in 2000. Roger Copeland writes the following in his book *Merce Cunningham: The Modernizing of Modern Dance* about the work:

Computer technology, almost by definition, offers a number of methods for confronting (and transcending) the "limitations" of the human body. In recent years, Cunningham has also been experimenting with the technology of "motion capture," which serves to "liberate" movement from the actual, human bodies in which it originates, subsequently propelling their skeletal or ghostly residues into virtual space (191).

Transcending the "limitations" of the human body and "liberating" the movement from where it originates – the physical human body – is central to my ongoing research and works presented in this thesis. It is consistent with my observation of the limitless ways the digital body can move, consequently able to adapt to a wealth of new material and possibilities.

The digitally created image/body stands in contrast to that which is human. As author and educator Ollivier Dyens writes:

When a human is digitized (when his image is digitized), the resulting image is no longer the "mirror" of a living being. A digitized human being becomes other... Once digitized, the image of a human is released from its origin and can transform itself into a multitude of landscapes; it becomes a system unimpeded by any conceptual limits (85).

The seductive power and agency of digitized technologies, along with virtual reality, have stimulated the emergence of technologically manufactured man-machine hybrids. My primary focus of the works outlined in this thesis is the exploration of how my disembodied self is re-embodied in and around cyber-bodies occupying increasingly immersive cyber-worlds through digitized interactive art experiments and the act of augmenting my body's abilities.

The self-descriptive, self-reflexive and recursive processes of consciousness reveal themselves as a dance of real and virtual, flesh, "second skin," and re-configuration, sensory presence and re-presentation, cognition and re-cognition. In the ordinary flow of conscious experience, these pairs are not encountered as binary oppositions in conflict, but

in a continual dance of transformation, one into the other. Aided by technological tools, I give birth to new gestures of consciousness.



Figure 3: (*Cyber-Human Dancers Series 2005*) Sharir as 'cyborg,' sharing space with his cyber-human partner during the performance. The cyber-human partner is generated in real time by the cyborg through the use of a wearable computer and additional movement sensitive devices placed on the physical human body in various strategic locations.⁴

⁴ My wearable computers and interactive devices are subsumed into my own personal space, designed to be placed on my body in a desired way / place where as the primary performer I can activate them at will, and as needed, interchangeably, allowing me to be the cyborg, at other times the physical performer. This sensory phenomenon includes additional operational command systems and interactional constancy that facilitates performance augmentation in real time. They are always on and always accessible. As such these devices have become a well-integrated extension of myself/body, affected by my own way of moving, gesturing, posturing, thus allowing me to operate in and around a communications area (performance or alternative performance space) that is receptive and directly responsive to my commands.

1.6.1 The Cyborg



Figure 4: (*CyberPRINT* 2004) Sharir, as “cyborg,” in *architecture of being*, constructing the physical and the virtual space. In this image, I am activating and manipulating a suspended transparent structure that serves interchangeably as a projection scrim and/or a performance space that is occupied by the performers.

The term “cyborg” was coined in September of 1960 by Manfred E. Clynes and Nathan S. Kline to describe an autonomous, human-machine hybrid system that possesses augmented reality abilities that are portable, “energy efficient computing devices that can be easily integrated with clothing. They have renewed interest in the possibilities of wear-ware” (1).

Realizing that I experience multiple identities with the aid of several types of wearable technologies which are mutable, easily adaptable and able to be comfortably processed allows me to not only manufacture cyber-human performance partners to interact with in real time but also to augment my ability as a physical performer by wearing the technology like a second skin. Depending on the task at hand, I operated in the physical realm, at other times as the cyborg. This ability allows me to interchangeably inhabit the position of the cyborg and/or back to the physical performer by wearing such pure computational power could be considered parallel only to the potential of the human imagination.

Clearly, the option of employing (in real time) augmented levels of operational transformation such as from acting as the performer or interchangeably operating as the cyborg not only evoked ideas of self possessing multiple identities but they greatly affected how I was operating separately within each mode. This was necessary in order to attain a certain state of clarity and coherence during the act of performance, which has been noted by other artists and researchers.

In his keynote address to the seventh International Symposium on Electronic Art [ISEA, formerly the Inter-Society for the Electronic Arts], Jos de Mul applied a phrase from Michel Foucault's 'Technologies of Self' to the discourse on virtual community. He proposed 'that the computer is a technology of self which permits individuals to affect on their own bodies and souls, thoughts, conducts and ways of beings, so as to transform themselves in order to attain a certain state of happiness, purity, wisdom, perfection, or immortality'. De Mul foresees a future in which human beings will realize them'selves' as multiple identities. What is today approached as pathology will, in the future, become the norm in the construction of self. Indeed, the forerunners of this ontology are the innumerable 'avatars' that inhabit the multiuser dimensions of today's Internet (emphasis in the original, quoted in Rajah and Srinivasan 57).

I can personally attest to Jos de Mul's notion of future human beings realizing their multiple identities. I definitely experience the duality of existence while operating simultaneously as the cyborg and as the physical performer. Clearly, it took a great deal of performance experience just to get over the feeling of being physically unstable, tentative and grasping for air as a consequence of operating in virtual reality environment. Added training sessions are necessary to overcome this sensation for new users.

Often when I act interchangeably as the cyborg and as the physical performer, I am reminded of Stelarc, the Australian performance artist and colleague of mine whose great works often focus on extending the capabilities of his on physical body. In *Acute Absence*, an unpublished essay about Stelarc, Shannon Bell best described his engaging approach to his works:

Stelarc, the cyber-samurai of posthumanism, long recognized as the world's leading performance artist, is as acutely absent as he and his work are intensely engaging. Stelarc is anything but inconsequential both in his artwork and in the body of posthuman philosophy that his artwork and his written and spoken meditations have defined; He is however, an acute absence – refraining from reference to a self, always referring to my body as "the body" or "this body" and like any authentic hybrid cyborg/zombie only fully entering presence in action and interaction (1).

I fully understand Shanon Bell's assessment of Stelarc being both as acutely absent as he and his work are intensely engaging. I have personally experienced being absent when performing as the cyborg in the physical realm while fully engaged navigating in the virtual environment. I then refer to "the body" as "this body" and experience the psychological, operational, aware and communicating body when in action or interaction.

I am acting as the cyborg when I wear one of several wearable computers that I have conceived and collaboratively constructed specifically to serve a different purpose depending on the needs of each work. They are all enhanced with different and specific technologies inclusive of multiple sensory devices, depending of the content and meaning of each work. They facilitate the integration of cognitive "mushi"⁵ technologies with the human body, thus allowing me to augment my abilities and experience "the hybrid body" as it builds to interface with its cyber-partner enacted through its individual cognitive resources.

Bell also notes that Stelarc categorizes the mind within the body as illogical in the following statement: "You are listening to a speaking body. If you want to characterize it as a mind within a body, that is a particular philosophical posture that we identify as Cartesian and Freudian; it is an arbitrary categorization" (4). My personal experience is counted for experiencing the physical, emotional, visceral and integration of body-mind connection with my own creation (the cyber-human) in its habitable cyber space/environment. The cyber partner is not merely a stand in for myself – the human body – but rather an autonomous being "that speaks of hyperembodiment, of extremes of physicality" (Little 25).

⁵ "Mushi" technology is a term that I have adapted from my work in the dance studio, often used by myself while I am conducting dance classes in order to express my dissatisfaction from a non-expressive de-energized "Mushi Dance" that need to be picked up and field with the appropriate energy it deserved. However, not like in the physical realm this term served me well in the process of developing "Mushi" technologies that are soft, weightless, mutable and easy to manipulate and use while in performance.

1.7 Interactive Systems

In this type of technologically mediated works – *Body Automatic*, *Intelligent City*, *Convergence Identities* and *The Twining Project* – communication is not the only principal practice. Rather, the emphasis is placed on the introduction of multiple types of interactive systems which require sensorial understanding, audience input and physical performer to cyber-partner interaction. A performative event that employs interactive technologies requires more than merely a single system. There can be no interactivity without the presence of multiple additional sensory devices placed in several strategic locations in and around the performance area that transforms it into a smart, intelligent space. In this kind of a fully-charged environment, any movement pursued by performers and audience members alike can trigger electronic signals in the following ways: 1) action is captured, 2) this leads to transmission, 3) this, in turn, leads to reaction and 4) this finally leads to a solution, which is the ‘image.’ As such, actions are equally triggered by audience’s, performer’s and cyborg’s input to system. For that purpose, a smart, multi-dimensional, multi-purpose, sensitive space also requires 3D video tracking systems, high-end robotic lighting instruments and several projection devices. It primarily facilitates audience participation by gathering their input in to the system in order to process it in real time. This important audience input is a major component of the thematic information that is shaping the performance. Interestingly they also develop a point of view – so much so, I would argue, that they need in order to be considered co-authors.

Perhaps more than prior forms of fine art, many forms of interactive art – as the term “interactive” implies – engages in the user’s sensorial sensibilities and places emphasis on the viewer’s input. It is, however, profoundly refreshing to find out how carefully an overused term such as “interactive art” can wear a new skin and meaning, depending on who is the creator and how the interactive system would be used. Roy Ascott, one of the early practitioners of interactive technologies, cybernetics and telematic art, has greatly contributed to our early understanding of the notion of “audience participatory role in determining the performance outcome.” I am particularly intrigued with his definition of “*that art*” in which the behavior of the viewer effects transformations of image, structure, or environment and in turn may cause transformations of the viewer's perception, consciousness, or physical state (*Telematic Embrace* 15).

Viewers' perception, transformation and consciousness coupled with their physical state of being is the most enticing aspect that is contributing to their curiosity and enthusiasm, thus becoming fully committed to the act of participating in performance and ultimately becoming involved in determining the outcome of all aspects of interactively charged events.

Until fairly recently, I have purposely employed interactive systems in performance as invisible (behind the scenes) tools, whereby the technology was purposely made invisible. However, interactive systems in my more recent works have primarily provided a heightened sense of awareness and subversive visibility of the technology vis-à-vis audience input to performer interactor. There are multiple perspectives through which we can clarify the position of the observer/user that can be designed so that their perception of reality is opened for investigation. In this kind of work, members of the public are no longer consumers or passive observers but rather considered – in my work – as co-authors and an integral part of the artistic process. I have carefully considered and applied this phenomenon in the crafting and analysis of the works in this document.

Communication scholar Sheizaf Rafaeli argues that “[i]nteractivity is an expression of the extent that in a given series of communication exchanges, any third (or later) transmission (or message) is related to the degree to which previous exchanges referred to earlier transmissions” (110). Rafaeli’s concept of three part communication exchanges clearly suggests that interactivity is not merely a mouse click/web surfing mechanism, but rather, a complex communication modality.

In Mark Coniglio’s *The Importance of Being Interactive*, he asserts the following: “[b]y using new technology to allow our performers to become real-time creators, and by asking our audience to be present to their on-the-fly artistry, we ensure that each performance of a work is absolutely unrepeatable, which may be the boldest move of all” (12). Coniglio establishes what we were trying to do for quite some time, which is to say that members of the public must be more involved as practitioners during performance in order to assure optimum level of a unique experience, and places equal responsibility on the viewers, too. He adds though that “[t]his is not to say that an interactive work cannot be appreciated at

face value,” nevertheless, performance experience becomes the mutual responsibility of both the performer and the viewer (10). All of these aspects heighten the phenomenological quality of performance. Interestingly, both Rafaeli’s and Coniglio’s notions (presented in this case from two very different sensibilities) require the same technological support that can enable a high level of participation.

In order to move toward what *The Virtual Tightrope Walker* team suggests as “second interactivity,” in reference to “second cybernetics,” conducted research drawn from cognitive science and biology, especially connectionism, genetics and the physiology of perception and action” (Michel Bret 48). “Second Cybernetics,” like dance improvisation, deals with more complex and fuzzy relationships that are closer to intuitive human behavior when compared with one another.

Like in dance practice, “Interacting with an Intelligent Dancing Figure” co-creator Marie-Hélène Tramus leads us to an often unknown and undervalued form of thought which she calls “body-thought” (48). To that notion I would add two terms often used in dance practice, “muscle-memory” and unplanned “action-reaction-patterns.” Dancers’ movement phrases, patterns and ultimately their ability to perform a complete dance work depends on the performer’s ability to muscle memorize the full length of any particular creation. Similarly, these action patterns, the ability to employ memory and the use of accumulative movement material applies to intelligent dancing characters. This is particularly important in order for us to better understand how an artificial construct/counterpart can begin to behave autonomously.

Questions arise as to how the art of dance is affected by the employment of interactive systems. How is the act of choreography altered by simultaneous immersion in a physical and a virtually constructed environment? The technologically supported feedback that loops between the real and the virtual have produced profound shifts in consciousness and experiences of being both embodied and disembodied at the same time in ‘a duality of existence.’

1.8 Performance Content Methodologies

The importance of choreographer Merce Cunningham and composer John Cage's collaborative works and methods, developed in the beginning of the 1950s and lasting over five decades, seems totally fresh and new today as if the act of “chance dance” logic and its embrace of complexity was been recently invented, and it relates the past to the present. In my quest for technological exploration, chance methodology has been often employed in order to benefit from its obvious attributes – which is to say randomness coupled with numerical orders and logic – but has proven to be far ahead of my ability to imagine problem solving.

When Cunningham and Cage speak of “chance methods,” their emphasis lies as much or more on the rigor of the methods as on the randomness of the chance. By contrast the long tradition of modern dance that preceded Cunningham was motivated more by a retreat from 20th-century scientific methodology than by an embrace of it (Copland x).⁶

Digital dance coupled with ‘mushi’ (soft and easy to wear) interactive systems greatly contributed to my ability to better utilize “dance by chance.” The model I have developed tightly integrates practices and technologies for user, receiver, random audience input and content sharing, rearranging movement phrases in real time and choices related to who gets to appear or disappear in the virtual space made with no previous knowledge. In addition to chance operation and real time technological system input, audience direct input, interference and their “on-the-fly artistry” have opened a new way to explore movement material in cyberspace. It helped me to see how cyber-human bodies – particularly their spinal cords, hip and additional body parts – could become more fluid, curving, undulating and twisting beyond my ability to comprehend in the physical world.

As I am examining how my cyber-partner(s) move around and about cyberspace, it instantly alters my understanding of gravity, allowing notions of gravity-less dancing to

⁶ In a conversation with John Rockwell, Merce Cunningham said the following: “When I choreograph a piece by tossing pennies—by chance, that is—I am finding my resources in that play, which is not the product of my will, but which is an energy and a law which I to obey. Some people seem to think that it is inhuman and mechanistic to toss pennies in creating a dance instead of chewing the nails or beating the head against a wall or thumbing through old notebooks for ideas. But the feeling I have when I compose in this way is that I am in touch with a natural resource far greater than my own personal inventiveness could ever be, much more universally human than the particular habits of my own practice and organically rising out of common pools of motor impulses” (Kam).

become a new reality that is greatly affecting my approach to the ways I move and act in the physical realm. Chance dance is facilitated by interchangeable images, attending to commands activated by a specific code that affects all the connected systems such as video projections, multiple interactive systems distributed over multiple locations, wearable computers/devices, 3D worlds and virtual reality/environments. These well-coordinated systems' output, coupled with our ability to manipulate it as desired in the moment, has the potential to parallel our own abilities to imagine how far the physical limitation could reach.

It is within this realm of utilizing interactive sensorial-based systems which are activated through human postures that I locate my artistic practice, drawing on gestures, pedestrian movement combinations and communication between real and the perceived/virtual. While performing in cyberspace, I improvisationally generate movement material specifically designed to fully understand the ways my cyber partner and I can more fully engage. I am always fascinated by what I discover. I see things that I never imagined were possible. Although I am the creator of the movement phrases, I am always surprised and astonished by what actually happens while performing. There are many surprising elements: the fluidity and ways of moving, graceful undulations about and around the space, the creative ways in which my cyber partner responds to my human gestural commands, the torturous ways it knows how to reestablish itself into gravity-less balancing acts, serve as a source of inspiration and prioritizes the production of content and meaning over the exploration of technological elements. What I learn from my cyber-human performance partner applies to myself as well, offering new possible ways to extend my ability in order to exceed the physical boundaries of what my current capabilities allow me to define as 'dance.'

The source material I draw on as a choreographer involves American Sign Language, pedestrian movement and everyday gestures and human postures. They fuel my creative process, whether in the physical or the cyber-world. My research interests and artistic practices converge – literally and figuratively – in a zone of postures, gestures, movement and communication between real and virtual worlds, and the effects on consciousness of such spatial practices. My technological exploration of the physical or the digitized body is mediated through the use of choreographic works of art which embody the way I move, the

way I employ human gestures and postures of creative intentions, interactive visual language and the cognitive linguistics that fuel innovation.

1.9 Historical Context

Because of the highly communal nature of this work and the field, acknowledging the historical context is particularly important. I will first address concepts, then move to artists and collectives and finish with debates.

1.9.1 Trends and Ideas

It is important to note that my work, research and practice had the opportunity to develop and grow as a direct consequence of the greater community of artists who made important contributions to the development of technological intervention to the art world in general but more specifically, to dance, interactive dance and dance as a performative art. Together in the early 1980's well into the 1990's, the international dance community was collaboratively able to conceive, develop and create new works with the use of such technologies as interactive systems, motion capture technologies, wearable computers/prosthetics, biomechanics, virtual reality, computer animation and 3D virtual worlds. Assumptions related to the used of these technologies were challenged during performance.

It would be unwise to point out one specific practice and/or artist as having contributed the most to the development of new technology in dance. However, I can clearly attest to the fact that the global community of artists working with these media was engaged in constant conversations (meetings, conferences, personal contacts, collaborative efforts) related to new developments and work making, which allowed us to move 'beyond the electronic connection' so we could draw our attention to the creative process.

During the early stages of exploring how to incorporate technology into everyone's distinctly unique works, common issues emerged: how could we best understand and

employ interactive systems? How could we electronically charge a performance space for the purpose of freeing the performers' bodies from interacting/wearing the crudeness of electronic devices? How could we maximize the effectiveness of projected cyber images so that they could co-exist in the space with live bodies? And finally, how could we better understand issues of identity and representation in cyberspace?

In *New Visions in Performance*, Gavin Carver and Colin Beardon identify some important characteristics of new technology in performance:

Simplified, these are: the virtuality and fluidity of space and time, and the potential for alternative realities, spaces and narratives; interactivity and the active audience / participant; the role of the body (and its double) in technology enhanced or mediated performance and the ensuing questions around identity and presence; the ability of performance to extend itself beyond the circumscribed moment and place of its enunciation; and the 'problem' of liveness in multimedia work – issues that inevitably (predictably perhaps) question taxonomies in performance (2).

The possibilities of alternative realities, interactivity, audience/attendee intervention and multiple systems attending to augmentation of the new ways in which the body could operate and be explored only when a community of international artists and collaborative teams were simultaneously researching and creating works that fostered and encompassed all of these elements. This body of work is singular if only by virtue of its lateral, radically interdisciplinary, collaborative, generous community of artists.

During this period of discovery, our community sought to better integrate technology in performance. My collaborative partners' and my focus was to find a way to evaluate and decode the invention of new technologies particularly developed for real time audience and performer input while attending to live performance strategies. The purpose was to better understand and discover the most effective ways they could be used.

The integration of interactive systems and the establishment of communication protocol between the media used and the performers has been an essential and integral component of the work I write about in this thesis. These two elements are inextricably linked and play an essential role in crafting a performance where all media are generated and manipulated in real time, similar to the physical human bodies onstage.

Steve Dixon in *Digital Performance: A History of New Media in Theater, Dance, Performance Art, and Installation* argues

[...] that the simple point so many critics seem to miss or not wish to acknowledge that the real has changed, as it has always done. The real, and our consciousness of what is real, is subject to time, and for several hundred years it has had a conjoined twin: technological “progress.” In the 1950s and the 60s, people were at first amazed to see little people in their homes on a thing called television, and the real changed then, But we have since got over how spooky television is, just as we have quickly become used to and have assimilated the capabilities of the computer and the Web – it is just part and parcel of what today is real (144).

Similarly, at the Post Me_New ID Forum on October 31, 2008, Dresden, Germany, in my keynote address and presentation entitled, “Identity, the Post Human Body & Digital Practice, A Journey From the Physical to the Virtual and Back Again,” I, too, pointed out a period – paralleled in time – of extraordinary creative energy in engineering, art, dance and music in the late 1950s and 1960s. The DVD film series *9 Evenings: theatre & engineering* documents this evocative period of creative output:

In 1966, 10 New York artists worked with 30 engineers and scientists from the world-renowned Bell Telephone Laboratories to create groundbreaking performances that incorporated new technology entitled *9 Evenings*. Video projection, wireless sound transmission, and Doppler sonar – technologies that are commonplace today – had never been seen in the art of the 60’s.

Although dance artists experimenting with the use of technology in dance making were primarily focused on augmenting aspects of dance performance, the use of technology per se has greatly contributed to blurring the boundaries between all disciplines. Thus, it has allowed for international cross-multidisciplinary collaborations: dance, visual art, electronic music, engineering, computer science, video art and sophisticated projection systems were blurred in a sea of creative, fluid and fruitful exploration. Participants learned from each other how – over time – to contribute in order to achieve a common goal.

Because most of this research and the production of experimental works were initially conducted in academia by academics and artists alike, the artwork itself has traditionally held an inferior position in relation to artworks conducted in the professional realm. They gained their legitimacy only when placed in a textual context. Particularly in North America, dance works and research have invaded the academic scene because resources were more readily available for experimentation and work making. University alternative

and performance spaces have given birth to video moving images, animated human bodies, virtual reality, interactive systems, wearable computing and artificial intelligence (AI), to name just a few. Furthermore, professional artists previously working outside the academic environment managed to attract funding and land residency activities, which supported their research and works. Additionally, as their role within this learning environment increased, so did the importance of this scholarship.

The magnitude of technologically mediated artwork that has been created in the last forty years is indeed impressive. What is most significant, however, is the increased interest in how the use of new technologies impacts traditional dance, performance art and more recently, digital theatrical practices. It would be unrealistic to imagine addressing the commonality of *all* the important, technologically-charged works which belong to so many different disciplines, such as a dance works vis-à-vis interactive live cinema, or an art installation with digital theatre production.

In the last three decades, clearly, the dance art field has experienced tremendous growth which has produced a number of memorable and ground breaking works worth mentioning: Merce Cunningham, Gavin Brayars, Paul Kaiser and Shelley Eshkar's *BIPED* (USA, 2000); Stelarc's wired-up, memorable set of distributed events remotely stimulated over the internet by audiences around the world, such as *Fractal Flesh* (Sydney, Australia 1995), *Ping Body* (Sydney, Australia, 1996) and *ParaSite* (Glasgow, 1997); Thecla Schiphorst's *Bodymaps* and *artifacts of touch*, (Vancouver, Canada, 1996); Bill T. Jones, Paul Kaiser and Shelley Eshkar's *Ghostcatching* (USA, 1999); and Diane Gromala and Yacov Sharir's *Dancing with the virtual Dervish Virtual Bodies* (Canada, USA, 1993). These fine works contributed to the renewed interest in the field of dance and technological mediation. They also answered some questions related to the physical body, which historically resisted the restrictive aspects and the crudeness qualities of the technology as well as the embodiment as machines. They flirted with the subversive qualities of suggested magnified performance and the pleasurable pain it elicits. No matter how deeply involved these artists were in the work process, the major question answered was related to the dramaturgy of performance content, internal and external time and intuitiveness and consciousness.

1.9.2 Significant Artists and Collectives

The important impact and privilege of working within this community of researchers that possesses so many diverse investments in theory, artistic skills and technological abilities is that it placed us all in a desired dynamic state of continued stimulus, inspiration, learning, experimentation and collaboration. We were able to mine the proliferation of possibilities of implementation, evaluate the methods and recognize the innovation in our colleagues' work; our collective memories informed each other's research and practice.

One important figure in this collaborative community is Canadian David Rokeby, a hybrid of artist and inventor like most of us working in this media. Since 1982, he has been making electronic installations heavily featuring video- and sound-based compositions. He contributed to the multiple intrinsic characteristics of media interfaces that expanded the ways we interacted with electronic music artists as well as how we have ultimately redefined our performance spaces.

The best example of this is his *Very Nervous System* software. Rokeby has used it in installations, but it is also available to other artists for their work. Electronic composer Russel Pinkston and I used it in both *Twining Project* and *Automated Body*. As Rokeby writes, the

Very Nervous System is the third generation of interactive sound installations which I have created. In these systems, I use video cameras, image processors, computers, synthesizers and a sound system to create a space in which the movements of one's body create sound and/or music. It has been primarily presented as an installation in galleries but has also been installed in public outdoor spaces, and has been used in a number of performances.

Russell Pinkston and I employed David Rokeby's *Very Nervous System* in multiple ways. The most notable and effective is the system tracking the dancers' movement in order to affect (by way of moving) sound-based music and computer cyber-human images. One additional use to this system is its ability to visually track the performance space with the aid of video systems in order to generate visual imagery and control high end systems lighting instruments, ultimately turning every segment of the performance space into a sensitive, electronically charged, interconnected entity.

Another important creative team is the U.S.-based Troika Ranch, which was co-founded by choreographer Dawn Stoppiello and composer/media artist and programmer Mark Coniglio. Since 1994, the methodology of this group has been highly collaborative and interdisciplinary and their goal has been to examine the moving body and its relationship to technology.

The content and the meaning of their work is best articulated by the artists themselves: “The company continues to build upon a ‘body of work’ that fosters many points of contact with the public - through the creation, presentation and touring of collaborative, multi-media performances, installations and films.” Troika Ranch produces and supports art that values live interaction between viewers and viewed, performer and image, movement and sound, people and technology. Coniglio and Stoppiello conceptualized and invented much of the technology, equipment and techniques currently in use in the field. Coniglio’s passion for giving control to the performer led him to create the award-winning software Isadora, a flexible graphic programming environment that provides interactive control over digital media

John McCormick and Hellen Sky are the co-artistic directors of another significant collective, the Australia-based Company in Space. As the company’s website states, McCormick “is a choreographer and electronic artists. His work with the company ranges from designing real time computer interactive systems, real time vision orchestration, new applications of telecommunications systems to deliver interactive art as well as overall concept and direction of image, choreography and technology [sic].” The company has consistently pioneered applications of new technology to movement. Their works creates dialogues between visual, aural and kinetic perceptions and exist in a number of media; live performance installations, video and electronically charged virtual spaces, accessed from anywhere in the world. These include ISDN telematic performance, interactive Web TV and VRML worlds. These technologies supported the creation of works such as *Escape Velocity*. In 2001 they developed *INCARNATE*, a dual site performance produced in association with the Hong Kong Arts Centre for the Digital Now Festival and direct Architecture of Biography.

Company in Space is a model for how our interaction and relation shared (relatively new and experimental) technological knowledge, engendering a proliferation and continual enrichment of was proliferating and continually enriched the field of dance and technology at large. More specifically, this knowledge infused new energy and optimism that affected future exploration with collaborative transdisciplinary⁷ teams and the collective growing contributions made available to all.

These efforts were led primarily by artists such as Robert Rauschenberg and a research scientist at Bell Laboratories named Billy Klüver in Murray Hill, New Jersey. Additional major contributors included composers John Cage, David Tudor and the choreographer Merce Cunningham. “[T]he collaborations between the artists and engineers that produced innovative works using these emerging technologies” and the resulting “performances still resonate today, as forerunners of the close and rapidly evolving relationship between artists and technology” (9evenings.org).

Alternatively, until very recently, dance technology and performance artists have formed their own loosely knit community of practitioners that presented their experimental works and research at several International Dance and Technology conferences (IDAT). These took place in several universities during the 1990’s, mostly in the U.S. and Canada, including the University of Wisconsin-Madison (U.S. 1992), Simon Fraser University, (British Columbia, 1993), York University (Canada, 1995), Arizona State University in Tempe (U.S., 1999). I was fortunate to attend and present my work/research at each one of these conferences.

The development of my own work was in conversation with this broader context, from early fully mounted works employing such technologies as Virtual Reality, like *Dancing with the Virtual Dervish*, to computer animation with *Automated Body*, to bio-feedback, wearable computers and architecture of being in *Cyber Print*, to the surveillance cameras, video cameras and high end robotic lighting devices in *Intelligent City* and the *Twining Project* and on to multi touch screen technologies in *Too & For*. All derived from a sequence of continuous learning, team building and transdisciplinary working and sharing.

⁷ Transdisciplinary is meant to connote both the convergence of many disciplines in one work as well as the transnational bases of the collaborators.

The work of choreographer and multi media artist William Forsythe radically shifted ballet from its classical roots to a contemporary, dynamic art form. He also has a particular interest in the mechanics of the body and how it operates, and this curiosity and desire for new possibilities pushes his work into new media like installations, films and web-based works.

In April 2006, writer, organizer and media artist Scott deLahunta interviewed William Forsythe about his improvisational structure methodology. This was part of an article entitled, "Sharing Questions of Movement." DeLahunta wrote the following:

Soon after this demonstration, Kaiser suggested that animated computer graphics could make the ideas behind Forsythe's movement creation more accessible to a non-dancer. A team of multimedia researchers at the Centre for Art and Media Technology in Karlsruhe (ZKM) picked up this proposal; eventually producing a prototype that included video illustrated by the addition of graphic lines tracing the movements as Forsythe demonstrates them. The prototype's success inspired the team to create a self-tuition education tool to assist new dancers entering the company in understanding Forsythe's choreographic thinking. This resulted in a version with over 100 short lecture-demonstrations for use by the company, and public interest in the project led to the eventual publication and distribution of the interactive multimedia CD-ROM *Improvisation Technologies: A Tool for the Analytical Dance Eye*.

This disc/DVD is one of the main tools for teaching contemporary improvisation methods and is still widely used today.

Like Forsythe, dance practitioners/creators of related fields of creative practice are engaged primarily in the process of discovery and creation of new and possible ways the human body can move. This constant and ongoing quest is well analyzed, recorded and documented and added to a very rich and highly developed vocabulary of movement material that is intricate, fluid and made of astonishing physical virtuosity. As such, it addresses the value of the art of dance/choreography in direct relation to technological exploration and intervention and its important contribution to this research. It also implies that emphasis is placed on the relationships between dance and other fields of practice such as architecture, electronic music, visual arts, computer science, engineering and biomechanics. This manifests in my work as I consider the hybrid between physicality and virtuality, between human and cyber-human, because the creative process is crafted through

additional related means that consider the totality of live performance, performance art and art installations.

There is a difference between the artists with whom I have continually interacted and others with whom I have collaboratively created work. American choreographer Merce Cunningham, Canadian dancer and media artist Thecla Schiphorst, Australian performance artist Stelarc and German choreographer and media artist Johannes Birringer are among multiple artists I consider as having continually interacted with through technology and their on personal and experimental work. In other words, while we have not collaborated on a particular piece, our work has been in conversation through conferences, academic programs, commissioned works and more. It is through observation, conversations, exchange of ideas and the intensity caused by our sometimes comfortable and sometimes uncomfortable close proximity that led me to discover new aspects of my own work. Although continued interaction suggested good working relationships, it also revealed itself as another productive form of collaboration that I have fully embraced.

U.S.-based architect Marcos Novak is both a collaborator (in the first iteration of *Dancing with the Virtual Dervish*) and interactor, as we have often had the opportunity to interact at international conferences and symposia. His research writings and work as an artist and theorist equally draw upon architecture, computer programming to generate visual content, music and computing. His work, like my work and most of the other works mentioned in this document, intentionally defies categorization. The reason being is embedded in the notion that these works leave the door open for further interactions, collaborations and the formation of new and diverse alliances that are primarily about critical understanding through the practices of new media.

What I have grown to realize and appreciate is that these ongoing multiple interactions over long periods of time are extremely productive and informative. I was inspired by the numerous attempts and trials to enhance the ongoing collaborations and interactions with organized formal debates, think tanks and round table panels related to our mutual concerns such as content and meaning versus our fascination with technological development. How could we collectively deal with the chaotic nature of this field and work while advancing it and creating a more predictable outcome?

One such international think tank worth mentioning, “New Performance Tools: Technologies / Interactive Systems,” was conducted at Ohio State University (OSU) on January 25-27, 2002. Media artists and writers Johannes Birringer and Scott deLahunta organized it and published this report online:

The Think Tank was structured as an intensive three-day research laboratory that included presentations, various discussion formats, practical working sessions and public exposures. While involving individuals at different stages in their careers, there was no separation between ‘students’ and ‘teachers,’ and all learning took place in the context of peer-to-peer exchange. The international selection of invitees came from a diverse range of backgrounds: electronic music, the visual arts, dance and performance art, computer science and engineering, interactive/ digital media and installation art.

Most often, such gatherings were generated as a consequence of a specific need for the development of interactive systems, attendees to contribute to system input, crafting individual approaches and aesthetics related to performance and/or clarification and learning related to various wearable devices. “New Performance Tools: Technologies / Interactive Systems” was no different, as it sought to investigate the possibilities of technologies in performance through cross- and inter-disciplinary conversations and experiments.

Although the initial motivation for such gatherings was to collectively clarify and resolve issues related to how performance, meaning and content could benefit from the use of technology, emphasis was placed on critically engaging both the possibilities and risks of integrating technology into our processes, methodologies and products. Birringer and deLahunta continue:

The setting for the Think Tank opens a space for conversation, the starting point for these new platforms. Dance, movement research and body-based systems of technique meet interface design, interactive systems, 3D visualization or immersive data environments, virtual world and other generative system designs. Choreographers, dancers, composers, media and installation artists exchange notes with programmers, engineers, and architects. Writers and curators talk to DJs and cognitive psychologists.

1.9.3 Debates

Collaboration and interaction within this field has not been without disagreement, however. For example, I chaired a roundtable discussion interrogating the assumption that a move toward technology means a move away from spirituality. As freelance writer Sophia Hansen wrote of the event:

A panel of artists took on the provocatively titled, “Content and the Seeming Loss of Spirituality in Technologically Mediated Works.” Presentations demonstrated a grounding in the sensual (Thecla Schiphorst’s enquiries into touch and “skin-consciousness” through interactive installations) and the religious (Stelarc’s shamanistic suspensions). There was talk of the potential for abstraction contained in digitally mediated realms. The informed exchange inspired as many “back-to-basics” anti-technology comments as it did eulogies for hard-wiring and hypertext.

Pro- and anti- technology voices were present in the conversation and contributed to an unusually productive and reflective learning experience. The attendees were encouraged to think through their beliefs about cyberspace and the physical realm, and many of our assumptions about which of us engaged spirituality in our work and lives were challenged. Others that seemed to be quite spiritual revealed a significant absence of spiritual practice within their work making.

An unexpected and quite enlightening outcome of this panel was a broader discussion about where technology is situated in our cosmologies of work making.

Much was made of the fact that new media work in progress is often forced into the guise of finished product, when really it is only the start of a dialogue. The debate polarised; the artist should just dive on in, only this “hands-on” approach will get results; the artist must always approach technology with an idea in mind; technology can only ever facilitate, never create.

This understanding of technology is more complicated than a step in a process or methodology. It also addresses the capitalist focus on product over process, and returning to the importance of process recognizes that we are all improvising on a continuum, progressing, revising and discovering. It addresses the totality of all the elements, stages, influences and the state of operating in the moment necessary for the development of work.

There were far fewer debates within the international communities of art makers using technology than there were at the peripheries of our overlapping disciplines (art, architecture, dance, theatre, cinema, etc.). As our methodologies are highly collaborative, utilize zero point methodology and are nonhierarchical, our work does not fit standard understandings of authorship. As our aesthetics necessarily involve the exposure of the mechanics of the technology we utilize, it often appears crude. And as our goal is – as Hansen and Roy Ascott have written – to dive in and directly engage our experiments with technology, the work that we share is always already in progress, the start of a dialogue, providing more questions than answers and is the result of what technology (among other artistic elements and decision making) has facilitated.



Figure 5: (*Body Automatic* 2005; footage in Appendix 4) Second generation of cyber-human dancers in performance. In this computer-animated sequence, no physical human performers were involved. The purpose was to create an exclusively computer generated group of dancers to perform a specific creation that extended the notion of dance as we knew it.

2.1 Visualizing the Real and the Virtual in a High Performance interactive Dance Environment

This chapter analyzes visualization and participatory experiences within a high-performance interactive dance environment. To avoid confusion, I differentiate between the terms “VR” and “virtual reality.” I use the term VR when referring to the traditional technology of head-mounted goggles, data gloves and other technological mediations that disconnect some of the senses (primarily vision) from real, physical space and immerse the participant in a fully virtual world. I use the term “virtual reality” to describe the full range of experiences which result from the connection between real and virtual input. And as mentioned in my first chapter, this thesis examines my work from the inside – as a primary creator and researcher – and the outside – as a scholar. Therefore, this chapter includes information and sources from both of these perspectives.

Though the dance performance *Body Automatic* did not use VR technology in the traditional sense, performing within this space proved to be a profoundly immersive experience; the difference is that both real and virtual spaces and events are present to the senses of both performer and audience simultaneously. This created a coincidence of worlds, a virtual reality in the second sense, which, when analyzed, sheds light on the nature of and the relationship between the real (physical) and the virtual (perceived). The experience of moving through and sensing a real space while wired into a tightly linked interactive system in a virtual space is a visualization of virtual reality and reveals properties of a self-describing system, a Gödelian “strange loop.”⁸ The exploration of such highly interactive visualizations where the real and the virtual inform and determine each other requires an analysis of design issues related to the development and use of cyber spatial environments.

⁸ The Gödelian strange loop that arises in formal systems in mathematics is a loop that allows such a system to “perceive itself,” to talk about itself. The concept, “every CD needs a CD player” leads us to Gödel's Incompleteness Theorem, which in turn leads us to a possible definition of human consciousness. [This article was originally published as "Gödelian Ontological Arguments" Analysis 56, 4, October 1996, pp.226-230]



Figure 6: (*Body Automatic* 2005; footage in Appendix 4) Second generation of cyber-human dancers in performance. No physical human performers were visible in this computer-animated sequence. The dance event sought to reveal the object of visualization as virtual reality itself. As such, the complexities of visualization, the problematic term “virtual reality,” and the paradoxes inherent in self-descriptive systems were addressed through this event.

2.2 Introduction

The dance work *Body Automatic* centered on the computer-mediated interaction between a physical dancer and computer-generated cyber-dancers. Real and virtual worlds were blended and simultaneously experienced, distinguishing the system from a full immersion using VR technologies where the visual input of the immersant was wholly algorithmically generated. The term “virtual reality” (meaning a range of experiences distinguished from VR as a specific set of technologies) suggests a non-contradictory, yet paradoxical blending of two worlds (Benedikt 1992, 124). Virtual realities vary in degree of immersion from web surfing and relationship building in cyberspace to the full sensory immersion of a VR construct (Bricken 1992, 364-365). These experiences often call into

question fundamental perceptions of space, time, embodiment and identity: the building blocks of how we cognitively construct (visualize) the world in which we operate (Varela, Johnson, and Rosch 1996, xv-xvi). Consequently, these experiences can powerfully affect the participant. If virtual realities of increasingly immersive power are to be used for scientific and educational visualization, an understanding of these subjective human experiences needs to be factored into the design processes (Pesce 1993).

This analysis steps outside of a dance performance experience as aesthetic object per se and examines it as a visualization whose subject is the interaction of the virtual (perceived) and the real (physical) as categories by which we organize and describe experience. The data visualized is created in real time by the visible interaction of human and cyber-dancers. The abstract and elusive categories of “real” and “virtual” are modeled in the multi-sensory modalities of dance: visual, sonic, kinesthetic and proprioceptive.⁹ Visualization reveals and deepens the complexity of the interaction between the physical dancer and the cyber-dancer.

2.3 The Technological Environment

Although virtual reality has been employed for years in such applications as pilot training, Computer Aided Design (CAD) and scientific data visualization, and is increasingly common in movies and video games, the use of VR in the fine arts and performance has been very limited. This is largely due to the fact that it requires expensive facilities, specialized training, large-scale interdisciplinary collaborations and the development of collaborative skills and conversation.

Body Automatic was a collaborative effort between Russell Pinkston, a composer/programmer and myself as the dancer/choreographer. A touch-sensitive dance floor/Musical Instrument Digital Interface (MIDI) controller, capable of transmitting

⁹ “Proprioception from Latin *proprius*, meaning ‘one's own’ and perception, is the sense of the relative position of neighboring parts of the body. Unlike the exteroceptive senses, by which we perceive the outside world, and interoceptive senses, by which we perceive the pain and movement of internal organs, proprioception is a third distinct sensory modality that provides feedback solely on the status of the body internally. It is the sense that indicates whether the body is moving with the required effort, as well as where the various parts of the body are located in relation to each other” (“Proprioception” 1994, 1285).

precise position coordinates, velocity and pressure information in the form of standard MIDI messages was developed as an environment for the creation of interactive dance works. The surface consisted of a large number of Force Sensing Resistors (FSRs), which are attached to heavy-duty plastic sheeting and covered with polyethylene foam. The sheets could either be placed on top of or beneath a standard dance floor. The FSRs were typically arranged in a grid with 16 columns (left to right) and 4 rows (front to back), which resulted in a 16' square dance surface with 64 (1' x 4') velocity- and pressure-sensitive regions. Each was assigned a separate input channel of a Voltage-to- MIDI Interface Box which had 64 analog inputs and MIDI Out. The MIDI Box incorporated a Motorola MC68HC11 microprocessor and could be programmed to convert input and output analog signals to and from any desired MIDI messages, on multiple MIDI channels. Hence, when used in conjunction with an intelligent external video motion tracking MIDI processing system, it was ideal for use in interactive dance compositions. One or more dancers/choreographers could affect music, lighting and the motions of the cyber-dancers by the nature of their movements through three-dimensional space as well as by their precise position(s) on the touch-sensitive dance floor/MIDI controller.

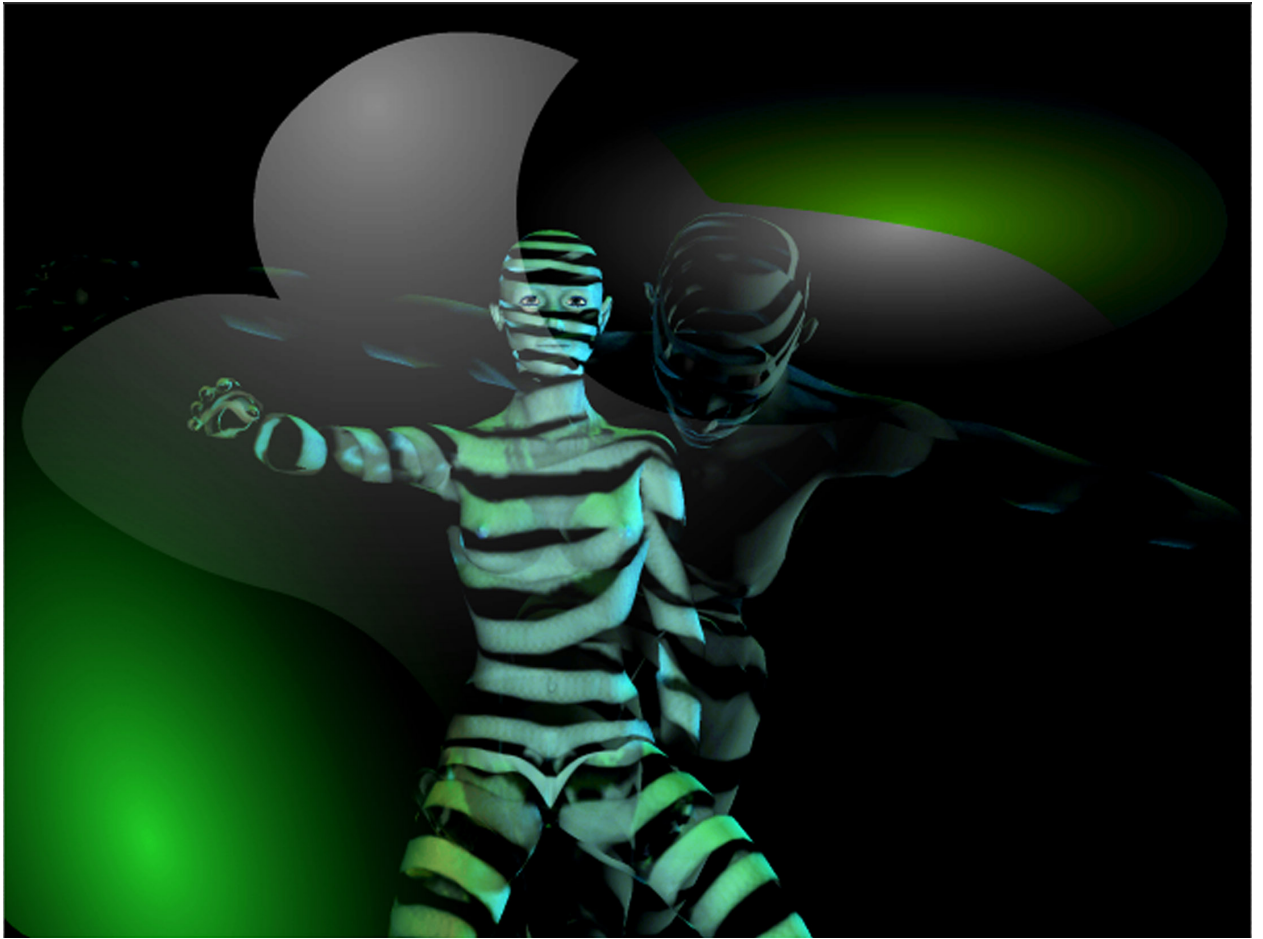


Figure 7: (*Body Automatic* 2005; footage in Appendix 4) Second generation of cyber-human dancers in performance. In this sequence, movement was generated interactively in a sensitive environment; the live dancer/choreographer's movements triggered the movement material of four animated cyber-human dancers.

2.4 Description of the Dance Performance

The work-in-progress analyzed here was presented at the seventh Biennial Symposium on Arts and Technology at Connecticut College, March 4-7, 2005. I will describe the event from two different viewpoints: that of an outside observer (as much as possible) and that of the dancer/choreographer.

The dancer/choreographer used the interactive MIDI dance surface in conjunction with a video motion tracking system (conceived and designed with electronic music composer Russell Pinkston). Movement on the dance surface and space interactively triggered the dance movements of four animated cyber-human dancers, which were projected on a large screen. Following the initial activation by the dancer, the performance was mutually

constituted; the cyber-dancers' movements varied in response to his movements and the sound-based composition.

While the movements of the cyber-dancers are tightly linked with those of the live dancer, they differ in several ways. The cyber-humans exist in a virtual space with no defined boundaries. At times, their movements can defy both gravity and the articulation of the human body, thus expanding the possibilities of dance and movement, though never going beyond the human so far as to break with the essential humanity of the representation. The term 'cyber-human' is applied to these entities and their imagistic representation. Even though the audience members know that the movements of the live dancer are generating the movements of the cyber-dancer, that distinction of causality rapidly blurs.

The question, "Who is leading whom?" is important for two reasons. First, the humanity of the representation of the cyber-dancers invites the attribution of agency to their dance movements in affecting the live dancer. Secondly, the fundamental operation of mimesis, the way a dancer will respond to another (live or cyber-) dancer's movements, tightens the link by developing interaction on this second, non-mechanical level. This additional level of interaction fashions the influence of live and cyber-dancers as a two-way street, and the response of cyber-dancer(s) to human dancer(s) helps to create the perception of 'humanity' in the cyber-dancer. As such, a recursive feedback loop is created: 1) the dancer moves in the space; 2) the motion triggers the movements of the cyber-dancers; 3) the movements of the cyber-dancers affect the live dancers, now influencing their motions; and 4) these new motions on the part of the live dancer trigger a different set of motions on the part of the cyber-dancer, thereby closing and continuing the loop.

The fact that the linkages exist both on the mechanical (motion-sensing, signal-transmitting) level and on the cognitive (intentional and responsive) level of the live dancer's choices in the interaction is important to this analysis of the real and the virtual. How does the dancer experience this multidimensional, multisensory looping? An excerpt from the dancer's report illustrates how the dancer both visualizes the event and analyzes the visualization. Both visualization and interpretation deepen the complexity of the interaction between 'real' and 'virtual' dancers. As I, the dancer/choreographer, wrote in my own journal:

The multiple sensory systems enabled me to fully immerse in some kind of a future body, physically, emotionally, and virtually. At times, as I was physically moving about and around the cacophonous performance space, I was able to fully manipulate my performer partner, a cyber-dancer, either each of its elements one at the time or the whole body at other times. As I progressed, I felt as if I had become increasingly clear and clean, accompanied by illuminated bright and clear images. As a “body without organs,” in such resembling the cyber-dancers themselves, I inhabited some kind of a search engine or browser, which produced my historical visual images (Deleuze and Guattari 1994, 9). These images could lend themselves to other spaces or other humans or cyber-humans and in couplings. These images bring back dim memories of my early cyber images as if they were ancestries, located elsewhere, in another space, yet completely and entirely accessible. I felt illuminated, accessible, and at times clearly disembodied, experiencing life on another level altogether. When I am totally immersed in such a complex computerized physical and virtual performance environment, at the very least I feel subversive, intertwined within the theatrics and automatics of the machinery. There is no when, no now, and maybe no then. It was a performance environment where time, like space, is a becoming-coagulation, which is to say becoming clustered, engaged in a process of solidifying itself in a confluence of an event that passes in and out of chaos. I am overwhelmed by strong and somewhat conflicting emotions; I feel immersed in a cyberspace where the automated bodies of the cyber-dancers emerge as beings, as bodies always do (2003-2005).

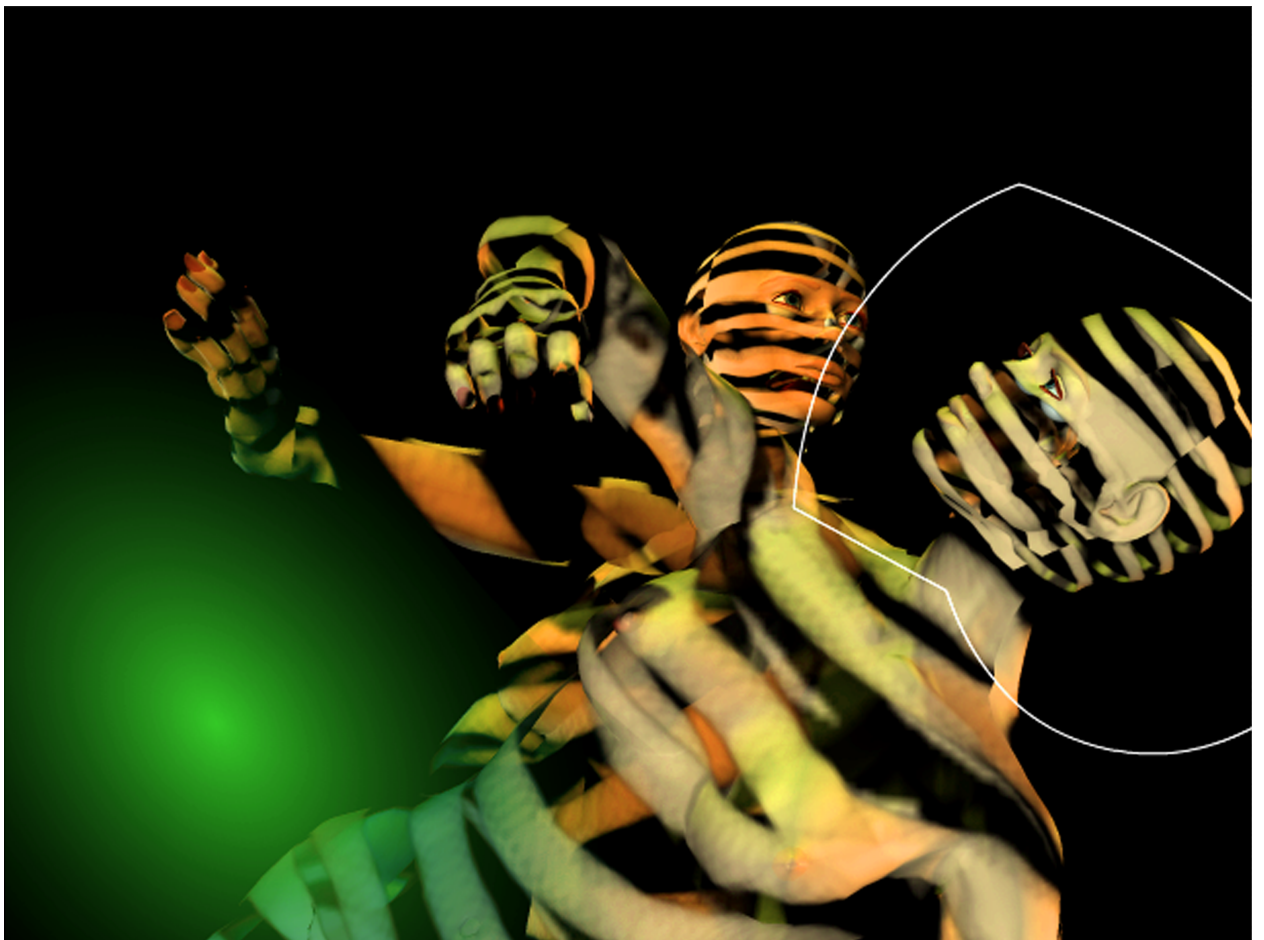


Figure 8: (*Body Automatic* 2005; footage in Appendix 4) Second generation of cyber-human dancers in performance. In this sequence, movement was put on a loop where by repetition lead to the realization of a conduit between earth and airborne sensation that was reminiscent of becoming-coagulation, a confluence of an event that passes in and out of chaos.

2.5 Analysis of the Dance Performance

The analysis of the dance event in an interactive environment as a visualization seeks to reveal the object of visualization as virtual reality itself. To this end, the complexities of visualization, the problematic term ‘virtual reality,’ and the paradoxes inherent in self-descriptive systems will be discussed. The questions raised by the analysis range from the philosophical to the psychological to the technological. They are raised, not in the expectation of answers, but as probes to incite discovery and heighten awareness of the complex issues at stake in the design of increasingly immersive interactive environments, whether the intended use be scientific visualization, education, art, entertainment and games, or some combination of these.

2.6 Visualization

In speaking of ‘visualization,’ I am referring to the output of the computer in the form of visible, dynamic images, algorithmically generated from data gathered by motion-sensing devices. Are we talking about the cognitive models (mental images) of the designers of these systems, the prior modeling or visualizing of data on the part of the engineers, scientists and/or artists? Or when we use the term ‘visualization,’ are we referring again to the interpretive models, the cognitive creations of the data analyst, whether that analyst is called scientist, audience observer, or interactive participant? If the answer to these questions is, ‘all of the above,’ as it was in the case of this dance event, we are describing a complex system of interlocking cognitive, bodily and computational events. These events are perceptual, representational and interpretive couplings of the human and the technological. Under the umbrella of multiple meanings, visualization as a process both creates and uses virtual realities. The use of the same term, ‘visualization,’ for actions and events in both human and machine worlds – the blending, in fact, of those worlds when

the term is used without specification – points to seamless nature of the experience. As I reported about my experience as the dancer/choreographer:

If I am immersed in the virtual space, I always still exist in the physical space. That duality is a very interesting thing. When you are immersed in a traditional VR construct you lose the physicality, lose the sense of your physical being, or at other times you are reminded of it because of disjunctive circumstances happening in the virtual space, causing feelings of instability, light-headedness, or nausea. In *Body Automatic*, I experience something closer to an optimum balance between the real and the perceived because my body is the activator – not the conduit – for the virtual experience.

The physiological effects of VR have been noted by many of those working with this medium (Pesce 1993). The virtuality of the cyber-dancers becomes an augmented layer of experience, not a replacement for the physical experience. A key property of interactivity is the multi-layered quality of the experience (Benedikt 1992, 129). As in all immersive virtual experiences, real space and virtual space coincide, cognitively blended by the participant. A simple example of world blending occurs when a person walking down the street is wearing headphones and listening to music. He is in an electronic sound-space; he is moving to the music, perhaps semi-dancing, humming and/or mumbling the lyrics in real space in response to the music. For him, the multiple worlds are blended seamlessly. For an outside observer, the distinction between worlds is visible in the disjunction created between movements in real space and the sounds that are inaudible from the outside. If you do not see the headphones, the behavior looks similar to that of a hallucinating schizophrenic in tight communication with a world perceived only to himself.

In *Body Automatic*, the dancer was not only contiguous with an interface (the dance mat) but was within the interface of the video tracking system. His movements, however, were not disjunctive; the audience could see the effects created in the cyber-dancers, as well as the interactive relationship between real and virtual movements. The real and the virtual worlds were both blended and shared. Some, but not all, of the virtual realities in play, were available to the audience, as evidenced by the dancer's description of a far deeper immersion. This disparity raises questions as to the means of assessment of visualization tools using varying degrees of immersion: will wholly objective (observable from outside) methods suffice in evaluating effectiveness if this disparity between 'inside' and 'outside' experience proves a critical factor? What are the differences between virtual and real

space? What is the possibility of a blurred distinction between two intersecting complex worlds? What is the connection between the humans and their representational counterparts in cyberspace? How can an articulation of the design process for the cyber-dancer address these questions?

2.7 Reality and Virtuality

Asking an engineer, “What is reality?” often elicits a knuckles-rapped-on-table demonstration of what, in many cases, is the answer to a simple question. However, the real and the virtual are increasingly significant categories by which experience is being described, not just in classrooms and labs, but also in general usage.

These descriptors have conjoined in the powerful meme “virtual reality.” This term, composed of words from the domain of philosophy as well as our common-sense usage of “reality,” now denotes a cluster of emergent technologies used to craft dynamic, interactive and inhabitable worlds, including data-gloves, goggles, electronics signals and sensors and Virtual Reality Modeling Language (VRML). “Virtual reality” is a term embodying a viral idea, conjuring worlds of potential technological creation and inhabitation in the minds of scientists and computer gamers (future scientists, in many cases) alike, worlds that the imagination carries far beyond those which are currently technically or economically feasible. We are building the worlds we imagine; VR can let us physically inhabit in the virtual reality we call the mind's eye. We are visualizing these worlds in scientific and mass market articles, in speculative fiction and in cinematic special effects.

This phenomenon gives the impression that the term itself, and the imaginative world-building notions it denotes and connotes, contains the agency to give birth to that which it describes. What are the issues of time, space and physicality we must visit in asking the question of how the body is to be represented and inhabited in a virtual space? How can a sense of bounded space be accommodated within an environment defined through its lack of edges? What are the laws of motion in a non-physical universe? What metaphors are possible for the construction of virtual spaces?

2.8 Self-Describing Systems and Virtual Reality

Douglas Hofstadter, in the twentieth-anniversary preface to *Gödel, Escher, Bach: an Eternal Golden Braid* [GEB], defines his main thesis thus:

In a word, GEB is a very personal attempt to say how it is that animate beings can come out of inanimate matter. Strange loops are the distinguishing factor between inanimate matter and the selfhood of the animate. Strange loops are self-describing systems, the swirly, twisty, vortex-like, and meaningful patterns that arise only in particular types of systems of meaningless symbols (1999, 2).

The dance between real-dancer-body and cyber-dancer-body occurs in a technologically mediated, recursive feedback loop. *Body Automatic* suggested a complex metaphor of the self-reflexive visualizations of consciousness (or the self observing, thinking and modeling itself). The recursive process of the construction of identity through bodily expression between real and virtual dancers also recalls Turkle's descriptions of self-knowledge-seeking social interactions on the Internet (Smiley 2011).¹⁰ This impulse toward self and self-knowledge inherent in self-describing systems is evident in my choreographic intention toward the realization of my artistic vision. As written in my own personal unpublished notes:

I sought to create works that are very clean and clear with illuminated passages and transitions, works which will never have a plot, but rather, will inhabit a browser or a search engine attempting to search for the performer's past experiences and knowledge, works that do not need to be choreographed, since they will have neither beginnings nor ends. I am continually trying to conceive a choreographic system that will arrange and rearrange itself by itself, for itself. It will adhere to a pre-conceived code producing non-linear hypertextual content that will provide structure and allow the work to progress gracefully. It will take on a life of its own, recognizing its community of cyber-dancers, continually examining their ageless bodies and superb condition, bodies that will stop at a specified magnification of desired size, speed, and astonishing liquidity. The bodies will be placed against or adjacent to each other. They will gracefully and happily defy gravity and introduce a whole new vocabulary of raw movement material, organically and generously carving space for each other. These dancers will co-exist in peace and harmony within their given environment (2003-2005).

Although my use of this mode of creating non-linear hypertextual content (wherein users enter, manipulate and leave worlds) is now common in Massively Multiplayer Online

¹⁰ In *Jane Smiley* Special to The Washington Post, she writes on Sherry Turkle's meditation on technology, "Alone Together" the following: "A mechanical question elicits an answer, large painted eyes elicit compassion, a metallic touch elicits a responding touch and the emotions that go along with human responses cannot be controlled." Friday, January 28, 2011

Role-Playing Games [MMORPGs], such as World of Warcraft, or online virtual worlds, such as Second Life, their realization occurred far sooner than I ever predicted.

Hofstadter theorizes that “the Gödelian strange loop that arises in formal systems in mathematics [...] is a loop that allows such a system to ‘perceive itself,’ to talk about itself, to become ‘self-aware,’ and in a sense it would not be going too far to say that by virtue of having such a loop, a formal system *acquires a self*” (emphasis in the original, 1999, 3). In *Body Automatic*, this capacity of a looping system for self-description was made visible. If virtual realities – that range of experiences we have been attempting to describe from many angles – are self-describing, what is the epistemological potency of such a self-describing system? Self-description involves a shift between self as subject describing and self as the object described. The work itself, *Body Automatic*, can further be seen both as an it and a self, or more concretely, a dance between the two. The it, or object (the interactively animated cyber-dancer) is initially acted upon by the self, or subject (the live dancer). However, it (the cyber-dancer) takes on a selfhood and agency as the dancer responds to its motions. Clearly, they interact and influence each other in a world that is (despite the visible machinery of mediation) experientially seamlessly meshed as a single world. In the dance, the virtual and the real act and interact, observe each other (through real senses and virtual sensors) and respond (react) to each other. The body is the world that is most intimate to us, though “virtually” invisible when in the virtual, projected world. A virtual world is created and experienced by way of the body for the dancer and the audience. When we link the live body to a cyber-body in the dance, we begin to understand notions of interactivity as an extension of the human body and condition. More from my own personal notes:

This work presents a body informed by technological extrapolations that presents a relatively coherent view of an emergent art world. In my own experience as the dancer questions arise related to the physical body, which at times resists the automation of the body, or embodiment in or as machines, and at other times flirts with the subversive qualities of suggested magnified performance with the pleasurable pain it elicits. Additional questions have emerged suggesting topologies of temporality. No matter how deeply involved I was in this process, major issues and questions remain about the dramaturgy of performance content, internal and external consciousnesses of time, and new topologies of temporality (2003-2005).

In considering the real and the virtual, a fundamental question arises: what, exactly, does it mean to be cyber-human?

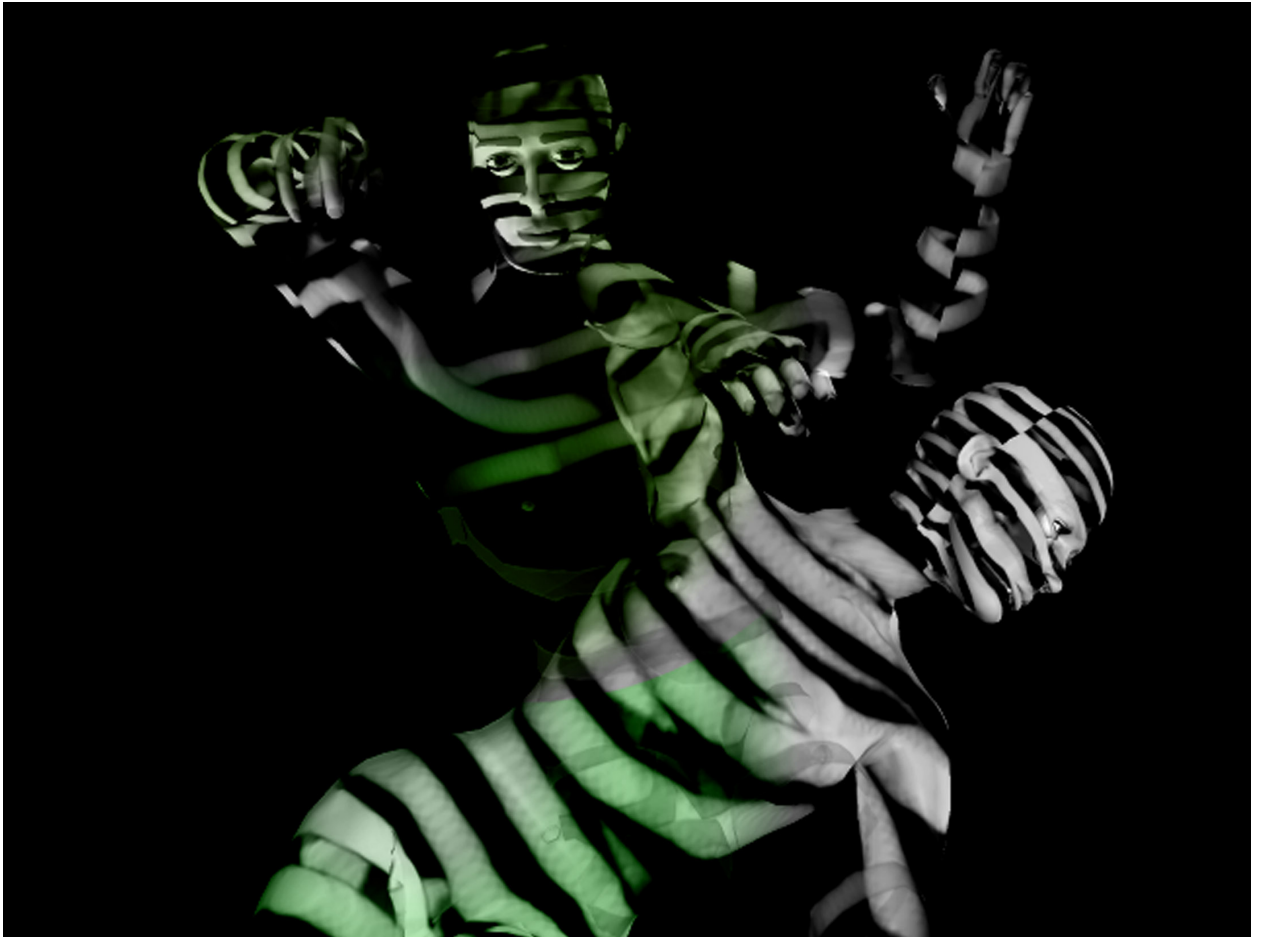


Figure 9: (*Body Automatic* 2005; footage in Appendix 4) Second generation of cyber-human dancers in performance. In this sequence, issues of suggested topologies of temporality were addressed through a secure sense of place and space in time.

2.9 Conclusion

Technologically mediated visualization is an epistemologically potent set of representational tools by which we are creating knowledge about the world in which we live. Use of these tools enables us not only to analyze complex data of what is, but to imagine worlds of could be and what if, the utopias and dystopias of the imagination. The visualizations of the tool builders, the programmers, the designers and the artists engaged in the building of virtual yet inhabitable worlds create knowledge about how we as humans construct the internal and external worlds we inhabit through the complex,

dynamic intertwining of reality and virtuality. Interactive virtual realities of varying degrees of immersivity are among the most powerful tools in terms of the human experiences reported and observed. The integration of the working methods of a group of individuals trained in different aspects of the arts and sciences offers insight into a range of design methodologies, and this interdisciplinary cross-pollination infuses the collaborations with the energy of human discovery. As the creator I have collaborated with artists that are increasingly considering metaphors of science and scientists that are employing metaphors of representation, visualization and imagery, which owe much to the world of the digital arts. As art is transformed by interactivity, science increasingly recognizes the subjectivity of the observer. In turn, technology informs our aesthetic and structures and is engendering new processes and genres of perceived and real performance.

As the dancer and choreographer I have sought to close with additional words from my own unpublished notes directly related to this work:

The *Body Automatic* makes me reconsider dance, while longing for what I have left behind and dreaming ahead. Without the electronic disturbance, the signal from the live dancer, the automatic body will not be able to function. Is the automatic body some kind of an electronic disturbance (or perfect order) where perhaps there is no perceived performance or no one is observing (2003-2005)?

CHAPTER 3: Convergence Identities



Figure 10: (*Convergence Identities* 2004-2008) One cyber-human character is peeling off of its cyber-human partner, thus mimicking the dynamics of physical human partners in a Contact Improvisation session.

3.1 Introduction

During the advanced development phase of my working process, I was generally not thinking in logical or linear terms. My lines of thought expanded in many different directions. I sought to fuse the boundaries between the physical human and the cyber-human and between architectural and technological discourse with live performance strategies in order to offer an intense improvised performative experience. I utilized the character and life of a forever-changing narrative that served as the primary source for content and virtual physical storytelling. My exploration fluttered around augmented, subversive and integrated digital technologies which supported the choreographic and design processes for the discovery and ultimately the making of *Convergence Identities*. In

order to create a favorable environment, an alternative, electronically-charged performance space was necessary; a small, more intimate Black Box¹¹ was preferred and selected. All aspects of design- and performance-related questions were investigated in this given space with particular emphasis placed on issues of real and perceived boundaries.

Within this fully technologically charged Black Box environment, my interdisciplinary practice focused on researching intelligent, self-generative events which bring techniques employed by a broad range of art forms into the choreographic/improvisational process. For that purpose, I identified and engaged individual collaborators who possessed relevant non-dance artistic practices such as architecture, electronic/interactive music, engineering, surveillance video and digital technologies.

I sought to explore the full potential of these technologies in order to support specific performance-related issues and how they affect movement and gesture components generated not only in the physical body but also in manufactured cyber-bodies. These practices provided useful movement vocabularies and concepts which expanded the choreographic process by enriching its available movement and compositional methods without radically altering its initial definition (i.e. the use of time, space, dynamics and imagery). Also, strong emphasis was placed on our desire to identify issues related to content, and ultimately, meaning.

Both my collaborative team and myself needed to embrace the strong desire to shift away from the old paradigm and the predictability of imbedded linear thought. This was necessary in order for us (as a team) to better understand how to incorporate the specific technologies we were considering constructing and employing for this work. This was also

¹¹ “Black Box” is a relatively new space concept that is favored by choreographers, directors and media artists pursuing small theatrical productions and performance arts installations. Initially popular during the 1960s, 70s and 80s it has been widely used by not for profit arts organizations because of its relative low operational cost. More recently, it has been considered to be a place where more authentic and intimate performance can be explored, thus becoming the favorite space by artists exploring the use of technological mediation. I favored this space for my work due to the proximity and excitement caused by the high energy it elicits. Some of the most memorable performances, which I have observed, have been performed in black boxes. As in my work, the use of this space helped revitalize and re-envision the way we explore and conceive work making.

found to be useful in understanding the behavior of our handmade, sophisticated, sensorial charged interactive systems. Consequently, we were compelled to continually experience and explore how digital technologies may be used to change our modes of thinking and knowing. While we tend to think of these technologies as mutable and inert, it can be argued that they are alive and manipulable when placed under the command of the performer's body and similarly when performance attendees are provided with the option of inserting input into the interactive system. This methodology altered long-term tendencies, organizational patterns and our ways of work making in quite dramatic ways. The inherent newness, trepidation and jubilation lie in the way we embedded our thematic ideas in order to discover how we could change and readjust, time and time again, in the pursuit of each new work.

3.2 Meaning, Space and Corporeality

The assumptions that meaning is contingent upon context and that context can be generated through viewer interaction fed the construction of our multiple interactive systems. Like the performer, the cyborg and the cyber-human, the system took center stage as “Mushi,” liquid-like, mutable, easy to wear and increasingly easier to use. In doing so, we were able to exploit several fields of energy, expanding it, managing flowing layers of it, utilizing body-mind centering techniques and channeling psychic energy. Additionally, we composed repetitive ritualistic movement material; together they offered a way of clarifying the boundaries within which we could conceive and experience how to pursue our work, *Convergence Identities*.

In *Body, Space, Image: Notes Towards Improvisation and Performance* by Miranda Tufnell and Chris Crickmay, their definition of the realization of a piece is as follows: “The emergence of a piece depends on how the material is explored and placed. A resonance emerges slowly – significance discovered rather than chosen” (1999, 193). The process of discovery is not deliberately chosen – it must organically unfold, making it necessary to have the appropriate environment to evoke and support creativity. They also write, “[i]n being receptive to the immediate moment and in tuning to our own sensations, feelings,

dreams, we begin our own narrative of discovery that differs from the received narrative of our culture” (1999, “Introduction”).

The receptivity and immediacy of tuning into our own intuitiveness and sensations are indeed the driving elements which fuel our own new ideas. Through each thought, each conscious and unconscious decision, we unleash the body to be receptive, open and available, which leads to experimentation. In this passage, Tufnell and Crickmay address the importance of the image as a seed to that which comes next:

Take an image, let it hang in the mind; let the sensation of the thought dissolve through the body. Let the movement inside the body – of breath, of thoughts – move the outside. Allow the sensations their own time and expression – yawning, rolling, resting – waiting for a space between the thoughts, an unlocking of the parts of the body – a gap into which something new can emerge (1999, 1).

The newness of it all is what we were expecting to emerge. We are rescued as we started to experiment with unlocking our body parts in the way we observed the cyber-human so freely operating in cyberspace just by way of being/moving. Interestingly, we observed that this operation happened in a sphere-like cyberspace as opposed to our three-dimensionally constructed physical performance or rehearsal space. In a sphere-like cyberspace, there is no up, no down, no side, just an endless, open, uninterrupted, ready-to-be-occupied space. Together as a team, we learned that it is virtually possible to fly away outside of the sphere (blasting through the boundaries of its perceived walls) and land safely, relying on our intuition; which is to say that every new step or action in cyberspace required extensive training. We attempted to undulate, liquidize our spines, melt into and out of various shapes with no feeling or sensing of the floor, sky, or ceiling, constantly changing our minds as we were gasping for air trying to imitate the various moves of our manufactured partners, all along being physically bound by the technology. Our embrace of this learning process yielded a better understanding of how significance is discovered.

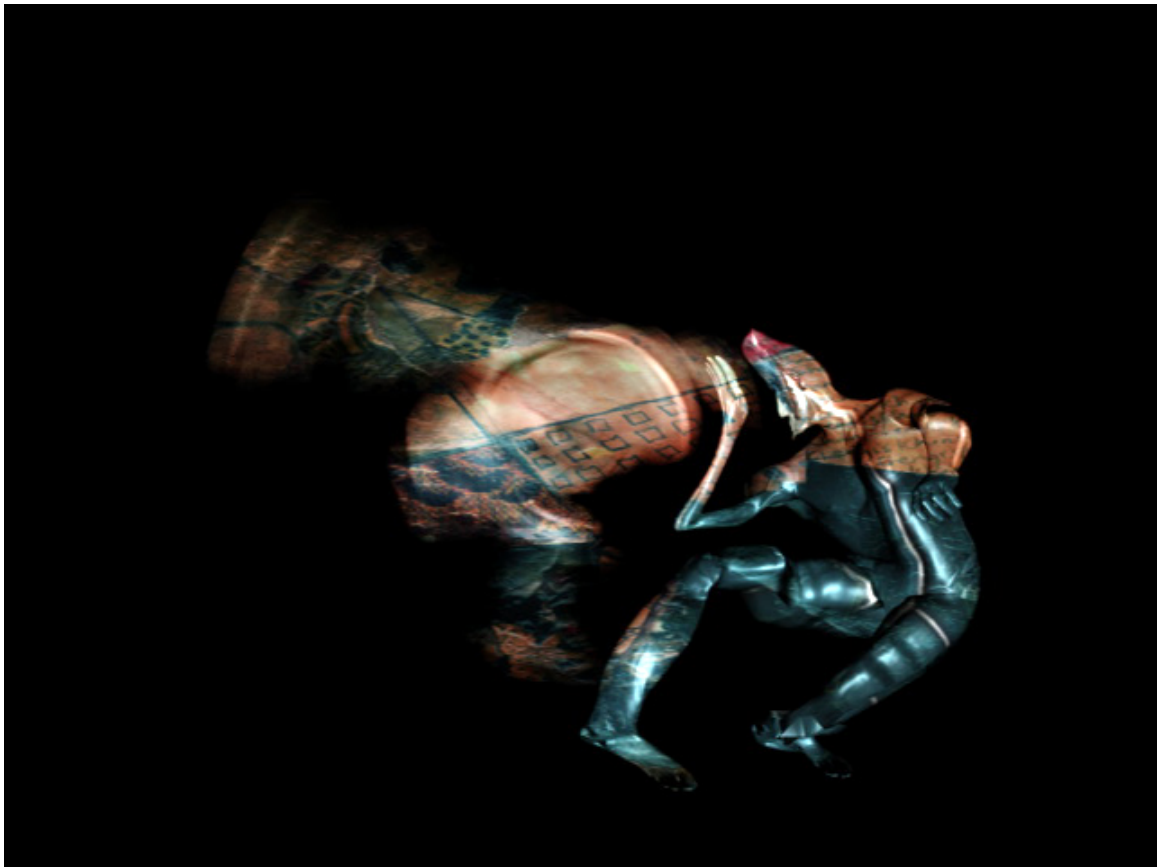


Figure 11: (*Convergence Identities* 2004-2008) One cyber-human character is peeling off of its cyber-human partner, again mimicking the dynamics of physical human partners in a Contact Improvisation session. Unlike human dancers, these cyber-humans are not bound by gravity or any other physical law.

I have previously written about operating in cyberspace as follows:

I know in my life there is a space and a dancer, and now a new space. An endless space – cyberspace – that is brand new... And it has turned around, upside down almost, what we know about dance. Cyberspace is zero gravity. There is no gravity in cyberspace. I can make a phrase where the dancer takes off in the air and stays in the air as long as forever with no bending knees, with no sense of gravity, with no sense of groundedness. So, zero gravity has changed the notion of how dancers move in cyberspace. Not physical and human dancers, but cyber-humans and cyber-dancers move differently (quoted in Dixon 2007, 658-9).

However, as a team what we have learned from observing and experiencing work in cyberspace had a profound impact on how we moved our bodies in the physical realm. For example, like one aspect of corporeality – being of material nature, we approached the behavioral patterns of the body as a structural issue that had to mature. Ultimately, it had to emerge and evolve rather than being seduced into a situation of being prematurely

unprepared to meet the challenges of interacting in cyberspace with a cyber-human partner. Like in the physical realm, the early stages of discovery were filled with physical and mental insecurities and uncertainty, which we had to overcome. We entered the slow and sometimes lengthy process of adjustment – meaning, learning how to find proper balance in cyberspace while attending to the limitations that the technology imposes, such as the need to continually finding ones center and focus and the duality of existence, standing still while virtually navigating in cyberspace and performing complex partnering acts with a cyber-partner while experiencing different levels of dizziness and nausea. These feelings and sensations are caused by operating both in the physical realm while in actuality attending to actions in the virtual space.

At this stage of development related to *Convergence Identities*, I found that I had been approaching corporeality in a way that was consistent with this research objective in order for the reader to better understand how materiality and substance could add – through repetitive and extended motion – ritual and spiritual elements to the act of performance.

In her dissertation document, *Toward a Phenomenological Theory of the Visceral in the Interactive Arts*, my colleague and collaborator Diane Gromala writes about corporeality the following: “While the corporeal, experiential aspects of interactive art seem to be a growing concern, very few theorists or artists have explored this subcomponent of the corporeal — the visceral dimension — specifically or systematically” (2006, 22).

Gromala’s observation about the lack of visceral dimension (a sub component of corporeality and intuitiveness) is seriously addressed in my research and work, not only for the visceral dimension but also for the emotional and spiritual aspects of performance. They serve as the primary components which facilitate meaningful working and performance-based practice with my manufactured partner. These attributes were made clear (like during physical dance practice) through long, improvised and ultimately repetitive movement sequences; the dance was revealed, unfolding layer by layer, suggesting the body is in its utmost poetic, visceral and spiritual state of being.

It’s important to note that this work used the “body” and “material” as co-existing entities for two related purposes. The first was to explicate what the body is in terms of its potential expressiveness. The second – and main purpose – was that the body, like material, when

-serving a mutual purpose, as in an efficacious manner, was the key factor, which instigates the development, understanding and promotion of the artwork.

After much experience as a performer and choreographer utilizing technology, a useful hypothesis is that I have rediscovered my dancing body; I entered the process of understanding the totality of its wisdom and intelligence from within. I have consciously considered the fullness of bodily sensations governed by a greater kinesthetic acuteness – “proprioception,” which is to say the ability to sense the position, location, orientation and movement of the body with its fully complex mechanism. This prepared me to assume greater responsibilities in cyberspace such as understanding, sharing and communicating while fully immersed in a virtual environment.

For dance practitioners, the interface between mind and body is a field of energy often referred to as the core. Through practice and performance, dancers acquire the skill to apply and manage this vital force by mobilizing several body- and mind-centering techniques. The increased awareness produced through these techniques enables dancers to productively distribute this power to where it is needed at a specific moment. Together, mind and body create a link between the physical existence and the spiritual state of transcendent consciousness, assuring a coordinated operational continuum between the two.

No viable organized, coordinated physical effort such as taking off into the air, spinning, controlled, sudden dropping (descending), or rising (ascending) to and from the floor can be pursued without a great understanding and command of the core. Dance, Contact Improvisation, yoga and martial arts, among several other training methods, are all forms of somatic practices. All can be used as physical performative communication modalities by uniting the physical and the spiritual as an integrated whole. I have found that although all of these practices require a simultaneous physical and spiritual connection, the act of performance grounds them in the body, which is continually engaged in a transformative process. This useful process introduces a range of opportunities that are presented to us when we consider the addition of interactive technological mediation. By integrating these technologies, the body experiences the unity of the physical, virtual and the spiritual selves as an integrated whole, and it is then ready to transform and assume a range of additional and augmented abilities. It becomes a greater source for inventing original new material,

and a training ground in perception. Question arises then as to how physical, human bodies and the artificially constructed cyber-bodies can unite and operate both dependently and independently.

Miranda Tufnell and Chris Crickmay offer the following: “Enter – not as yourself – but as a fresh ingredient called into being by the state of affairs in the space at that moment finding a gap that calls out to be filled” (1999, 87). Entering not as yourself and ultimately finding a gap in the physical space is, in actuality, taking a good chance at an opportune time. It is more complicated in cyberspace due to the characteristics and uniqueness of its endless, sphere-like attributes. Only the seasoned wearer and user of the technology will eventually acquire the skill and knowledge to be fully present and deeply engaged in the listening and seeing process. Navigating in a sea of endless new opportunities and yet undiscovered and untested gaps in the virtual space is more complex because of the lack of visible boundaries. In cyberspace, they are made possible only when specific worlds/architecture is added into the space. They then need to be explored and tested; ultimately this process opens the way for gaps to be discovered and filled.

3.3 The Importance of Contact Improvisation

The importance of being seasoned and proficient in Contact Improvisation [CI] as a method that is more useful when it precedes the interaction with a cyber-human has proven to be extremely beneficial. In CI, partners work in close proximity and physical contact, which requires great physical skill and efficiency in the way they manipulate each other. Like operating in cyberspace, the language of CI must be practiced and acquired over time. In “About Contact Improvisation,” Steve Paxton, one of the most influential pioneers of CI, describes it as:

The improvised dance form is based on the communication between two moving bodies that are in physical contact and their combined relationship to the physical laws that govern their motion—gravity, momentum, inertia. The body, in order to open to these sensations, learns to release excess muscular tension and abandon a certain quality of willfulness to experience the natural flow of movement. Practice includes rolling, falling, being upside down, following a physical point of contact, supporting and giving weight to a partner (1979).

A two-way system of communication – listening and responding – is key to the success of a CI event. In addition to the obvious electronic connection, partnering actions between a physical human and cyber-human share improvisational and sensational aspects with CI. In performance, a reflection of my own physical representation was projected on a see-through surface in the form of a cyber-human. My physical actions, movements and gestures were enacted; at this point, the wireless electronic and physical contact between my cyber-partner and I has become more intensely intertwined and committed to the moment-by-moment unfolding of the duet. Through repetition, these gestures and moves were accumulated – they have become a part of muscle memory and can be performed intentionally or unintentionally by either one of us, depending on the situation at hand. As in CI, the success of such tactile, physical, virtual and spiritual interaction necessitates mutual support and trust. Obviously, without an electronic connection, there is no cyber-human; it is and has to be a computerized entity. Beyond that, what continues to occupy me is that all of it – the performance, the behavior of both human and cyber-human dancers, the duration of the experience – is remarkably similar to the real physical world. We interacted according to the ranges of our ability, our experience, our inhibitions and the electronic connection.



Figure 12: (*Convergence Identities* 2004-2008) A cyber-human operates in a sphere-like cyberspace. There is no constant direction of up, down, left, right – just an endless, open, uninterrupted space ready to be occupied. This lack of direction is part of why it is difficult for humans to operate in VR without training and/or for extended periods of time.

In *The Illustrated Encyclopedia of Body-Mind Disciplines*, the improviser Paul Langland asserts, “the performers need to release tension and uncertainty and meet one another in an open, relaxed way, otherwise they will not be able to establish the connection that is essential to the process of reciprocal improvisation” (1999, 1). Clearly, reciprocal improvisation – giving and receiving in a loop-like manner – serves both partners and maintains a constant connection. Together we have organically and incrementally descended, melting into individually selected shapes; as we merged again we ascended, exponentially re-emerging, break up by bumping into one another, changing our plan of engagement, carrying on to a point of extreme fatigue. All along we were fully present, operating in the moment and letting go of old, physically memorized patterns which would otherwise prevented us from releasing the energy that freely travels between our bodies and minds.

In *Sharing the Dance: Contact Improvisation and American Culture*, Cynthia J. Novack points out these notions about several premises and perceptions related to physical dance:

First, the body and movement, the mediums of dance, are not purely natural phenomena but are constructed, in concept and practice. Second, dance is a part of culture, both contributing and responding to larger patterns of thought and organization. Third, dance constitutes an interplay of ideas, techniques and institutions with the lives of the people involved in creating and watching it (1990, 13).

It is clear and well established that the mediums of human physical dance are not purely natural phenomena. In the physical domain, getting in and out of dance formations and deformations of the various formal as well as innovative complex new moves and organizations are not always possible or perceived as natural. However, this is not the case in cyberspace whereby the cyber-human dancer body is fully capable of defying the logic of the most complex imaginable gestures, postures, deformations and moves not possible by the physical body. Here, cyber-dancer bodies and movement of any given form or deformation are completely natural. Observing and continually interacting with this phenomenon brought us closer to the understanding of how dance in cyberspace creates meaningful movement material that is affecting and adapted by physical humans; it is most

enriching, adds to the pool of existing movement material and expands what is currently perceived as the limits of the physical human body.

Based on the knowledge and practice gained from these experiences, I often incorporate it in workshops, lectures and informances that I have the opportunity to conduct around the world. They are often uniquely designed to share my latest findings related to how the physical body is continually enriched by interacting with cyber-bodies, specifically those that are revealed to me through my personal interactions during performance. As I consider these types of activities as intertwined with my teaching, I recognize the loop whereby teaching is work and work is teaching.

3.4 The System

In “Negotiating New Systems of Perception: Darshan, Diegesis and Beyond,” Margot Lovejoy and Preminda Jacob offer this information related to our struggle to understand systems of perception that are becoming available to us:

As we struggle to find theoretical frameworks that will enable us to understand the new systems for perception becoming available to us, we might profitably (re)turn to concepts of visuality (that is, the socio-historical dimensions of vision) developed in contexts culturally and/or historically distinct from our present moment. We believe this cross-cultural, trans-historical montage of concepts is in keeping with the increased awareness of global cultural exchange today that fosters negotiation of extremely disparate systems of perception and communication (1999, 62).

Although the concept that defines a system varies with the user or wearer of the system, in this work, we are referring not only to electronically charged systems, but also to systems that are capable of providing us with a mediated experience “through technological construction of a reality which can bring about suspension of disbelief” (62). Like in the pursuit of traditional choreographed dance works, the receptivity and immediacy of utilizing our intuitiveness and senses are still the driving elements which fuel our inventiveness in cyberspace. It helps us to discover new ideas, which lead to the realization of content, meaning and narrative.

In order to continue fostering more advanced reciprocal, improvisational and performance-level relationships with future generations of cyber-human performers, several systems

needed to be established: 1) mentoring, not on a master/learner mechanism, but more akin to a give and take of collaborative exchanges and experiences, 2) a wearable computer that posses a remembering knowledge-based system by way of accumulation and remembrance, and 3) a “Recombinant Poetics System” that lead us to unleash new “Fields of Energy” and “Psychic Interplay.”¹² These systems were specifically employed in order to better understand how a monumental work such as *Convergence Identities* could be pursued and how the combination and recombination of media elements can be manipulated. Here, we were discussing aspects of performance augmentation which single out the cyber-human as an intelligent, autonomous being that embodies accumulative and remembrance attributes as a performer, somewhat similar to its human counterpart. This ability is a primary component that allows events/actions directed onto the physical stage to be manufactured, stored, remembered and employed as needed, ultimately facilitating the operation of equally shared, projected and unconventional performance activities in an unconventionally charged intimate performance environment (a heavily charged, sensorial-based, intelligent environment that is purely activated by the way the performers move about and around the space).

In *Toward a Field Theory for Post-Modern Art*, Roy Ascott asserts:

Art does not reside in the artwork alone, nor in the activity of the artist alone, but is understood as a field of psychic probability, highly entropic, in which the viewer is actively involved, not in the act of closure in the sense completing a discrete message from the artist (a passive process) but interrogating and interacting with the system “artwork” to generate meaning. This field provides for transactions to take place between the psychic system “artist” and the psychic system “viewer,” where both are, to use Umberto Eco’s phrase, “gambling on the possibility of semiosis” (Eco 1976). Thus the user/observer must be a participator and is the operational importance of the total behavior of the system. A field theory of art must pay much attention to the participator (1980, 179).

¹² The notion that meaning is contingent on context, and that context can be generated through viewer interaction, is central to Recombinant Poetics. In Recombinant Poetics, a computer-based mechanism can act as a conduit of exchange between the author of a media-world and a participant or interactant. Such a media-world presents a set of potentials of interaction. Such interaction generates an engagement with an environment populated with media-elements as outlined above. Recombinant Poetic systems seek to explore fields of “psychic interplay.” Where Ascott points toward the notion of psychic forces at play, one can also approach the notion of fields from an energy perspective. A slightly different perspective to the notion of the field was proposed from a post-structuralist perspective by Steven Heath, in relation to film theory (*See Steven Heath *Process and Operation* and http://ensemble.va.com.au/enslogic/text/smn_lct07.htm.)

The reason we can relate so well to Ascott's notion that "art does not reside in the artwork alone, nor in the activity of the artist alone, but is understood as a field of psychic probability" is because of its strong emphasis that is placed equally on the user/observer and the performer, which in actuality contributes to the act of materializing the work. Based on my own experience, this notion is particularly important when we consider works that rely heavily on interactive systems whereby the role of the observer input into the systems serves as the primary instigator of the act of performance. This productive relationship between user/observer and performer were very clearly established in my first chapter, which discussed the operational importance of the total behavior of the system.

As we better understood this notion, our purpose was set in interactive art making within the context of performance. We placed emphasis on the ways live art performance is conducted in both the physical realm and in virtual situations. Several trials and small projects were specifically designed to investigate the conception of a choreographic system that could algorithmically create and recreate itself by itself. Such a system would be ongoing and endlessly repetitive, allowing participants to log on and contribute while the event (as a whole) existed independently from any one individual. Rather than adhering to the logic of a single choreographer, this system would incorporate participants' gestures and movement material into a performance controlled by a preconceived code that produces non-linear, hyper-textual content (digital dance), providing structure and allowing the work to progress gracefully without a beginning or end. The individual wearer/user of a wearable computer (the system) made decisions that adhered to specifically created human movement gestures, postures, emotions and feelings that can be tracked by this recombinant system. It did not respond to traditional computerized commands. The aim was that the cyber-human dancers would take on a life of their own, recognizing their own community of ancestors and continually examine their ageless bodies and superb conditions, bodies that will stop at a specified magnification of desired size, speed and astonishing liquidity and grace. Placed against or adjacent to each other, the bodies gracefully and naturally defy gravity and introduce a wholesome vocabulary of raw movement material that has yet to be fully explored. Taking on a life of its own, the cyber-human dancer possesses a way of moving that is organic in nature and exists in peace and harmony with its physical human counterparts. The generosity with which the cyber-human dancer shares space with the

human performer offers a model for how human performers could share space with one another.

Matthew Causey, in “Screen Test of the Double: The Uncanny Performer in the Space of Technology,” argues that “[t]here is nothing in cyberspace and the screened technologies of the virtual that has not been already performed on stage” (1999, 383). This bold and contentious argument did not simply provoke a negative reaction or make me feel that it was intended only to elicit reactionary responses. Instead, it renewed my interest in and desire to analyze the role that my body plays in the pursuit of this research. It made me reflect on the body – initially, strictly as the instigator, but also later as the central element from which every system is initiated and controlled. Additionally, it helped me to reflect upon and interrogate the role of the body, as it was employing more advanced and complex systems such as the “recombinant poetic system.” It supports the creation of works that could not be pursued otherwise.

3.5 What is Beyond the Electronic Connection?

Prior to the pursuit of the major work *Convergence Identities*, a set of smaller works were conceived, constructed and tested over a period of several years (2004-2008). Each one of these smaller projects offered different proposals about how progress is achieved. The methodologies employed were mostly borrowed and built upon the experience gained from previous works, which drew our attention to multiple additional design elements. The seductive power and agency of these technologies has stimulated and facilitated the emergence of technologically manufactured man-machine hybrids. They multiplied the ways to detect what was beyond the technological aspect, looking for the convergence and blurred boundaries of the real versus the perceived.

In *Digital Performance*, Steve Dixon writes that one of our foremost digital culture commentators – Lev Manovich – believes that “the greatest artists of today are computer scientists and the greatest art works are new technologies themselves” (2007, 5). Our experience with various software and hardware packages, which assisted us as a team in the act of making this work, lead us to agree with Manovich’s bold sentiment. The endless

possibilities offered by these technologies allowed us to create complex, endless combinations of visual output, content, materiality, real time interaction, interactivity and systems which facilitated audience interaction. We also accepted Manovich's statement that "the greatest interactive work is the interactive human-computer interface" (5). As such, we have experienced how the man-machine hybrid offers a secure sense and augmented level of self worth, thus possessing full command and operational ingenuity over the complicated aspects of the technological systems and tools we employed. To fully understand how they operate, we (as a team) had to master their intended purpose and fully deploy them toward the realization of this work.

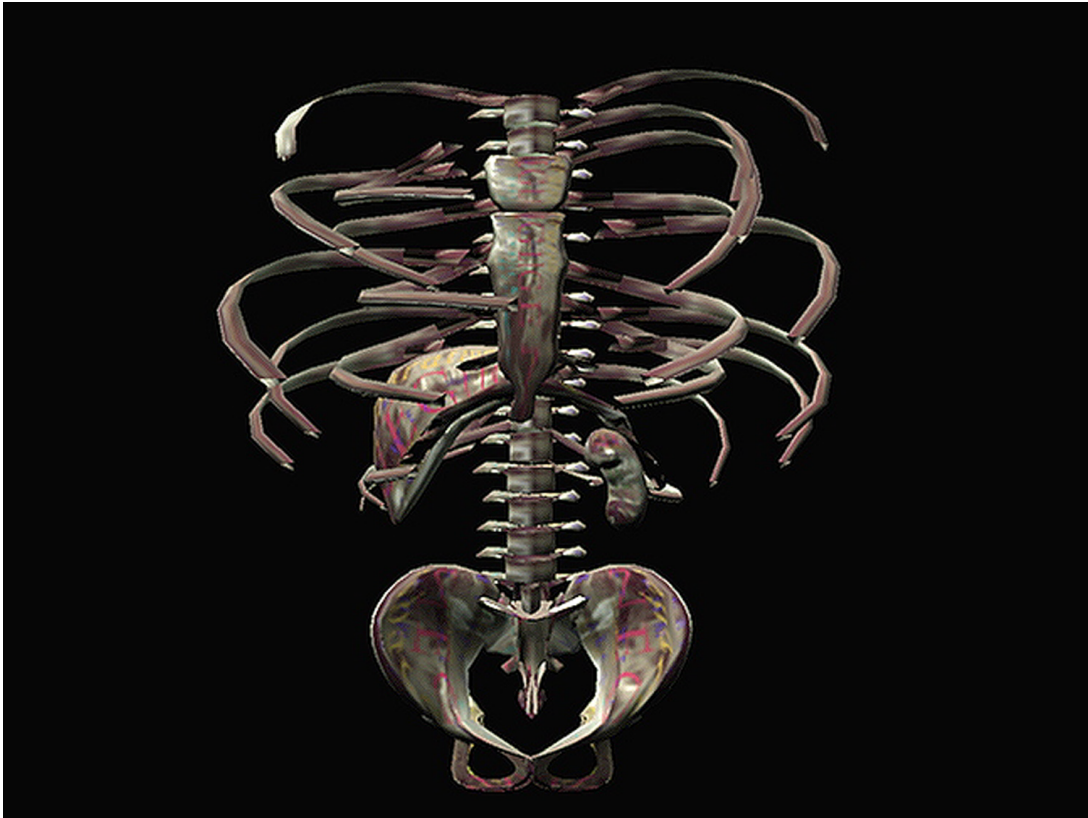
As the choreographer and performer, I could no longer exclusively think of myself as such; I had to continually conceive the specificity of the technologies involved for each work, contribute to building/creating the various interactive systems, wearable computers and highly charged environments, and then try to overcome the inevitable new challenges. Considering my extensive experience performing and interacting with simulated cyber-humans, my focus has gradually shifted away from my initial interest in making the technology serve its enormously important purpose of exploring what is beyond the *Electronic Connection*. As I was fully immersed in the emotional and visceral content (that is always already available during performance in the physical realm), I have sought to continue this latter goal while interacting with cyber-humans. As I was occupying increasingly immersive cyber-worlds, my disembodied self was re-embodied in and around the poetics, lyricism, cognition and processes of consciousness that accompanies the act of performance. Based on this valuable experience, a useful hypothesis is that within specific, favorably designed environments, a cyber-human can virtually perform and demonstrate attributes such as identity and autonomy which are comparable to and, at times, indistinguishable from its human counterpart. My research interests and artistic practice converged – literally and figuratively – in a zone of postures, gestures, movement and communication between the real and perceived worlds, including the effects on consciousness, creative intentions, interactive visual language and cognitive linguistics which fuel innovation.

Like the duality of existence I experienced while I was performing *Dancing with the Virtual Dervish: Virtual Bodies*,¹³ conducting the dance in the physical world while fully immersed in the virtual reality world among multiple emotional and visceral experiences, the most potent was feeling simultaneously physical and virtual, as if owned two split identities. Roy Ascott best describes this phenomenon in this paragraph:

Life in cyberspace can be seen essentially technoetic. Our experiments with the technology of being, involving for example VR, telepresence, and hypermedia, may be the prelude to our eventual migration from the body to other forms of identity. Unlike the material body the mind cannot be contained: it leaks out everywhere. It is as if our destiny is to make intelligence ubiquitous. Migration from the body does not imply its disappearance but the emergence of the multiple selves, the distributed body, whose telepresent corporeality creates its own field of being (*Reframing Consciousness* 1999, 66-67).

These useful concepts such as “migrating from the body to other forms of identity” and “the mind cannot be contained: it leaks out everywhere” are primary components that generate a creative, evocative and innovative improvisational or CI sessions. Inexperienced improvisers hold back, and operating freely in cyberspace is not for the timid.

¹³ *Dancing with the Virtual Dervish: Virtual Bodies* is among the first VR projects to synthesize immersive and interactive digitized new dance in a performance environment that includes a head-mounted display, data glove and interactive video projections which enable the audience/participants to interact with the environments and in essence, become co-creators. It explores concepts and experiences of the body on many levels (visually, sonically); behaviorally, and most importantly, issues of split identities. It is also reminiscent of the body: of skin, of materiality, growth and decay. This metaphorical representation of an inner body houses all activities in the virtual space, engendering emotional and visceral content and responses. *Dancing with the Virtual Dervish: Virtual Bodies*, is a collaborative work between Diane Gromala and Yacov Sharir. It was commissioned and first performed at the Banff Centre for the Arts, Canada, May 1994. It was also performed as an installation at the National Museum of Contemporary Art in Athens, Greece, “Synopsis 2-Theologies” 2002.



Figures 13 & 14: (*Dancing with the Virtual Dervish: Virtual Bodies* 2002) Sharir and Gromala's work was among the first VR projects to synthesize immersive and interactive digitized new dance in a performance environment. I was immersed in the VR environment pictured in Figure 13 during the performance, and shown in Figure 14, the audience saw me navigating this and a projection of what I was seeing. Therefore, the

audience saw the split which I experienced – both my physical self in the performance space and my interaction with the immersive VR environment.

3.6 Convergence Identities and Improvisational Structures

I have trained both as a performing dance artist and as an improviser since the early 1970's. As such, I understand that while engaged in the creative process with a cyber-human partner, there are moments when I cease to know. I am momentarily beyond my ability to think or find a new form or shape, wondering in the dark voice of inventiveness. Initially, not knowing what would take place next was a very scary proposition. However, it requires the release of these concerns and the embrace of calm and security, all along sensing when we cease to *know* that something is going to evolve. It is the time that the mind needs to be cleared of multiple, suspended thoughts, making room for the new thoughts at the edges, digging deeper into different moments, unconsciously and intuitively seeking the way toward progress. Improvisation allows its participants to explore by peeling away layers of past experiences in order to make room for new and more mature, informed decisions. Often, we draw our attention to our virtual partner knowing that being endowed with artificial perception and autonomy has the potential to contribute to the important process of discovery.

I have found inspiration navigating in cyberspace, where our bodies converge, not knowing who is leading and who is being lead. Physically, I was supposed to be fully grounded, stable and secure, however virtually, the navigation process is fast and furious, and it was difficult to gain command over my actions. Instead, at these moments, I sought to recover my balance, slow down the navigation process, regain command of myself and sync my actions in perfect harmony with my virtual partner.

As the dancer operating in cyberspace, I was primarily experiencing zero gravity. The lack of such an important component for dancers constitutes a major change that seriously challenges the body and mind while their attention is required elsewhere. Since cyberspace is essentially a non-habitable space (not included in a virtual sense) that is continually in a state of transition, it introduces new and always unexpected results. Thus, like in improvisation sessions, you must clear the space so that you may re-occupy it at an

opportune time. However, operating in cyberspace for long and extended sessions is not an option. Like training in a physical sense, new and additional practice sessions are required; however, the process of adjustment needed to master operating in such an environment is extremely challenging and filled with endless new possibilities. Change on the part of the dancer, their training and preparation is necessary in order to allow for meaningful production to occur between the artificial and the real (or physical).

Michel Bret, Marie-Hélène Tramus and Alain Berthoz, in “Interacting with an Intelligent Dancing Figure: Experiments at the Crossroads between Art and Cognitive Science,” offer the following observation:

This raises one of the most crucial questions in contemporary digital arts: that of the relationships between natural and artificial “perception-movement-action” functions. One of our aims is to create art installations showing virtual actors who are endowed with artificial perceptions that enable them to react in an autonomous way to the cues given by a spectator, thus opening art and cognitive science to a whole new range of possibilities for the exploration of virtual life (2005, 47).

This central notion and experience of the virtual actor endowed with “artificial perception and autonomy” is very similar to the energy shared between two physical human partners while interacting in traditional dance forms, partnering work and CI. Its newness, however, lays in the meaningful production and new material generated by the artificially constructed partner. This challenges the old paradigm of how performance content evolves and is revealed over time – how it looks and in what direction it is progressing.

Dare We Do It Real-Time was created as part of POST ME_NEW ID, which will be addressed in greater detail below. This piece was a co-production between body>data>space (London UK), CIANT (Prague, Czech Republic) TMA Hellerau (Dresden, Germany) and Kibla (Maribor, Slovenia), was supported by the European Union within the Culture 2007 Program, and emerged from an interauthored group process involving 11 European artists specializing in performance, video, virtual worlds and interaction. It challenged the ideas of the self and our multiple identities, both off and online. The performance included the following: “How do our avatars in the virtual realm reflect on ourselves? What do they teach us about ourselves and how can we use that knowledge to extend our understandings of others?” (2009, 96).

On Friday, October 31st of 2008, at POST ME_NEW ID (the post human condition of modern Europeans conference in Dresden Germany), I delivered the keynote presentation entitled, “Identity, the Post Human Body & Digital Practices.” I used the following keywords: gestures, rippled/waved bodies, interactive visual language and cognitive linguistics (2009, 15). In this lecture I addressed issues related to the “technologically manufactured cyber-humans and their co-existence with physical human/counterparts while engaged in performance.” I picked up on ideas initiated by the *Dare We Do It Real-Time* team. More specifically, I was interested in clarifying the virtual possibilities of our avatars – in the virtual realm – reflecting back on us and our actions. Thus, the question is what – in the physical realm – can we learn from this phenomenon? Our cyber-human partners respond to how we reflect and manipulate them during the act of performance and how we learn from the way they so gracefully move. In fact, *Convergence Identities* as a work is mostly designed to address these fundamental issues, such as multiple identities and our understanding of others, or passing along and sharing information borrowed from the virtual realm in order to adapt it in the physical world, not only between performers in both worlds but also between environments. As I stated in the keynote, “[t]ogether we create a link between the physical existence and the spiritual state of transcendent consciousness, assuring a coordinated operational continuum between the two” (16).

These concepts were set to examine, establish and gain experience that applies not only to the cyber-human but primarily to the human dancer/performer and to the way his/her ability and body can be augmented in order to exceed the current limitations of how we define dance. This has great implications for how the arts of dance and choreography can be altered when we employ such high-end technologies and interactive systems.



Figure 15: (*Convergence Identities* 2004-2008) Two cyber-human performers interacting in an improvisation session. They were generated by a wearable computer placed on the physical human counterpart. Although it is currently impossible for a human dancer to replicate the undulations and gravity-defying moves of the cyber-dancers, they expand our thinking about what is possible and provide new movement material.

Clearly, we had to develop means of utilizing these technologies in order to achieve this specifically desired outcome. I spoke about this particular aspect in my keynote at the POST ME_NEW ID conference with the following:

Continuous research related to these technologies facilitates the augmentation of these systems' operational sensory devices and attributes so they can fully function as a medium for inscription. They accept/detect human and cyber-human moves, morphing scaling, capable of color changes on the fly and adding new dimensions of expressivities and meaning to performance (2009, 21).

The medium for “inscription” as it applies to cyber-human performers is as important as the notion of “muscle memory” as it applies to physical dancers. Both are achieved through endless repetitive motion that eventually becomes memorize. Thus, it can be consciously and or unconsciously repeated with extreme accuracy.

Furthermore, cyber-humans are created and manipulated by various technological systems, fully charged with sophisticated technologies and multiple sensory-sensitive elements. The initial intervention is created by the physical human, wearer of the system and is based on human movement sensibilities. However, the cyber-human is now empowered to contribute by way of movement and gestures, which are, in turn, cybernetically inscribed. The composed gestures and movement material become a source of intention that relates to itself; its communicating environment becomes a visualization of the self-reflexivity inherent in the workings of the dance and consciousness, the self and the perceived. The dance is between two mixed identities (human and cyber-human) and the source material as it transitions and transforms into the domain of visible thought.

During the POST ME_NEW ID conference, theatre director and professor Steve Dixon delivered the keynote lecture entitled “Multi-Identities, Performance, Virtual Environments and the Hybrid Self.” In it, he asserted:

We should also reflect that although we seem ostensibly to be building new selves, the process is equally and as importantly about erasing the old self. The cycle of rematerialisation necessitates dematerialisation and it may be that an unconscious strategy of disappearance actually lies at the core of multiple identities. Finding the liberated, ludic, new self involves the concealment or obliteration of the socially formed old self (2009, 39).

This idea that we must make room for the new by erasing the old – whether we are talking about naggingly suspended thoughts that need to be cleared from the mind in order to allow the creative process to enter or erasing the old self in order to clarify one’s new identity – is potent and relevant within this context of performance that is distributed over multiple and varied environments and physical spaces alike. This is how we enter the process of excavating forgotten layers of knowledge: we “rematerialize” our bodies, remembering past experiences so that we may begin to know what we dare not know. While operating in cyberspace, we continually re-evaluate our position both in a physical sense as the instigator/operator of the technology and as the navigator in cyberspace, getting lost in the process, stepping high, getting low and looking around, all along trying to find the real self. Thus, we start anew each and every time, always engaged in a continuous process of possible new discovery.

This personal and intimate process highlights the technological progress of a development that begins with the implementation of machines as tools, heightening phenomenological experiences and further experiments with the use of high-end 3-D software, wearable computers, additional cyber wear devices and high-end interactive systems. Earlier technological developments have displayed various examples of computer-generated human bodies, visual prototypes of bodies and virtual selves and perceptually enabled intelligent agents, specifically as demonstrated in the works of Steve Mann,¹⁴ Thad Starner,¹⁵ and myself, among others.¹⁶

3.7 Cyber-Human Taking on a Persona

In *What a Body Knows*, philosopher and dancer Kimerer L. LaMothe makes the following argument:

To dance is a radical act because it reminds us that we, as bodily selves, exist only as an expression of the matrix of relationships with ourselves, others, and the natural world that enables us to be.

To dance is a radical act because doing so implies that there are forms of knowing that cannot be mediated to us in words, which give words their meaning (2009, 1).

Similarly, the notion that in cyberspace a cyber-human can exhibit attributes that suggest an individual set of behavioral patterns and personality conducts is indeed profoundly radical

¹⁴ From 1994 to 1996, while a grad student at MIT in Boston, Cyber wear pioneer Steve Mann streamed live video directly onto the Internet from a device that was mounted on his head. Everything Mann saw and heard during his day, visitors on his Web site could see and hear as well. The experiment allowed Net users to literally view the world as Mann experienced it. From their computers, they could also communicate directly with Mann, which gave him a rather odd ability. As he went about life, he could benefit from the combined brainpower and experience of those looking over his shoulder via the Internet.

Mann began building his own wearable systems as a high school student in the late '70s, and he has continued that work at MIT and now at Toronto. At MIT, Mann worked with a fellow grad student, Thad Starner, who's now running a wearable computing project at Georgia Tech. Jay Bookman Atlanta Journal-Constitution Staff Writer, 3.26.2000

¹⁵ Thad Eugene Starner is a founder and director of the Contextual Computing Group at Georgia Tech's College of Computing, where he is an Associate Professor, and one of the pioneers of wearable computing as well as human-computer interaction, augmented environments and pattern recognition.[1][2] Starner is a strong advocate of continuous-access, everyday-use systems and has worn his own customized wearable computer continuously since 1993. His work has touched on handwriting and sign-language analysis, intelligent agents and augmented realities. He also helped found Charmed Technology.
http://en.wikipedia.org/wiki/Thad_Starner

and qualified more as an observation than technologically or scientifically proven hard evidence. However, this argument is grounded in extensive performance experience over several specifically constructed small works.

While performing in virtually constructed spaces, I have continually experienced the fascinating radical process by which a cyber-partner takes on a sort of persona, as if imitating my own personality and moves, assuming my way of shaping, not only reacting to my way of executing movement material but also acting and causing me to react in turn. I have noticed that cyber-humans can act in unpredictable, creative ways: at times doing what I expect them to, at other times creating humanly impossible – but intensely creative – shapes. Who is in actually the initiator and who is being initiated?

The notion that a cyber-human could develop a personality, or identity, was at first both radical (a discovery of sorts) and suspiciously satisfying. It evoked multiple new research options for new improvised movement combinations that could not have been perceived or created in the physical world. I have sought to design specific movement phrases that helped reveal and unfold what was behind this possible phenomenon. I inserted some moments of stillness to identify where the smallest changes could be made; this also allowed me to better suspend the dance and observe what was transpiring? Conversely, I pursued the opposite impulse, meaning, developing sudden gestures, maybe a set of facial expressions, a set of postures, with a sudden change of energy.

Another unique aspect of cyber-partner attributes is that they – by way of being constructed – move with more precision. They possess a unique kinesthetic acuteness, an intense sense of awareness as much or greater than their human partners, demonstrating exceptional generosity (measured in the way of demonstrating an expressive quality) as well as remaining calm, filled with warmth and a willingness to engage. The question arises: how could this be? Is it possible that a cyber-counterpart can also assume some of my human, emotional attributes, as if it has a mind within its hollow body, sharing the visceral and spiritual journey with me? We touch, I listen, and my eyes close and then open – I am not dreaming – we both become more attentive, progressing toward sharing the dance and the responsibilities of an equal partnership.

Then again, nobody said a cyborg couldn't have personality enhancement complete with a seductive Zarathustrian laugh, as Shannon Bell in "Acute Absence" reminds us with a quote from an interview with Stelarc:

One can argue that you don't have a mind and a body in that separated sense that we conveniently talk about it. When this person speaks about a body, this person means this physicalological, operational, aware and communicating body in the world and that includes everything that goes up to and into this behavior (2004, 3).

During performance, personality enhancement is at its optimum level of clarity. The human performer is fully engaged in a deep listening process, which directly impacts the cyber counterpart, positively affecting its behavioral patterns and allowing it to change – calmly observing the undulating, liquid-like maneuvers of the cyber-human, learning its ways in and around its designated cyberspace and gracefully committing to its performative journey. This is the time when the conditions for sharing the dance are present and most favorable.

The research related to this phenomenon is not limited exclusively to how my assertion of cyber-human's taking on a character is supported through technological mediation. I also sought alternative communication modalities such as cognition (specifically in the realm of the body-mind centering techniques), energy expansion within the context of dance, duet partnering and CI, transformational and transcendental actions, researching exciting dormant powers, primitivist and spiritualized vision of action patterns, zero gravity, inertia, friction (between two bodies), centrifugality and momentum within the context of ever-varying internal and external states.

Together, the cyber-dancer and myself created a continual dance of transformation, one into the other, converging in our mutual creation. Through the ongoing self-reflexivity and self-recursive processes of consciousness, I am now better positioned to understand how the hybridity of my artworks (ongoing examinations of the moving body) utilizes its relationship with technology. It helps me to better understand how the transformation into dance of real and virtual is revealed in the ordinary flow of my intuitive and random selection of movement material. It gives birth to new movement vocabulary, consciously leading to more complete and satisfying physical actions.

3.8 The Emotional, Poetic and Spiritual Connection

Clearly, the emotional, poetic and spiritual engagement I describe is most potent while the physical and the virtual characters are engaged in attempting to touch, interact and/or find ways to manipulate each other. These emotions and feelings affect the actions and the outcomes of performance in unpredictable ways. They are situated within the phenomena of autonomy, for both the real and the virtual beings.

According to Varela, “autonomy means internal law related to self-generation, self-organization and the affirmation of identity” (my translation, 1989, 22). The artificially intelligent autonomous being stands at the core of what makes my work significant. It is manifested most powerfully during the various performance opportunities while operating simultaneously in the physical realm and interacting in cyberspace. Together we affirm our own separate identities through the way we self-generate movement and share, act, respond and influence each other’s ways of moving by co-existing in a transcendent state of being.

However, in this complex and multidimensional performative relationship, the boundaries between who is activating and who is activated are thoroughly blurred, as is the affirmation of identity and how the subject and object converge.

In the fall of 2004, *Digital Performance*, the online magazine for artists embracing technology, conducted an interview with Sarah Smirnoff and Hal Eagar, the creators of *The Adaptation of The Sandman*. In their discussions with Terra, the company member who manipulated the digital puppets, her response was that she was better able to synchronize her manipulation of the digital characters when she was looking at Tony, her fellow performer, and making an emotional connection with him on stage. As she put it:

“I did not feel that the characters were successful in making an emotional connection – BUT – I do think we are closer to figuring out the steps to understanding how and what the actors need to connect to each other while using the technology” (emphasis in the original, quoted in Sharir 19, 2009).

Terra, the company member who – while reflecting through her body into performance – manipulated the digital puppets, is correct to point out that the act of synchronized performance with a virtual partner requires further research and ultimately experience before we can scientifically confirm this important assertion about existing emotionally,

viscerally and spiritually charged connections. What we can claim, though, is the deep listening and emotional commitment made by the physical human performer/activator. It leads us to reflect on recent and more diverse relationships such as in real and perceived life in the online metaverse *Second Life*.¹⁷

During POST ME_NEW ID, several conference panels followed the three scheduled keynote presentations. Following my keynote lecture, digital artists Fidian Warman (of the Czech Republic) and Pavel Smetana (of France) continued the line of the previous conversations and shed somewhat different light on the topic of avatars:

Smetana followed Sharir's stance on *Second Life* and brought new arguments in its favour. One of them was that one managed to do more there than in real life. There is a new species of avatars emerging: a slave or a pet. A research was conducted were they allowing avatars to have their own life after the owners were logged out and that brought a whole new dimension to relation owner-avatar. We can easily develop simulacra identities (2009, 48).

In *Second Life*, my direct virtual representation is carried through my personally designed character, most often attempting to look and act in ways I will never become and often beyond my ability to comprehend. It acts and reacts only if or when I do, directly attending to my commands. The difference lays in the way we – the avatar and myself – behave in the metaverse with all of its particular attributes. It is primarily more about representation rather than identity, yet I am standing behind the avatar. Meaning, I am physically standing behind my it (outside the computerized information) while virtually representing my design and construct in the form of my avatar that is forever attending to my immediate actions, then awaiting further instructional moves. Thus, the lack of reciprocity is apparent.

In “halving angels: technology's poem,” artist and poet Jools Gilson-Ellis asserts:

Technology has made different kind of poets out of us, referring to his collaborator Richard Povall. Together we sing ghost songs. We have haunted mouths, and speaking flesh. Together we imagine impossible things that I can write, but not make. Together we make things that I can't imagine. We barter noisily like grandmothers. Because I am a writer, and trade in poetry, so I tempt technology to do the same (2004, 55).

¹⁷ In the metaverse, constructs that were once well grounded and known to artists, as to humanists and social scientists, such as contemplation, participation, or data mining seem to deserve a re-examination if not a re-formulation. In the specific case of dance, we will identify the areas of challenge that working with an intangible medium may present to choreographers and dancers and to what extent this ethereal quality may stimulate their creative work.

Alternatively, in my own work, we can make things that are possible to experience but difficult to describe. I can see and feel that the technologies I wear and employ can metaphorically float (specifically when placed on my body) and how the cyber-humans I create take on an emotional and spiritual life beyond their electronic beginnings, but I lack the technological and scientific justification to fully explain my experiences. I don't yet have a way to describe how these things happen or what makes them possible. The point of this thesis, then, isn't to offer explanations and offer solutions, but to possibly demonstrate that a cyber counterpart can behave autonomously and take on life/behavior of its own, and begin to ask: What, if any, are the combined mechanisms that facilitate this phenomena? In "halving angels: technology's poem," artist Richard Povall has this to add: "How do I make space intelligent?! (*laugh*) Artificial intelligence mumbo jumbo aside, I want to make the case that these systems are emotionally intelligent because they sense phenomenally" (62).¹⁸ I would like to think that Richard Povall not just elegantly but specifically used the term "phenomenally" because he was equating technological systems with meaning, intentionally addressing the broader sense of this phenomenon such as our ability to sense, feel and imagine things that are phenomenologically responsive.

3.9 Conclusion

In his recent article entitled "Improvisation and Intimate Technologies," choreographer, improviser, media artist and colleague of mine Kent De Spain concludes:

Improvisation is not an open vein pumping creativity into the world, and technology is neither bogeyman nor savior. As someone exploring the theatrical potential of movement, text, sound, and light, I know it is possible to make and experience vital, visceral, and inspiring art with or without a computer. Digital technologies are, however, intrinsic to our lives now and we have enfolded them within our most valued processes, our most intimate spaces – communication, creativity, memory, and love. If we are looking for a roadmap to compelling creative interactions with

¹⁸ The historical movement of phenomenology is the philosophical tradition launched in the first half of the 20th century by Edmund Husserl, Martin Heidegger, Maurice Merleau-Ponty, Jean-Paul Sartre, et al. In that movement, the discipline of phenomenology was prized as the proper foundation of all philosophy — as opposed, say, to ethics or metaphysics or epistemology. The methods and characterization of the discipline were widely debated by Husserl and his successors, and these debates continue to the present day. (The definition of phenomenology offered above will thus be debatable, for example, by Heideggerians, but it remains the starting point in characterizing the discipline.)
<http://plato.stanford.edu/entries/phenomenology/>

and through that digital world, simply improvising with the technology is not enough of an answer (2011, 11).

It is important to note that because those of us in this medium of finding resistance and/or satisfaction in the pursuit of transdisciplinary performance are usually doing quite different things, the great deal of mutual understanding that is taking place is quite remarkable. Not just in aesthetic and spiritual output, the use of poetry, emotional and physical content, intimacy and mysterious artificial beings acting autonomously, but also in the basic, fundamental approach to digital performance. Since there is quite a bit of a workable critical theory output around most of these works, a commonly understood language to describe what we are all trying to do has naturally evolved. For years, those of us working in technology were more adept with this theory than with actual creative output. In recent years, however, much of the usual hype and rhetoric has diminished as we all began producing more impressive products to showcase. This trend in productivity also offers a sense of heightened self-worth and confidence for many of the makers and their works to come.

Great advances have been made in several areas related to live arts performance and interactive intelligent installations. Internationally recognized collaborative teams conducting important experiments at these crossroads include the following unusual combinations of new mixed fields: cognitive science and biology, connectionism, genetics and physiology of perception and action, neural science and networks and artificial haptic teleoperation. Also, second interactivity and body-thought are very important, intriguing and hold the potential to lead us to very important new research areas.

I wish to conclude with the assertion of philosopher and dancer Kimerer LaMothe that is physically and philosophically so relevant to the work pursued in this thesis: *Mind over body*.¹⁹ A first and fundamental value of Western cultures is the one that privileges our mental capacity, in particular our ability to reason, over and against our feeling, sensing and moving bodily selves. As René Descartes' famous adage goes, "I think, therefore I am." We believe that as thinking minds, we both *can* and *should* exert control over our bodily

¹⁹ This concept is a central tenet of LaMothe's *What a Body Knows: Finding Wisdom in Desire*. Hants, UK: O Books, 2009.

actions. We believe that achieving such mind-over-body mastery is good, and that it is even our ticket to success in any realm of endeavor.



Figure 16: (*Convergence Identities* 2004-2008) A hollow cyber-body designed to accentuate its unique possibilities in performance, as it is not bound by gravity, has no organs, etc. This represents a new species of avatar emerging where the real and the perceived converge, parallel to the process of the affirmation of identity. Despite the differences between cyber-human and physical human dancers, the works with cyber-humans are designed to give them equal agency, thereby configuring their cyber-minds over their cyber-bodies.

CHAPTER 4: IntelligentCITY

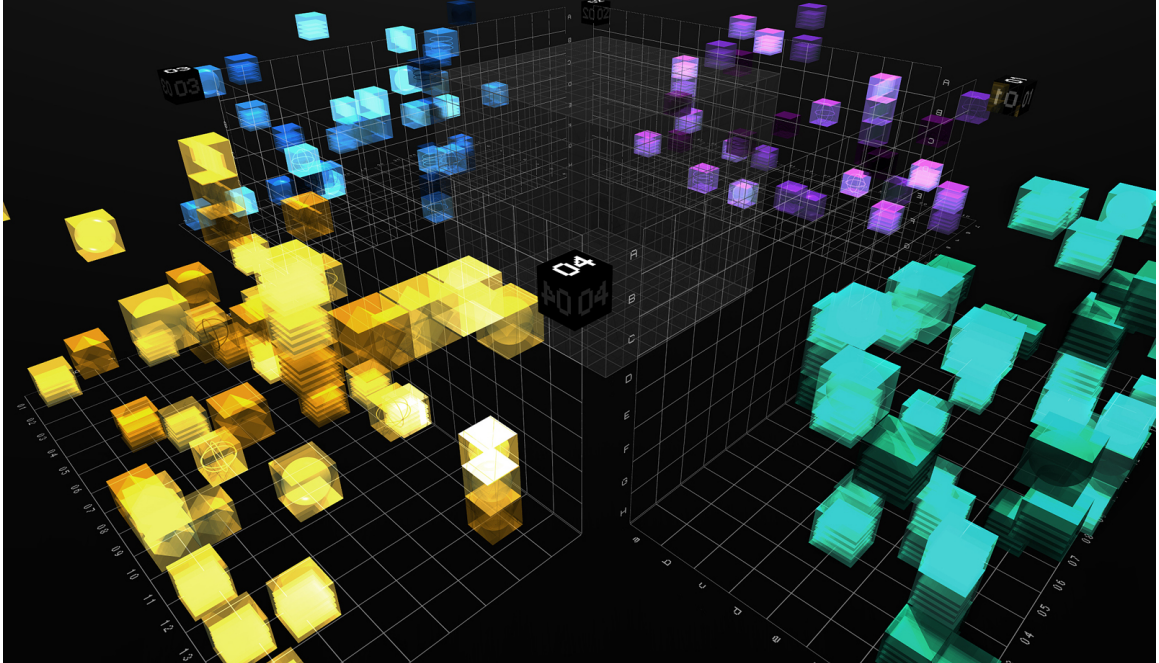


Figure 17: (*IntelligentCITY* 2005) One of two cyber architectural studies exploring a dynamic understanding of the element of space completed in the collaborative planning process for this and related works. Image courtesy of Elif Ayiter.

While never realized to the extent we desired, the many iterations of *IntelligentCITY* allowed my collaborators and I to erode the boundaries between many disciplines – most specifically for this piece, dance and architecture. The site-specificity of the work meant that we engaged an existing space, architecture, users/people, habits, memories and histories; our challenges included collapsing the past, present and future of the space, sometimes even purging these memories so that the spaces could be seen anew. Contrary to common conception, architecture, like dance, is dynamic and this principle infused our process as we activated the audience to continually discover using accessible, quotidian movements so that they could be co-creators/authors of the pieces. The use of real time technology – particularly cyberspace – fostered the expansion of notions of choreography, challenged the laws of gravity and notions of reality and increased the level of interaction between the many collaborators and spaces of this work.

4.1 Introduction

*IntelligentCITY*²⁰ is one of four projects/works that constituted this thesis. It epitomized the complexities and the mechanics that accompanied an international collaborative, transdisciplinary new work. It was designed to examine how a highly interactive, sensory, multi-charged collaborative event would function and co-exist in a site-specific and/or site-inspired complex architectural structure, such as in a public shopping mall with its various and multiple available intricate spaces.

For the pursuit of this monumental project, we first had to explore and reach a consensus about the working relationship between the three primary collaborators: choreographer and video artist Sophia Lycouris (based in the UK), multimedia composer Stan Wijnans (based in Holland) and myself (based in the U.S.), a choreographer/multimedia artist. Our first task was to find a mutually accepted working language, which proved to be complicated and somewhat difficult. Additionally, we had to deal with recurring concerns, differences and the disparity between the creative processes and goals of each of the contributors. However, following multiple face-to-face and long-distance discussions and planning sessions, we gradually developed a set of thematic ideas as a foundation for this multifaceted work.

We were then able to examine the intricacy and dynamics of real and virtual architectural structures and of our (carefully selected) ‘site-specific’ space, the ‘shopping mall’ in direct relation to artistic practice. We also investigated whether to involve trained dancers that could operate and coexist in harmony with day-to-day users of the shopping mall (i.e. shoppers/pedestrians) or to exclusively employ the quotidian users of the space. Another concern was how to make the technology visible and accessible to returning users/visitors of this mall during the day light hours. Question arose as to how we could efficiently deliver clear information and content, as well as a meaningful experience in such a complex environment. We discussed whether large-scale images could interact with video captures

²⁰ *IntelligentCITY* was a FUTURE PHYSICAL commission by Shinkansen (London, UK) and East England Arts (East England, UK) co-commissioned by The Junction (Cambridge UK). It also received a Research & Development grant from London Arts (London, UK), a research grant by The Nottingham Trent University (Nottingham, UK), and support from various organizations including the Department of Theatre & Dance of The University of Texas at Austin (Texas, USA) and The Jerwood Space (an art center in London, UK). Finally, *IntelligentCITY* is the last phase in a series of practice-based research projects exploring the nature of interdisciplinary, collaborative, technologically mediated art works.

of the users. The aim was that this captured information of the users would serve as the activation for the technologically charged systems and set the work in motion.

As for the technological aspects, we explored the complex structure of surround sound and whether large-scale virtual images could be summoned and used effectively in and around the smaller shops and into the most intimate spaces without creating sensory overload and confusion. We favored the use of multiple interactive sensory-based systems with added wireless surveillance video cameras and sophisticated multisensory sensitive devices that could be placed strategically in this everyday built environment. These combined technologies were specifically designed to augment the space, transforming it into an intelligent, smart, responsive and sensitive structure. We planned to facilitate the free movement of audiences/users amidst a sensory-immersive installation at the intersection of day-to-day pedestrian movement material, taking into account real and virtual images. One of the most important design questions of this work was to craft the space to be of the most benefit to the user. In other words, we carefully designed the user's progression path from one desired position to the other desired location(s) in the shopping mall.

Furthermore, we searched for possible connections between the notions of space, cyberspace, habitable (in a physical sense) and non-habitable architectural space, materiality, embodiment and the mixture between choreographed and improvised movement sequences. Another important factor was how to physically interact with members of the public who are, in most cases, familiar with the space.



Figure 18: (*IntelligentCITY* 2005) This is a performance still demonstrating the creative team’s perception of the connection between the notions of space, cyberspace, habitable space (in a physical sense) and non-habitable, architectural space. The projected image was generated in real time through the use of a wearable computer on my body.

The interdisciplinary research process evoked the formulation of key questions relating to the nature of both architecture and choreography for dancers and non-dancers. The overall theoretical, philosophical and methodological point of view we embraced posited that every design decision related to the users’ pathways, sound design and proposed images will lead them to continually experience and shift their experiences of the architecture. We attempted to situate the environment in a constant state of imaginative change, thus disrupting the notion that architecture, as an environment, is largely static.

In *Public Space Serial Books: Architecture & Urbanism*, Raoul Bunschoten argues that “public spaces must have a prototypical character” in the sense that they should function as instruments of change (2002, 5). He explains that because a “prototype is a programmatic condition,” it carries dynamic properties. As a model for testing, a prototype inherently contains a number of different sets of possibilities that could give rise to new qualities. Bunschoten perceives public spaces as the playground for society, “the playground in which society re-invents itself” (2002, 6).

4.2 Thematic Notions and the Artwork

IntelligentCITY was a long-term, large-scale, site-specific, international research project and work that was pursued in multiple smaller iterations over a period of five years (2003-2007). As mentioned, it included three primary collaborators: Sophia Lycouris, Stan Wijnans and myself; additionally, there was a secondary team of international collaborators and programmers that embodied multiple important technological skills.

The first iteration of this project was scheduled to take place at the shopping mall in the city of Cambridge (UK) in April 2003. Grafton shopping mall was carefully selected as an appropriate site for *IntelligentCITY*, which was expected to be part of “Respond,” a series of events including conferences and multiple artistic activities in the city of Cambridge. As we were exploring the nature of responsive environments, given the opportunity to choose, we purposefully selected this *public* space for our site-specific work.

Our main research purpose was to transform, deform and accentuate the interconnectedness that supports traditional perceptions of ordinary architectural structures. We attempted to do so by challenging its myriad – real and virtually distorted – prior notions of the narrow understanding of what this specific space was in the living minds of its day-to-day users. Personally, I was most interested in whether I could find the poetic map, traces and imprints of time/memory that can be left behind on every inch of this site. Our creative team’s trajectory thoughtfully embraced the notion that physical and virtual architecture can be perceived as being in a constant state of transition whereby the initial perception of the architecture and the perspective of it was continually shifting. Our intentions were to deploy the users’ energy, weight and motion – whether gestural, pedestrian, or choreographed – to generate and augment levels of energy sources. By way of moving, one is being detected and captured, setting the sensorial systems into action. Thus the pedestrian/visitor becomes the force majeure, meaning literally the greater and primary force, for awakening the various systems deployed with the purpose of revealing the hidden meanings embedded within the multiplicity and intricacy of the spaces.

Our team thoroughly enjoyed the initial planning and research of the site. This was followed by redesigning several existing pathways to redirect the public into newly

constructed physical and virtual pathways, which led them to rediscover how to experience the work while walking from one desired location to the other. We also explored the strategically accessible locations of our large-scale images. Our intentions were to evoke thoughts, content, emotions, imagination and feelings, but mostly memories about what the space is and used to be – in direct relation to its current newness – as the work (oftentimes by chance, randomly) unfolded. The design process was founded on the notion that everywhere one looks, one sees signs of the newly redesigned, projected, real and imaginary images of familiar and unfamiliar content, all imbedded in the spaces they initially recognized, but were now strange. Some of these signs were placed in the original space, some in newly projected cyberspace and others were real but most likely invented – or, perhaps, left hanging in their imaginations/minds.

In *Cyberspace: First Steps*, contributor Marcos Novak offers the following interpretation of cyberspace:

Cyberspace is a habitat of the imagination, a habitat for the imagination. Cyberspace is the place where conscious dreaming meets subconscious dreaming; a landscape of rational magic, of mystical reason, the locus and triumph of poetry over poverty, of “it-can-be-so” over “it should be so.” The greater task will be not to impose science on poetry, but to restore poetry to science (1992, 226).

The poetic output embedded in the history of the site architecture serves as the metaphor for the habitat of our production of large-scale virtual images. Together they are the landscape of rational magic that constitutes the key components in considering the pursuit of the thematic makeup of this work. The inclusion of mixed environments (physical and virtual) has inevitably assured qualitative interaction between humans, cyber-humans and the technology in direct relation to the site and its visitors.

These fundamental processes constitute a new, mixed, site-specific and site-inspired space, suggesting that a sense of being is present – an embodied collective self that is unique insofar that it applies to an artificially manufactured hybrid space. The physical human pedestrian is re-embodied in real and artificially constructed and projected images that operate in sync with its projected cyber bodies by means of physical and mental articulation. The pedestrian occupied increasingly artificially constructed spaces, 3D virtual worlds, 3D surround sound installations, wearable surveillance cameras, additional wearable devices and projection screens and scrims and all of these were synchronized to

act and operate within and in relation to their immediate spatial and kinesthetic awareness in their surrounding environment.

A selected empirical method for the pursuit of this research was carried out and supported by artistic/performative practices. These methods were the means by which we could best gather information in order to develop a strong theoretical base that justified the thematic ideas of the work. It allowed for simulations of the real (the physical) and virtual (large computer generated images), leading toward (a desired) integration and intercommunication of a full range of sophisticated systems that were strategically placed in and around the environment.

4.3 Exploring the Limits and the Technology

This new work and its complex public environment engaged both the consequences and the limits of the nature of its original purpose (to facilitate the public's shopping) and the site's collective physical attributes and function related to what was yet to come. However, it is important to note that our selected environment with its inherent materiality and opportunities to generate content provided us with the most tempting stage of and gateway to our collective imagination.

A dialog was created between what we perceived as the act of dance/choreography (fully enhanced by the multiplicity of technologically supportive systems) and the notion of generating a renewed perception of the specificity of the site, which embodied the characteristics of both the large-scale and the intricacies of such a public space. Before we fully established the enticing and seductive environment to invite the users to fully activate their own way of desired play with(in) the environment, we had to seriously consider that many of them possessed a mental collective memory of the site that might be difficult to erase. Would a territorial disagreement of sorts occur? The major factor considered here was whether all 'input' by the users into the systems must be accepted as is or whether parts of it should be edited for what we would then consider as acceptable material.

In *IntelligentCITY*, the users, the observers and a small, select group of performers were stimulated/compelled to interact with the technology through a series of games that consisted of physical and virtual play. The intention was to initially develop a sense of self-community creating so that the territorial disagreements – if and when they occurred – became trivial, as their own journeys were initiated by a sense of augmented perceptual experience. This goal was directly related to the newly redesigned environment and its multiple, smaller, more stimulating spaces. Their movement was captured through wireless camera-based sensors in order to trigger visual, sonic and dynamic transformations of the space manifested by multiple projections of video and virtual content and amplified by the 3D surround sound.

Additional methods included the deployment of live artwork, physical human pedestrians who were also the primary users of these public facilities, cyber-humans and physical humans who were fully trained and accomplished artists. The application of these multiple technologies engendered a renewed perception of the static as cyber-humans and invited audience/participants/users became co-authors/creators by means of everyday use, wonder and navigation, thus re-creating and re-defining the space.

The most effective interactive mechanism systems incorporated in support of this work were camera-based sensorial devices. Once employed, these wireless cameras provided data that was analyzed in real time by the software, (which made it more accessible) and determined the appropriate changes to implement in all other video feeds and sonic material that was recorded live in the performance space. The sonic material, processed through MAX/MSP,²¹ was then redistributed in the space through the surround sound system, thus re-organizing the sonic environment. Similarly, the processed video material was redistributed in the space in the form of multiple projections.

Both architecture and choreography engage in methodologies which address and develop spatial structures. This commonality is particularly crucial in the creative research of collaborating choreographers Sophia Lycouris and myself. Lycouris explores the potential

²¹ MAX/MSP is an interactive programming environment, which means you create your own software using a visual toolkit of objects and connect them together with patch cords. The basic environment that includes MIDI, control, user interface and timing objects is called MAX.

of choreographic environments and dynamic spaces within which the viewer/user can roam freely and physically, thus experiencing the impact of various types of movement including structured movement of human bodies and the movement of sound and visual images. I research the architecture of virtual environments/structures and how they can affect the architecture of the body through the real time use of wireless wearable computers/suits and other wearable devices. This work is set to capture the dialogue between the different perspectives of Lycouris and myself, framed by our common experience in live performance strategies. In short, *IntelligentCITY* has provided us with a good foundation for an informed conversation about site-inspired and site-specific pedestrian dance.

In the Introduction to *Site Dance: Choreographers and the Lures of Alternative Spaces*, editors Melanie Kloetzel and Carolyn Pavlik make this important observation about “The Site Choreographer”:

[T]he site artist zeroes in on local idiosyncrasies. This is because local places are the touchstones, muse, and medium for the site artists. These artists examine our neighborhood haunts at length, taking in all the visual and sensual details of a site. Site choreographers, for example, can be found physically investigating a place. They may conduct extensive research into the historical manifestation of the site; they may interview the current residents about their relationship to the place. Then, after all these efforts and meditations, they create artwork that is relevant to *that* place and *that* community (emphasis in the original, 2009, 2).

Since site-specific works are not exclusive to the range of works I am interested in pursuing, I do not consider myself a site choreographer per se. However, issues such as the local idiosyncrasies of a site, the opportunity we had to “conduct extensive research into the historical manifestation of the site,” and the interaction that arose from “interviewing the current residents about their relationship to the place” proved to be extremely unique and informative for the pursuit of such a project. I took this opportunity with a heightened sense of responsibility and humility and embraced it as a chance to experience the mounting of an enormously complicated and interesting event that required a great deal of learning, which is the greatest pleasure in art making.

From a theoretical and practical point of view, my personal contribution to early investigations of site-inspired architecture and technologically mediated interactive/virtual works of art suggests an architecture of being that expresses selfhood – in both a physical and a virtual sense – in real time and opens a new world of possibilities, many of which

were explored in this work. Additionally, the pursuit of such exploration and cross-fertilization promises to engender a new area of creative inquiry into the architecture of the body and develop lasting, collaborative partnerships with its counterparts in the sciences, technology and the world of art making. The end result was that existing traditional disciplines were fused for the purpose of augmenting all aspects of traditional and alternative performance.

Close examination lead us to determine that ultimately, the innovation of this research lies in the process developed for understanding corporeality and operational perceptions enabled by the use of multiple sophisticated technologies and wearable camera interfaces by which the human and apparatus seamlessly redesign and feed each other. Thus, the combined use of these technologies has demonstrated how, as a result, one can blur the distinctions and boundaries between the two.

4.4 Site-Specific Space, Cyberspace and Public Space

A site-specific work allows the art maker to conduct an in-depth examination of a space and create outside of traditional theatrical spaces. A site-specific space is chosen primarily because of its unique alternative setting and potentiality for providing the most appropriate inspiration that compels the art maker to engage with the work. Most site choreographers are attracted to working within the confines of the public domain, partially because it elicits interesting public discourse. In *Site Dance: Choreographers and the Lures of Alternative Spaces*, site choreographer Joanna Haigood writes that site-specific is always a place where its people “give the architecture a sort of consciousness that imbues it with meaning far beyond its essential functions” (2009, 61). Furthermore, since most site works are not created in the studio for performance in a traditional theatrical set up, they are in most cases designed to co-exist in peace and full harmony with its chosen site. The site is, ideally, a place where we feel safe enough to store our own memories while looking for the imprinted memories left behind by its other users. Site choreographer Stephan Koplowitz asserts: “I do think of architecture in terms of harmony, that there is a rhythm created by certain design features in a building” (2009, 67). Meredith Monk, a pioneer site choreographer/composer, describes her process with the following: “[L]ayering is often in

my work. I like to explore the layers of texture and skin and surface. I often think more like a visual artist, a painter or a sculptor. I take this sense into the performance experience where I have a dialog with the three dimensional space” (2009, 34). Harmony, rhythm, layering, texture, skin and surface apply to architecture and dance alike. These are the foundations that allow them to co-exist so seamlessly.

After forty years of creative output within Site Dance, it is finally getting its long overdue recognition for its terrific body of works. The term “site work” no longer privileges concert stage work. However, according to choreographer and site artist Ann Carlson, “the term is a bit watered down at this point – domesticated, easily dismissed. So I like to call it all work” (104). As is evident in Carlson’s quote, site-specific choreographers are often required to justify the meaning and purpose of their work – and even to define it. Simply put, many site choreographers choose to describe their next project as “new work,” leaving more possibilities open so that an informed conversation/debate may occur.

Carlson does not simply advocate the dismissal of the term, though. When asked whether categorization of the term could be problematic, she responded: “Yes, but I do love the possibility in site-specific work, or site-sensitive work, or site-responsive – however it’s named – that people will happen upon an event or public performance work. I love the opportunity for passerby to ‘stumble’ upon something they didn’t expect” (104). This important statement made by site artist Ann Carlson touches upon one of the most effective aspects of what site-specific work is about: “the opportunity for passerby to ‘stumble’ upon something they didn’t expect.” Most audiences can – more or less – have an idea about what to expect in a traditional performance set up. However, nothing of that nature applies to a site-specific work. The composed material is always uniquely attached to a particular site and can be exclusively performed for this site only, and the audience’s expectations for traditional performance are immediately disrupted.

In addition to the artistic, thematic, content and meaning, the planning process for *IntelligentCITY* did include additional complex issues that accompany such a large-scale project that are inherently specific to site works. In *Site Dance: Choreographers and the Lures of Alternative Spaces*, editors Melanie Kloetzel and Carolyn Pavlik point out that

Site Dance consists of a collection of artists who seem to relish frustration. Negotiating with government officials, police, community members, and business owners or struggling with potentially dangerous equipment or landscapes, site-specific choreographers venture on arduous artistic quests to create work in some of the most unlikely places. Yet whether those places are subway terminals or abandoned jails, river barges or rose gardens, they shoulder such challenges with remarkable poise (2009, xiii).

However, not unlike other some of the traditional site artists, we did not “relish frustration” or venture on arduous artistic quests to create work in some of the most unlikely places. The phase of “negotiating with government officials, police, community members, and business owners” took place only following the full completion of the laying of our thematic foundation, our content and the various technologies we planned to incorporate. However, like most site artists are prepared to do – we did “shoulder such challenges with remarkable poise.” Much to our benefit, the administrative burden for most of our large-scale project was initiated and pursued by the sponsoring organization Shinkansen (London, UK) and East England Arts (East England, UK).

Close examination of the site lead our creative team to establish two main goals: 1) to plan a work that would purge collective memories of the past, and 2) identify the elements that might galvanize past events in tandem with what is yet to come.

We were engaged in the multifaceted process of discovering the unique attributes and possible narratives derived from the site’s many intriguing parts and hidden surfaces. We visited the smaller and bigger shops, the cafés, the boutiques, the hidden passages connecting with yet undiscovered gates leading toward smaller outdoor kiosks. Questions arose regarding the new opportunities available to us when we were open to discovering the experiences of these places told by the users and whether architecture needs its inhabitants in order to claim its uniqueness and/or its soul.

The movement material for this work was carefully generated through research and interpretation to fit the site’s unique matrix of characteristics and topographies, whether architectural, historical, social and/or environmental. This process has the possibility of discovering the hidden meaning in each specific space and developing methods to amplify

it. The dance/movement is specifically designed to exist only in one of the multiple endless intricate spaces.

In *The Architect's Eye: Visualization and Depiction of Space in Architecture*, architect Tom Porter argues that:

Architecture can be considered as a creative expression of the coexistence of space and form on a human scale but its understanding, together with all other concepts, is rooted in the psychological space of our thoughts. Our perceived experience of interior and exterior architectural space is primarily a sensual event involving movement – for to pass through an environment is to cause a kaleidoscope of transitions between one spatial impression and another. Each experience affects the orchestrated functioning of our senses in a variety of ways – our eyes, ears, nose and skin registering changing stimuli, which trigger a flood of brain responses on all levels (1977, 26).

The perception of the architecture being “rooted in the psychological space of our thoughts” becomes a matter of the interrelationship between body, movement, choreography and the space. We were so interested in this particular site because of its unique functionality, the importance and its multiple attributes considered by its community and because it came of age through the experience of its users.

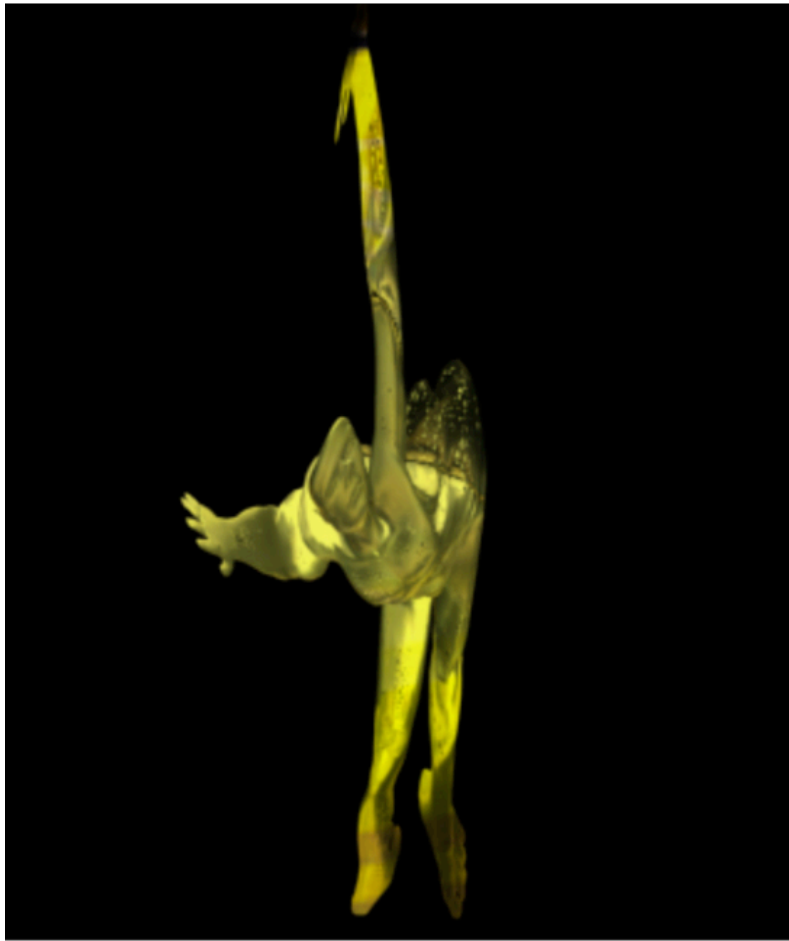
These elements informed the ways we understood each other in direct relation to “our knowledge and experience of interior and exterior architectural space that is primarily a sensual event involving movement” (Porter 1977, 26): the walking, gesturing, posturing, tumbling and dancing through small and big doors and narrow, long, dark and high passages. The users define, trace and sculpt spaces; they can virtually make these spaces shift, move and breath, open and close, expand and contract.

In *Digital Grounds*, architect Malcolm McCullough re-iterates: “The modern space was all about freedom of movement [...] the act of design became the shaping not of buildings, but of space [...] space became conceived in relation to a moving point of reference (2004, 13-14). Before we attended to shaping the internal spaces as we were thinking of the choreographic output, we carefully analyzed the notion of how space is conceived in relation to a moving point of reference, which is to ask: where and how do bodies moving in and out of the site know where they are? And how do they affect the central point of view of the work with the way they act?”

4.4.1 Cyberspace

During the planning phase of *IntelligentCITY*, our creative team considered cyberspace as a medium because of the endless opportunities that were revealed when we began to consider how best it could be deployed in support of this specific work. In *Cyberspace: First Steps*, Michael Benedikt offers the following remark: “cyberspace’s inherent immateriality and malleability provides the most tempting stage for the acting out of mythic realities” (1992, 6). The notions of cyberspace’s malleability and the opportunity it provides to act out mythic realities are intriguing and challenging. Surprisingly, we found that our site possessed the qualities and dimensions necessary for a similar exploration. Additionally, it can be argued that a work of such magnitude and complexity is destined to act out of mythic realities. Clearly this was a big challenge to overcome, but early research and analysis undertaken by our team proved it to be possible.

Cyberspace is a unique resource that carries infinite information, a home to a world of electronic images and digital story telling, a place where electronically manufactured beings live and are housed in intelligent environments, an endless space where architectures of being and non habitable architectures coexist in harmony, a space that does not physically exist and yet does exist when accessed electronically and in the memory of its users. Cyberspace is a place with infinite dimensions, but also a place where we are all made available through information, communication and our own images.



Figures 19 & 20: (*IntelligentCITY* 2005) Two of several cyber-human animated performers specifically designed for this project. These images represent a mythic reality, possible only for cyber-humans to execute.

In his Introduction to *Cyberspace: First Steps*, Michael Benedikt predicted the following:

The door to cyberspace is open, and I believe that poetically and scientifically minded architects can and will step through it in significant numbers. For cyberspace will require constant planning and organization. The structures proliferating within it will require *design*, and the people who design these structures will be called *cyberspace architects*. Schooled in computer science and programming (the equivalent of “construction”), in graphics, and in abstract design, schooled also along with their “real space” architects, cyberspace architects will design electronic edifices that are as fully as complex, functional, unique, involving and as beautiful as their physical counterparts if not more so (emphasis in the original, 1992, 18).

Benedikt is correct to point out that the door to cyberspace is open and that “poetically and scientifically minded architects” can and will step through this door in significant numbers (1992, 18). Beginning in the mid 1980’s, architects such as my colleagues and collaborators Marcos Novak (*Dancing With the Virtual Dervish: Virtual Bodies*, 1994) and Julio Bermudez (*CyberPRINT*, 2000) entered that door with great enthusiasm, demonstrating all along a great deal of creativity, thus introducing new terminologies that are affecting many architects and art makers currently researching their ways through cyberspace. The notion of a “liquid and non habitable architecture” (Novak 1992, 251) and an “architecture of being” (Bermudez 2000) served as ever enlarging leading terms for excavating many layers of new experiences related to the realm of virtual art making.

Novak’s notion of liquidity in virtual architectural works creates an image that greatly altered my personal perception of my own way of moving. It added an additional dimension that continually leads me to find different order for movement inventiveness, in a physical and virtual sense. It encourages my mind to float, looking up, all around and inside of me, ultimately leading to the creation of cyber-human performers with their liquid spinal cords and hips, undulating long arms and their bodies of astonishing beauty that are designed to endlessly flow as if they are seeking to reach the edge of the unknown.

In *Cyberspace: First Steps*, Marcos Novak describes “Liquid Architectures in Cyberspace” in this way: “A liquid architecture in cyberspace is dematerialized architecture. It is an architecture that is no longer satisfied with only space and form and light and all the aspects

of the real world. It is architecture of fluctuating relations between abstract elements. It is an architecture that tends to music” (251). Clearly, when we considered liquid architectural non-habitable space like we have experienced while engaged in the process of planning this work and during the trial period, we encountered the following phenomenon with surprise: in cyberspace we couldn’t see or develop a sense of how to measure our travelling or our distance from our designed environments. We had to adapt to moving with softness and ease in order to develop a better sense of coexistence in the space, place and time. We adapted new working patterns, such as considering the principles of multidirectionality, with better physical alignment and applied kinaesthetic understanding. We couldn’t fully comprehend the shape of the architectural output within the context of its place and its actual size. Form is not the end of a process – as we have determined, it is just the beginning of it.

As architect Dave Ten Hoop wrote about Peter Eisenman’s 1989 work *Between Method and Madness* at the Wexner Centre: “a column hanging instead of standing firmly on the ground – a clear disregard for the force of gravity, thereby estranging the visitors who are confronted with this distorted image of reality” (2010, 11). A hanging column in cyberspace will never be questioned as being odd but in the physical realm, it is quite jarring. The lack of gravity in cyberspace inherently alters our expectations of space and structure. Like Eisenman’s notion of “a clear disregard for the force of gravity,” we made good use of it primarily in all of the various large virtual images, which by nature of their being defied the force of gravity. It also influenced and directly altered how we operated in the physical world, as the images reflected our actions and inspired us with new content.

4.4.2 Public Place and Choreography as Structure

Our initial premise, from which we have approached choreography in relation to our selected site, was that formalism in dance dictates styles or altered sensibilities, whereas site-specific work, the site itself is the genesis of form, style and content. This notion helped us to arrive at a mutual language for the design of the movement material, and based on this premise, we were set to begin our choreographic exploration and experimentation.

As we were investigating and studying our site, we found inspiration in the work of Peter Eisenman; he significantly contributed to a new understanding of non-linear conceptions of public and private space employing deconstructive methods, which operate in opposition to the creation of static environments. Eisenman also promotes the investigative possibilities of the development of fluidity within these structures (existing in motion by constantly shifting their initial perspectives). From a choreographic point of view, the advantage of ‘fluid’ or ‘liquid’ environments is that they have greater potential to stimulate corporeal responses to the makers’ and the viewers’ understandings of the work as it progresses; in a sense, they affect perception by generating physical sensations. He has proposed a methodology by which architectural forms cease to prioritize the viewer’s visual experience and, like in dance, allows for a tactile, emotional and poetic experience containing a strong realistic connotation grounded in body sensations.

In *Eisenman Inside Out: Selected Writings, 1963-1988*, he had this to say about form:

Specific form demands personal responses of an aesthetic or subjective nature, i.e. to such factors as its proposition, quality of surface, structure symbolism etc. Generic form does not ask to be considered in these terms. It is not a question of our liking or disliking a cube; it is a question of our accepting its existence and recognizing its inherent properties. But specific form, since it has a close symbiotic relationship with the other elements of the architectural equation, must be analyzed in relation to them (2004, 6).

Like architecture, dance embodies personal choices in relation to small gestures and shapes, quality of movement material, touch, emotions, narrative construction and poetic experience, all of which is directly related to choreographic output.

The design of random non-linear movement material and the consideration of narrative – based movement patterns in and out of an architectural structure is most complex and in many ways also unique, but no different in its fundamental approach to a choreographed work in a theatrical set-up. The most notable difference lies in the way the work is experienced by the public, including the level of personal involvement and personal contribution that is fully encouraged. In site-specific dance, the public is asked to walk the journey of becoming artistically involved and experience the joy and consequences of contributing as co-creators.

Eisenman's ideas are an example of how contemporary architectural discourse can support the expansion of traditional choreographic concepts. His ideas engender a dynamic understanding of the element of space. This allows for the development of new methods for the production of organized movement, be it movement of human and cyber bodies and/or additional elements such as images and sounds. In other words, his ideas provide an appropriate extra-disciplinary vocabulary with the support for other disciplines – such as choreography – to adapt new, related methodologies.

Interestingly, Eisenman's innovations have been inspired by the work of his contemporary Jacques Derrida.²² Derrida's notion of Deconstruction²³ as a process, through which texts are dismantled on the basis of the inherent flaws of their basic structures and subsequently put together in new arrangements, communicates initially concealed inconsistencies and informed the so-called "de-constructionist" architecture. However, as it has been often emphasized, architecture is a discipline of the real and tangible world, its main aim to make buildings that do not fall apart or look as though they are falling apart. Derrida's initial concept of Deconstruction is considered an assault on philosophy's metaphysical assumptions about the existence of absolute truth and the value of presence. Therefore, it can be argued that Deconstruction in architecture can be the process of unearthing the flaws of traditional architectural principles, or of the assumed meanings of typical architectonic metaphors. Although it is difficult to identify examples of architectural works which exemplify this approach, the above idea is not particularly new or even radical within the discipline of architecture.²⁴ However, it offers a unique contribution in the re-development of *IntelligentCITY*'s interdisciplinary methodology so that this project could be fully functional as part of an open public space rather than its unique and distinct function as a shopping mall.

²² Jacques Derrida (1930-2004) was the founder of "Deconstruction," a way of criticizing not only literary and philosophical texts, but also political institutions. Although Derrida at times expressed regret concerning the fate of the word "deconstruction," its popularity indicates the wide-ranging influence of his work in philosophy, literary criticism and theory, art, and, in particular, architectural theory.

²³ This term denotes a particular kind of practice in reading and, thereby, a method of criticism and mode of analytical inquiry. In her book *The Critical Difference* (1981), Barbara Johnson clarifies the term: "Deconstruction is not synonymous with 'destruction,' however. It is in fact much closer to the original meaning of the word 'analysis' itself, which etymologically means 'to undo' – a virtual synonym for 'to deconstruct.' [...] If anything is destroyed in a deconstructive reading, it is not the text, but the claim to unequivocal domination of one mode of signifying over another. A deconstructive reading is a reading which analyses the specificity of a text's critical difference from itself."

²⁴ One such case is the work of American architect Gordon Matta Clark. Another is an undergraduate dissertation submitted by Robert Holloway to the Plymouth School of Architecture in 1994.

In *Written Into the Void: Selected Writings, 1990-2004*, Peter Eisenman replied to a letter written to him by Jacques Derrida. In it, he introduces and defends his notion of being both absent and conversely present. He writes:

Yes, I am preoccupied by absence, but not in this simple present/absence dialectic, as you might think. For me as an architect, each concept, as well as each object, has all that it is not inscribed within it as traces. I am preoccupied with absence, not voids or glass, because architecture, unlike language, is dominated by presence, by the real existence of the signified. Architecture requires one to detach the signified not only from its signifier but also its condition as presence (2007, 3).

Similarly, when we consider dance in its physical manifestation as well as in cyberspace, it is signified by its presence at times and absence at other times. The physical body with its interiority (like in architecture) is considered to be an “element,” and as such it “must be detached not only from its signifier but also from its condition of the present” (3). Very importantly, it underscores a condition that precedes the notion of autonomy, allowing the cyber-human and the physical human to be freed, and thus able to fully engage in the act of playing/performing. Meaning, only when one is free it suggest for present, therefore free to engage in play (the creative process).

Following the completion and studies of our site (the shopping mall), we found that in addition to its obvious purpose and function, it concealed an unwritten narrative and short stories that were well worthy of further and deeper investigation. Additionally, we were naturally drawn to the idea of it being a concept, for its physical location and the importance to its users: the community.

4.5 Architecture and Choreography

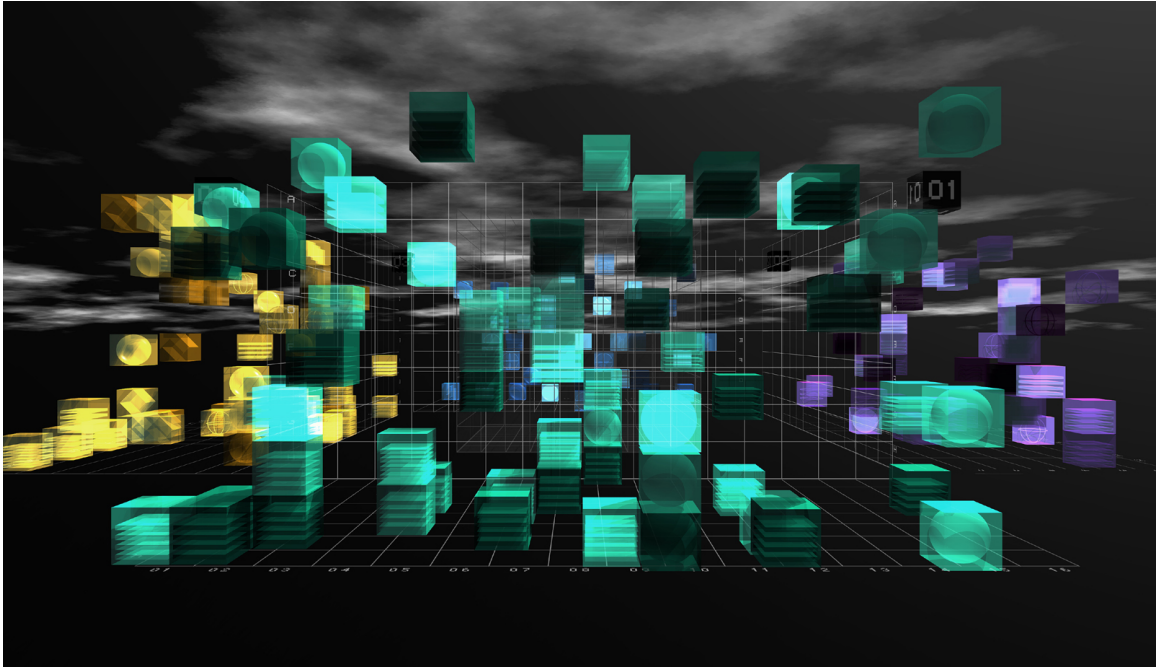


Figure 21: (*IntelligentCITY 2005*) (*IntelligentCITY 2005*) One of two cyber architectural studies exploring a dynamic understanding of the element of space completed in the collaborative planning process for this and related works. This tool was useful for me in the planning of the user's (the community's) navigation of the performance space. Image courtesy of Elif Ayiter.

“We know that the choreographic process is dependent on inner sensing, imaginative response, and aesthetic shaping of the inner experience” (1982, xi).

*Alma M. Hawkins*²⁵

In the advanced development phase/stage of this work – past the flash of insight – I sought to fuse architectural discourse with live performance strategies in order to offer an intense experience of the character and life of a site-specific public building – in this case, a shopping mall. This strategy was designed to be experienced within the context of what is, to most users, an architecturally familiar environment that we/they have yet to fully explore, but will do so as the work unfolds. My choreographic exploration in this architectural structure flutters around multiple subversive, technologically mediated systems and wireless, wearable, surveillance video cameras. My goal was to utilize and integrate these digital technologies/devices into the choreographic/movement and design process in an environment occupied daily by hundreds of people. We collaboratively

²⁵ Dr. Alma Hawkins is a pioneering modern dance educator who founded the Dance Department at the University of California at Los Angeles.

investigated all aspects of design and performance in this given space with particular emphasis placed on issues of real and perceived concepts and boundaries. Lastly, we perceived our performance site to be well defined and continuous, and determined that we could work within its multidimensional units and layers whereby works created for it would inevitably be integrated within its coherent structure.

Our plan included the creation of physical and virtual links between the various spaces of the site in order to create additional and alternative pathways for the users as they moved from one desired location to another. The aim was to engage the audience, pique their curiosity and imaginatively add a sense of coherence to their spatial trajectories that may not have previously existed. Our preferred methodology was specifically designed to allow for a tactile, emotional experience containing strong realistic and virtual connotations based on physical bodily sensations and the content of the images.

As studies of the proposed structure of the building/architecture were conducted, we were also investigating the possible ways for which the virtual technologies could enrich and support the work. We were looking at the differences between a virtual environment – which we were in the process of creating – and the physical environment of *IntelligentCITY*. Our process necessitated a blurred distinction between these two intersecting complex worlds in real time while conducting the ‘performance.’ We were also welcoming the possible existence of metaphors that were reliant on the users noticing that the site had never been seen like this before – and/or that they have never looked at it in this way. Hopefully, if the work did what we intended it to do, the users were inspired to tell their own stories and engage in a playful, creative endeavor so that the work became part of the building’s life, inclusive of all of its invisible encrypted memories.

It is widely accepted that for a dance-related artwork to qualify as choreography, evidence is needed that the work includes/engages movement material which has been organized according to time, space and energy parameters. However, for a site-specific work, traditional choreographic structures must be altered according to the site’s architectural attributes and its stated and practical functions. Additionally, the same parameters apply when the role of technological intervention is equally important as the chosen site and the movement material that accompanies the work. It is significant that the sense of place

where these three elements congregate and co-exist is within both physical and virtual human bodies.

This definition of dance as organized according to time, space and energy parameters should be considered with a clear awareness of the specific context, which gave birth to *IntelligentCITY*. The creative team and I worked under the assumption that there could be a wider conception of choreography, one in which both physical and virtual bodies are amongst a whole range of different elements and wherein time, space/cyberspace and energy parameters come together to provide structure for site-related artistic work. This perspective allows for a clearer understanding of current art practices, including site-related dance works in which interdisciplinary choreography/movement-based explorations and the use of new technologies have become an integral aspect of the creation process.

The state of site-related dance works has gradually changed as the perception of it – among critics and audiences alike – shifted to recognize it as an important form of artistic expression. In *Site Dance*, Melanie Kloetzel and Carolyn Pavlik write, “after 40-odd years of stumbling upon dancers lining the walls of a museum or taking over the staircase at the public library, we feel it is time to investigate the artists behind such exploits” (2009, xiii). The site-related artists and site-related dance in general have begun to gain the recognition and appreciation they deserve. The slow pace of this progression was a result of the gradual introduction of new ideas in dance making (and in art in general), which has become the norm in most cases.

When James Kolstoy, the editor of *Merce Cunningham: Edited and with Photographs and Introduction by James Klosty*, asked Cunningham if there was a difference in the work he was making today and how the audience sees it in comparison to 1970, he responded:

I think that lots of the things we do that were strange and new then are not now simply because things have happened in society, so that there are things now they can unconsciously accept which then they couldn't. There's such a splitting up of image today in most anything anybody sees that the idea of splitting images now is not so strange. The music is still a great disturbance to them, but not anywhere like it used to be. Sometimes they don't even bring up the dance being separate from the music. The question comes up less and less, I'm not even sure they think of it as separate (1987, 7).

The body of great works inclusive of new forward-looking methodologies and ideas has freed dance makers to pursue innovative new structures and combinations of dance supported by electronic sound-based compositions, new technologies and dance in site-specific structures/locations.

In the wake of these developments, we were positioned to address several issues related to the overall process. We investigated how far the definition of choreography could be exploited or manipulated beyond recognition, inclusive of pedestrian movement material, running, posturing, tumbling and more. We determined that it could be exploited as far as we felt was necessary, given that the users were provided with a stimulating and playful experience. In other words, the visitor's willingness to play became the driving factor by which the movement ideas were generated/invented.

The primary concern was not to burden the users with terminology or factors that will cause them to withdraw or lose interest as players. Ultimately, the choreographic/pedestrian movement material was comprised of simple, fun, gestural, everyday, humanlike movement that they could easily identify and enthusiastically accept. More complex sets of movement were later considered, as long as we conceived that the user would never lose the understanding of his/her major role, which was that of the instigator and the system activator. Addressing choreography in a traditional way was not necessary, and we did not wish to burden the visitor by what we perceived as choreography. The exploitation of the notion of choreography and its meaning was also important when we considered that the work could be re-sited as a work in an another alternative space, an art gallery, or a more traditional theatrical space. In this way, the work was never considered exclusively as a site-specific work, which left multiple options open to us. The question at this point is how far can a choreographer stretch traditional boundaries so that the work can still be understood or recognized as performative or as play? Is it even necessary to be understood in any particular way? Categorization is proven in this case to be problematic – and thus, unnecessary – on many levels.

This begets the question, what is the new role of performance in this case? The innovation is that performance includes the technology. Every aspect of the technological interactive systems and the humans/cyber-humans involved are in performance mode from the

moment the first user enters the space. The user enters, the electronic system is triggered by the users' actions or reactions, content is delivered, a coherent set of images appears and surround sound is filling the space – *the show is on*. The flexibility to move across the whole spectrum of possibilities between literal and metaphorical understandings of the elements and all its many layers of complexities is essentially what makes such work possible and conceivable. Moreover, the use of interdisciplinary and collaborative methodologies becomes the crucial element that drives this new development.

The transdisciplinary practice adopted in this project focuses on how the multiplicity of ideas provided by the collaborative team members and the combined technologies could be deployed as a united, powerful system that fully supports this site work. In order to achieve this aim, we considered additional techniques employed by other art forms and disciplines, such as in the visual arts, design and architecture. These practices provided useful new language (i.e. vocabularies) and concepts that helped us expand the artistic process by adding to our existing available compositional methods. However, we achieved this without radically altering its initial definition as the use of time, space and dynamics in order to generate movement material. It is absolutely crucial that this exploratory process refrained from bringing duplicates of existing patterns from other practices into choreography. Concepts and terms operating in other practices should instead be used to rework conceptual frameworks around the choreographic process, and in this way, instigate new methodologies for the creation of the images, the systems, and the movement materials.

As this work gained its conceptual framework, we were able to conduct multiple small trials at alternative venues, hopefully leading to the full realization of our original intentions; in each small trial it was realized anew, looking more and more as if it was emerging directly from the specific site. While working toward the realization of the project preparatory period, multiple group lectures and individual presentations at international conferences and other venues around the world were delivered by our creative team. The unique aspects of site-specific work coupled and supported by technological mediation piqued our curiosity, interest and anticipation.

4.6 The Site Artist and the Visitor/User as Co-Creators

People use everyday architectural structures and environments for various agreed upon purposes – small shops for browsing, streets for walking, riding and driving, and train stations for waiting. They move, speak and perform various actions in order to fulfil their needs. The nature and limitations of these environments and the character of their architecture define the ways in which these activities take place. The ways in which people perceive the relevance of these environments to their everyday lives is affected primarily by their preferences. Over time, they inevitably develop a physical as well as emotional relationship with these environments, personal stories are born and memories are superimposed, attached, fused, inserted, adapted and negotiated with the various structures materials, physical parameters and other qualities of these architectures. History becomes important – both the history of the buildings’ lives and the personal histories of the users – as well as the relationship between the two. It is significant that the users of these various sites and locations provide the inspiration and character by which these sites and their existence are justified.

In *Site Dance*, Melanie Kloetzel and Carolyn Pavlik write the following:

In an era of globalization, local places get lost in the shuffle. Homogenization surrounds us; we can frequent Wal-Mart in every town across the nation, and our identical TV screens may seem more like home than our kitchens. Yet while many of us get lost in the latest virtual reality game from New York to Hong Kong or the next indistinguishable chain store or venture into our neighbourhood, the site artist zeros in on local idiosyncrasies. This is because local places are the touchstones, muse, and medium for site artists (2009, 2).

Site artists examine and research local spaces in order to locate their unique attributes and character that are potentially ripe for exploitation in the pursuit of a new work. They follow the users to learn and adapt to the established paths that will inevitably be manipulated in the performance; “[t]hey may conduct extensive research into the historical manifestation of the site; they may interview the current residents about their relationships to the place. Then, after all these efforts and meditations, they create artwork that is relevant to that place and that community” (Kloetzel and Pavlik 2009, 2). Through the work of site choreographers, we learn how to better appreciate and engage with our spaces. As the day-to-day users, we are often called upon to share our own present and past experiences with a

specific site; these insights are then used to inform the choreographic process. The daily users provide a heightened sense of awareness of their surroundings.

The users and visitors of the site and their roles as the content/systems activators of it were approached in the spirit of play. According to Lyn Anne Blom and L. Tarin Chaplin in *The Intimate Act of Choreography*, “play implies choices and the lack of constraints, yet there is seriousness to it” (1982, xx). A successful operation – specifically in improvisational and Contact Improvisation structures – normally uses the term “play” as a means to generate and unleash the creative mind and juices. Close examination led us to determine that “play” is enjoyed for its own sake, without the necessity to produce; later you may cull. When we encourage you to “play with it” we mean to “create with it” with an eye toward, but without obligation for, an end product” (1982, xx).

As for the visitors and the users, it is very well established that many people are endowed with movement and creative ideas that are often expressed, but in most cases, never realized. One of the reasons why this potential hidden talent is not formally presented is because of the inherent insecurity and the lack of the knowledge which yields realization. However, as a creative team, we always considered this potential as a source of creativity that we would tap into and unleash for the pursuit and in service of this work.

We did not intend to teach the visitors or site users how a choreographic work is generated or any sophisticated movement. Rather, we conducted research related about the various pathways which were heavily utilized by the users and methodically observed their behavioral patterns while using the space. By studying and documenting this important information, we identified the dead or inactive spots of the site’s spatial arrangement. Our central questions included: How are they navigating within this space? Where do they go? Which pathways do they trace? Which routes do they choose to follow? How fast do people move? What kind of atmosphere does the space generate? How does this affect the energy levels from the point of view of the users? Where do they look?

We used this as a method of activating and animating unused and/or misused areas.

We then carefully collected this information and turned it into bits and pieces of organized and independent movement phrases. The purpose was to utilize these phrases to awaken

and activate the interactive systems as the users were roaming the site. This allowed chance operation and for the creative content to surface and be generated by and for the users.

The viewers and users could circulate freely and physically experience the impact of various types of desired movement inclusive of their own human bodies, the movement of surround sound and multiple images distributed all around them. No one element existed in the newly charged environment independently from the others, but rather – like in a symphony – was part of a hybrid of all instruments, gathered into a whole where not just skill but intuition and meaning were present.

CHAPTER 5: *Twining Project*



Figure 22: (*Twining Project* 2006; footage in Appendix 4) Cyber-textiles and a cyber-human dancer twisting together, interlacing and interweaving during performance.

This chapter explores the works *Twining Project* and *CyberPRINT* as explorations of advancements in textiles woven with technology, ranging from earlier rigid and bulky items to the more recent flexible skin/second skin pieces. These technologies have had an important impact on our understanding of the human body, just as the use of cyber-textiles challenge the perceived limitations of how it can move. As these fabrics become more sensitive, delicate and flexible, the technology becomes one with the physical body and becomes invisible (or, at least, the separation between the body and the fabric is greatly reduced). “Twining” is an important metaphor for both the creation of the fabrics used in these works and the interlacing of multiple disciplines, influences, collaborators and the interdependence of the performers, technology and audience during performances. All of these are common threads in my work, along with a reliance on pedestrian movement and

improvisation as a means for generating movement vocabulary and maximizing freedom and liveness while fostering dynamic, embodied interplay.

5.1 Introduction

Twining Project was a set of collaborative small projects and works that evolved and pursued periodically over a seven-year period (2005-present) between Professor Yacov Sharir (from the University of Texas at Austin) and Professor Barbara Layne (from Concordia University in Montreal). This set of works were primarily structured and designed to fit the format of improvisational, performative sessions alongside more experimental forms of narrative dance and storytelling.

This multidimensional, ongoing project continually sought to explore the unique relationships between programmable, electronically invigorated textiles, textual information displays, materiality (as it relates to distinct concepts in communicating operational commands) and embodiment. We looked at how they could be exploited both in a physical and in a virtual space that is specifically designed and wired to function as a smart, intelligent, alternative – or, in a more traditional space. During this process we experimented with electronic textiles that were woven together as well as manufactured, cutting edge dance movement materials. We placed emphasis on the commonality between the two (for example, the electronically invigorated textiles were woven with movement dance phrases) as opposed to what potentially could expose their differences. The *Twining Project* process – “twining” meaning twisting together, interlacing, or interweaving – is the primary motivating and stimulating mechanism and concept that fed and drove this creative research. It directly affected the text, content and meaning production of all the movement material that we have generated throughout this set of works. Depending on location, purpose and need, three generations of wearable garments/computers were created, completed and used in a performative set-up; as such, they served various types of performances, research and lecture presentations and art installations.

As the primary wearer and user of these various garments throughout the trial period and the multiple performances that followed, I have found that the sensorial, tactile and visceral experience played an important role in the most unexpected and sensual ways. The garment felt and operated as if it had become my own second skin, totally subsumed into my personal and most immediate space. As a wearable garment/computer, it possesses an intelligent and independent operational command system of interactional constancy when used for the purpose of communicating messages. Most notably, it is a device into which myself, as the performer, the user, or an audience member can always enter/change text and operational instructions while in and around the performance space. Close examination supported our initial ideas about our ability to generate a vocabulary of direct desired input (into the system) and expressions of creative intentions (human gestures) that can be recognized so that an improvised or choreographed set of movement can be generated, muscle memorized, repeated and manipulated as often as needed. These combined elements relate the experiential state of each motion to corresponding system actions. It can be argued that the results are an expression set, instead of a command set, through which the interactor communicates – rather than controls – the system. Following several trials and live performances, we found that the system became an integral part and extension of the body from which the wearer was able to send and receive a variety of actions and content-related messages while freely operating and engaged in the act of performance.

For this work (and most of my works), a distinct, recognizable new set of movement material and corresponding surround scores were developed with digital animation of cyber-humans, video information/images and several iterations of cyber-cloth/textiles. During the trial period, all of these elements served as the source material and the energy that fueled all activities leading toward the realization of several dance events in the form and tradition of Contact Improvisation sessions.

We have found that each event, in addition to being performative, could also serve as an opportunity to further analyze the results of wearing a new and augmented garment; we then questioned how it corresponded and adjusted to new ways of moving. In other words, the physical contact between performers (while wearing a new, untested garment) required considerable and careful interaction in order to avoid interfering with the real time flow of

commands and other communication messages. We investigated the use of various types of invigorated, colorful cyber-textiles in order to experience how they felt on the body while operating over an extended period of time (with the variables of battery life, sensory devices, temperature and durability, etc.). We specifically sought to explore the tactile experience, flexibility, mutability and the comfort and ease with which we could move while testing a new and augmented garment.

The communication content was most often composed of narrative: sequences related to storyboarding, performance thematic content and meaning, projections and the flow of additional related technical information. We carefully analyzed and documented how these combined elements related to each other, but most specifically how they responded and co-existed in total harmony with real-time transmission of processed data, how we created meaning and how performers were receiving information and instructions during our improvisational events and performances.

Methodologies employed included real time interactive composed structures of sound-based material with extended textual, touch-sensitive mechanisms/images in open and ever-unfolding ways. The physical human body, several generations of cyber-human bodies, cyber-textiles and corresponding physical textiles converged into one synchronized unit, and as such it had several opportunities to be manipulated and put to task. Additionally, we tested several generations of various interactive systems represented in the form of wearable electronic garments on which text was written (displayed via LEDs which scrolled the words) generated randomly by computers as well as non-linear text inputted by performance attendees. Lastly, we deployed a physical human recombinant gestural system borrowed from my previous work *Body Automatic*.

The character and life of a forever-changing text/narrative generated from direct input to the garment is unique and stimulating, and it served as the primary source for attending to high level improvisational scores allowing multiple opportunities for engagement during rehearsals and performances that are conceived and activated in real time. In *The Moment of Movement*, improvisers, choreographers, Lynne Anne Blom and L. Tarin Chaplin write about the nature of improvisation (improv):

Little has been written about improv in part because it is so elusive. Not only is it ephemeral, but at best an improv is a constantly changing phenomenon. Trying to pinpoint in words exactly what dance improv is seems at times to betray the medium itself, for language is linear and improv is not. What is very real and understandable in movement does not necessarily have an equivalent in words (1988, ix).

The improvisational methodologies and the nature of this form of dance (being a constantly changing mode) is always “fresh,” new and unpredictable – and so, is very suitable to the kind of work we were pursuing. It has been most effective because it included innovation of new movement material through play, consequently allowing us to tap into our senses and intuitiveness in order to reach the most positive outcome (i.e. making it work). The last sentence of this quote – “[w]hat is very real and understandable in movement does not necessarily have an equivalent in words” – also points to the inherent difficulty of this dissertation project.

The fundamental aspects of what makes improvisational structures and scores so suitable to technological intervention, is inherent in the notion that all the systems output involved in a live arts event are operating in real time and in the moment. Whether we consider the sound, the images, the physical and virtual performers and/or the multiple types of visual images, they all feed on and from each other. Blom and Chaplin describe it this way: “The Moment of Movement provides basic information about how and why dance improvisation works” (1988, ix).

The physical performers/dancers were assigned to simultaneously explore the psychology and state of mind of their own performative character in direct relation to how smart textiles (the wearable garments) behaved (moved), how it felt while placed on the body, how it was heard and how fluently and lightly it was attending to physical, directional changes. It could be described as a dialogue with the animate (the cyber-human), and we considered it as improvisation. While in performance, we were thinking of it as knitting, twisting, weaving and revealing of particular qualities of the sensory sensitive garment – which, together with its wearer (the physical performer), are the characters (the fused cloth/flesh) that attend to the computational/data values generated and transmitted to the corresponding system.



Figure 23: (*Twining Project* 2006; footage in Appendix 4) A cyber-human performer in dialogue with a computer generated cyber-cloth, interchangeably affecting each other during performance.

5.2 Technological and Historical Context

In Smart Fibres, Fabrics and Clothing, researchers and editors Sungmee Park and Sundaresan Jay Arman assert:

The field of textiles has been instrumental in bringing about one of the most significant technological advancements known to human beings, i.e. the birth of the computer, which spawned the information/knowledge revolution being witnessed today. It is only appropriate that this field take the next evolutionary step toward integrating textiles and computing, by designing and producing intelligent textiles that can adapt and respond to the wearer's need and the environment (2001, 226).

The newness of interacting with sophisticated, adaptive and responsive textiles is embedded within its uncontrolled fast growth – and consequently experimental – nature, which for us meant high levels of functionality, breathability and lightweightness. As we were exploring the possible outcome of one generation of textiles that could function as our primary interface, new lighter, durable, easier to wear and more sophisticated textiles were emerging. According to Sungmee Park and Sundaresan Jay Arman, the newer textiles “can also be designed to accommodate the constraints imposed by the ambient environment in

which the user interact, i.e. different climates” (2001, 227). For us (as live performers), it opened new means and ways to primarily manipulate our immediate physical movement modalities as well as the ambience, the mood and the atmosphere related to our performative spaces.

My collaborator Professor Barbara Layne has conducted material research in the Textiles Lab of *Hexagram*, the Institute for Research and Creation in Media Arts and Technology at Concordia University in Montreal, Canada, for the last ten years. In Layne’s laboratory, textiles are constructed by integrating Light Emitting Diodes (LEDs) and electronic circuitry into the structure of hand woven fabrics. The array of LEDs present changing patterns and scrolling texts, much like an electronic message board. This programmable surface was made interactive by embedding several sensory sensitive devices while wireless communication systems (such as Bluetooth technology) allowed for mobility and facilitated remote interaction. The particularly unique feature of these fabrics is the technique which was invented specifically to include all technological components to be embedded into the fabric while it is woven on the loom, meaning that the technological components become an integral and organic part of the structure. The warp and the weft of weaving produces a natural set of x-y coordinates that function similar to a substrate for circuitry. Flexible wires can easily be woven alongside traditional fibers in a technique known as supplementary warp and weft, but if the wires and components were removed, the fabric would lack a strong, stable structure and inevitably would fall apart. Careful attention has been given to the craft of weaving and electronics that provides not only a strong circuit but also an aesthetically pleasing visual appearance. Each work required several hundred hours in the hand weaving process and the result was a garment that appeared to have evolved from traditions in hand weaving, jewelry making and electronic engineering. The key to maintaining robust circuits is the development of a wire wrapping technique that allows for both flexibility and strength, which is clearly the most difficult challenge in this approach.

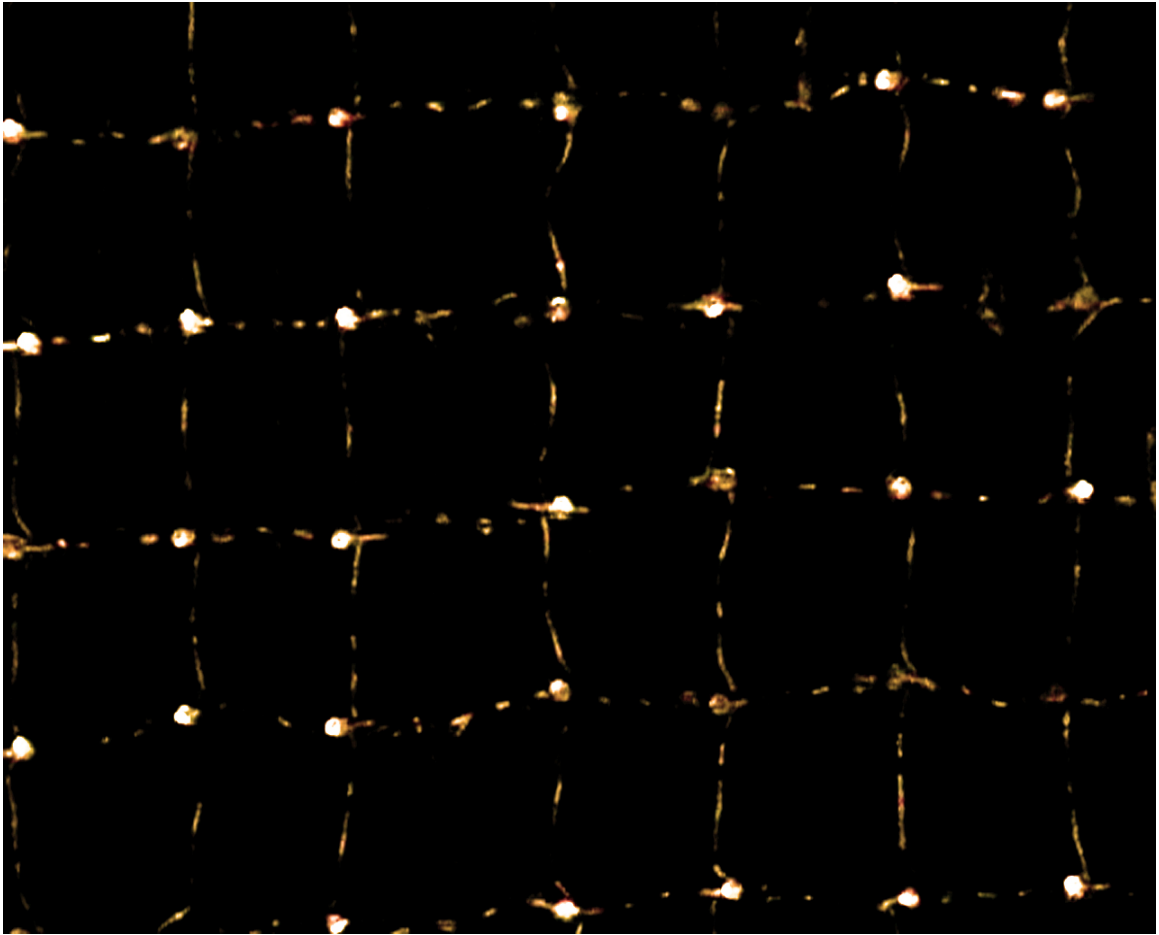


Figure 24: (*Twining Project* 2005; footage in Appendix 4) Barbara Layne, collaborator for the *Twining Project*, constructed textiles in her laboratory (like the one pictured above) by integrating Light Emitting Diodes (LEDs) and electronic circuitry into the structure of hand woven fabrics. Image courtesy of Barbara Lane.

Cloth, various types of fabrics and textiles are the most intimate items that we interact with in our daily lives. This research (related the textiles) builds on the ability of technologically treated fabrics to carry text messages, operational instructions during performance and meaningful communication related to various real time artistic and human experiences. In this work, the woven fabrics/textiles take form as a wearable computer/garment that is technologically charged, fully interactive, light and easy to wear. Throughout this project period, several generations of wearable garments were constructed and served as the primary interactive system in the pursuit of art works that were presented in art galleries, theatrical spaces and in support of site-specific or site-inspired works. During our trial and earlier works, we employed an experimental garment in which scrolling patterns included designs found in traditional weave structures.

The first of this series, *La Grand Pandora* (2004), was inspired by a practice of the Parisian fashion design industry of the 17th century. Since at that time there were no magazines to publish the latest fashions, wax dolls in different styles and of different heights were sent to the Provinces. These dolls were named Little Pandora (La Petite) and Big Pandora (La Grand Pandora). The *Twining Project* garment was a direct descendant of these traditionally woven structures.

In the early production of the LED garments, Barbara and her collaborators had to invent a way to productively embed LEDs into the garment. All programming of texts and patterns were pursued by utilizing the software “Basic Language.” Each LED was entered individually by typing its corresponding zeros and ones. For this version of the first *Twining* garment in 2005 (the descendant of *La Grand Pandora*), the LED array has become larger and new technological advancements have been developed including the development of new software that facilitates keyboarding input for the purpose of communicating text messages from considerable distance. A hardware connector links the computer directly with the “Basic Stamp” microcontroller without removing it from the garment. The next phase of innovation was the wireless transmissions that provide communications from a distance (2007- 2008). This opened up additional opportunities such as interactivity and video processing options for onstage performances and art installations. Input is sent either from another performer, from a controller off-stage, or from additional hardware components that have been developed to receive text messaging through added personal devices that were controlled by audience members.

An experiment with remote interaction and communication has already been incorporated into two of the garments – wearable computers – that were specifically conceived for art installations and ultimately, for the *Twining Project*. A Bluetooth device designed to be subsumed in the garment has been deployed both for communication with the tunic and the wearable computer from a distance of up to 50 feet. The messages have been transmitted following a simple on/off command that was also capable of regulating the display of imagery in the LEDs of the various garments. The Bluetooth device could be carried by the garment wearer or by another person, in which case the fabric becomes “excited” as the two

individuals come close to each other – meaning that electronic noise is emitted due to the overload of information being transmitted through the system.

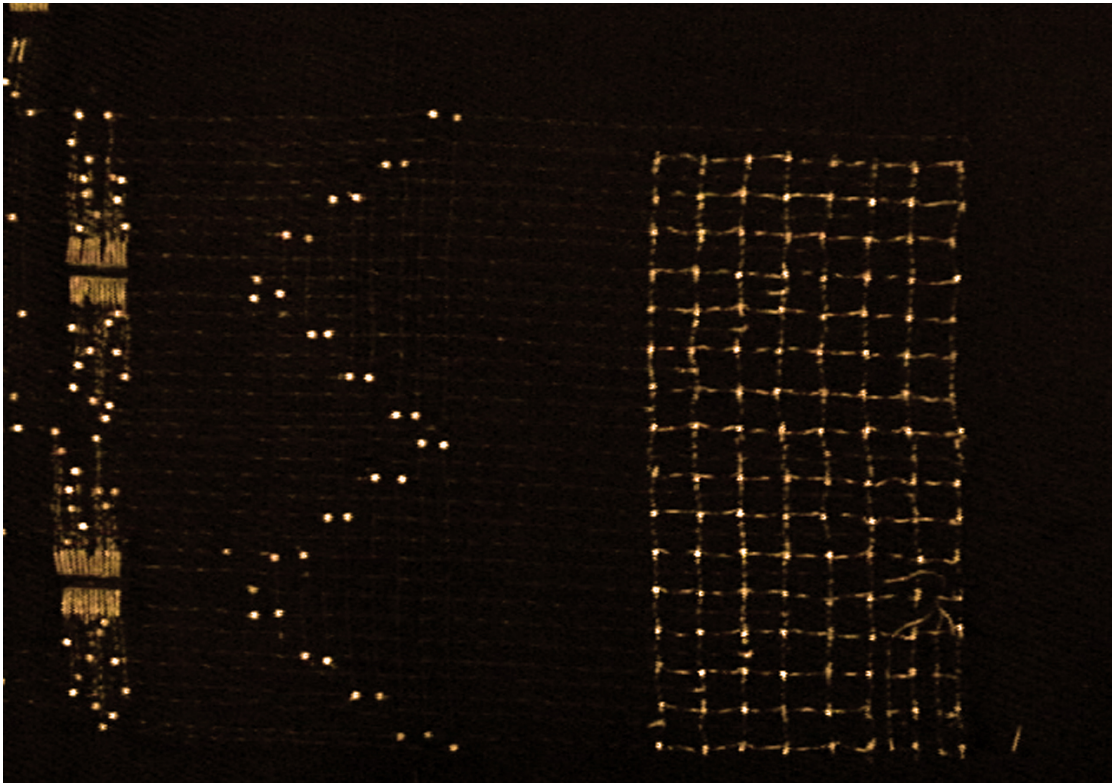


Figure 25: (*Twining Project* 2005; footage in Appendix 4) Barbara Layne’s fabric made for the *Twining Project*. The LED array became larger and new technological advancements developed including the creation of new software permitting keyboard input. Image courtesy of Barbara Lane.

In the fabric for *Wall Hanging* (designed for Barbara’s teams first museum installation), an additional device in the form of a sonic sensor has been woven into the circuit. This device is capable of detecting human presence in the art installation environment and responds by displaying different messages in the LED array, depending on the location of the viewer or user. The “content” inputted into this fabric varied greatly depending on the specificity of each situation in which it was displayed or for any other related relevant messages.

One of the first exhibitions conducted at the HUB (National Centre for Craft and Design-Gallery) in Lincolnshire, England (2005) included a series of texts and patterns deployed to depict the historical aspects of the art gallery. By embedding proximity sensors in *Wall Hanging*, a viewer/user moving within one meter from the artwork was capable of triggering text (in the form of a short story) about Sir Isaac Newton (born in Lincolnshire)

and his experiments with light and gravity. Within the two-meter range, a list of qualities related to seeds (rare, aromatic, floriferous, etc.) scrolled through and along the side of the fabric, referring to the building's former life as a seed warehouse. Additional references/messages about the specificity of the site were embedded in the textile's patterns and manifested when the participant moved further away from the cloth. Thus each user was presented with multiple individually preferred options based on their wishes and desires.

Depending on the textual and sensorial input, one of the unique aspects of this fully charged fabric was that it could easily be reprogrammed to reflect on the nature of the performative event and/or content related to various sites. Interestingly, as the garments were transported between one performance site to another, they were also capable of retaining some of the textual information in the form of accumulative encrypted memories that were inputted in the previous sites, similar to the way a traditional piece of cloth or textile can pick up the smells, stains, or tears relative to a particular place, situation and/or time.

The idea of an expansive and open-ended interchangeable text/content as well as the new technological innovations used in *The Tunic/Garment* and *Wall Hanging* were adopted in support of the *Twining Project's* wearable computer. Thus, they lead to the investigation of new approaches to interactive art, physical movement and performance. Questions arose as to how we could facilitate transporting uninterrupted clear communication messages, while they were placed and activated on a moving body.¹

5.3 The Work, Cyber Cloth and Textiles

Following the completion of the first generation garment, I sought to incorporate my ideas and concepts related to the work we were about to enact. Initially, it meant to raise questions about the narrative, content, meaning and the constructed worlds of storytelling supported by the production of text. Most importantly, my intention was to create a work that was coherent, clear and completely developed – one that could co-exist in synch with

¹ The technological information presented in this document was generated between Professor Barbara Layne, her collaborative team and myself.

the digital manifestation of cyber-textiles mixed with additional visual images in order to create an organic whole. The *Twining Project*, in its inception (embodying primarily an improvisational structure), employed a movement score/form and a kinetic expressivity which is closely and intimately inspired by calligraphy, shapes and gestures interweaved with new pedestrian dance movement material and narrative art. Although the choreographed and improvised scores that drove this work are somewhat unconventional such as American Sign Language, gestures, postures and pedestrian movement, the transformational quality of live movement supported by digital corresponding invigorated cyber-textiles and cyber-humans.

Performers in the *Twining Project* relied on the textual communications, and so, fully trusted the textual commands. A useful hypothesis is that the multiplicity of technological elements and corresponding textual images included in the pursuit of this work resulted in a complete trust of these textual images supported by clarity that is highly and intimately communicative. The presence of textual scores and narrative and contextual relevance lead us to recognize that the work possessed a strong culturally-based output, and thus was inevitably subject to categorization and definition. As a consequence, questions arose as to the works' intention in terms of its performative manifestation. How did dance dramaturgy, ideas, concepts, processes and meaning come together as an organic whole? Following a trial period and a close analysis, we deemed that these sets of questions combined and pointed out toward the widening spectrum of new and enriched levels of performance augmentation.

Our engagements with the very latest innovations and developments in wearable computing/devices have been greatly driven by first integrating the latest, more advanced sensors into the textile composites, and second by the ways we perceive, alter, infuse, manipulate and program these textiles. These sensors are ideal candidates to be embedded in textiles' structural composites for monitoring and to be inputted into the system more precisely. These newly sensorial charged textiles represent the next generation of fibers, fabrics and articles produced as a result of these new innovations. Consequently, an enormous wealth of opportunities has been realized, deployed, tested and is now imprinted in each generation of our wearable garments. Each addition leads toward the realization of augmented levels of proficiency and quality, providing us with the opportunity to develop

the dramaturgy, aesthetics, visuals and the techniques that contribute to the crafting of a more complex hybrid event.

Cyber-clothing and smart textiles played an increasingly important role in the construction of our wearable garments and the many ways they contributed to the interactive performance in general, but more specifically, we have found that their importance to the *Twining Project* lies within their direct link to our ability to embed and hand stitch sophisticated new technologies directly into the fabric. This allowed the production of text and ultimately, to our ability to freely move and interact with the multiplicity of moving data and additional elements that organically coexisted in the performance space.

Electronically charged, conductive, intelligent textiles woven with additional electronic sensory sensitive elements are often embedded within the fabric in order to enhance various prototypes of garments are challenging the ways we originally perceived and employed them in performance. They rely heavily on fiber strength that is also flexible and durable with specific mutable properties that allowed for easy transmission of messages and interaction with other bodies (performers). Some of this research and outcome impacted many aspects of our lives outside the realm of what we conceived as our own works, but more importantly, what we have considered as live arts. In *A Novel Intelligent Textile Technology Based on Silicon Flexible Skins*,” which contains research supported by the National Science Foundation (NSF), experts R. B. Katragadda and Y. Xu provide the following information on this issue:

‘Intelligent textiles,’ variously known as ‘smart fabrics,’ ‘electronic textiles,’ or ‘e-textiles,’ have attracted considerable attentions worldwide due to their potential to bring revolutionary impacts on human life. Despite many promising progresses in this exciting newly emerged research field, there still exist a number of important obstacles. One of the most challenging issues is the conflict between the flexibility of the textiles and the need to incorporate sensing and computation modules. To address this critical issue, an innovative intelligent textile technology is proposed. The central hypothesis is that practical intelligent textiles can be realized by integrating fabrics with flexible transducers/electronics that are made using a unique, ‘flexible-skin’ technology (qtd. in erich 2006).

Close examination lead us to suppose that the integration of smart fabrics coupled with flexible transducers/electronics and ultimately “flexible-skin” technology is what differentiates earlier generations of more robust, heavier and more difficult to manipulate

wearable computers from the newer versions of wearable garments that act and (when placed on the body) feel like a “second skin.” This greater flexibility drew attention to and focus on performance issues while allowing performers to freely move around and about the space.

Additionally, it can be argued that “flexible-skin” technologies (because of their lightness, softness and ease of wearing) can stimulate and unleash the physical human body to explore and experiment more efficient means of communication and understandings of the definition of space around the body, ultimately leading to such interactions that facilitate the performer acting as an agent for technological transformation. Thus smart, intelligent textiles are transcending their traditional intended functions – they can morph into one interconnected platform that links between transmitting messages to and from performers and performance attendees.

In *Textile Futures: Fashion, Design and Technology*, Author Bradley Quinn describes second skins:

The growing symbiosis between textiles and art is generating a new body consciousness. Just as textiles play a key role in molding the body’s shape into stylized second skin apparel or in crafting rigid garments that define space around the body, they also lead themselves to the creation of sculptural shapes that explore new representations of the human forms (2010, 153).

Because of their proven attributes – being light, smart, autonomous, responsive, flexible, mutable and easy to wear – they can be made to fit on any type of body in a physical or virtual event alike. Most importantly, cyber-textiles (because of their augmented technological innovation) have altered how we think about the ways the human body functions, operates and/or is moving and communicating while the garment is engaged in a full operational mode. As a result, it is responding in specific and distinct ways at times and randomly at other times, acting in perfect synch with all organized aspects of performance and the overall production elements.

We have found that these newly adapted advanced technologies allowed us to think about and employ the same rules, principles and improvisational structures to which we attend in the physical, traditional realm – in essence, facilitating direct communication and sensations between electronically charged cyber-textiles (i.e. those virtually created and

projected in the performance space) and the physical human body/partner. Most importantly, it has brought about a new understanding of the ways we experience embodiment and disembodiment. The ultimate sensation of wearing light, flexible, soft and smart textiles woven into the form of a garment versus the more robust, heavy and unbending wearables is extremely liberating and gratifying to the user/wearer and/or the operator.

In *Textile Futures*, Bradley Quinn offers the following:

Textiles are transcending their traditional functions, and *Textile Futures* centers around my conviction that they are morphing into uniquely tactile interfaces through which broader sensory stimulus can be perceived. Because fibers, fabrics and textile techniques are becoming seamlessly integrated with technology, textiles represent an interconnected collective that links many disciplines (2010, 5).

The introduction of tactile (touch sensitive) surfaces and technologies have increasingly dominated and dramatically transformed the ways we have conducted more recent performances. They have inspired radical new visions related to how we perceive our future works.

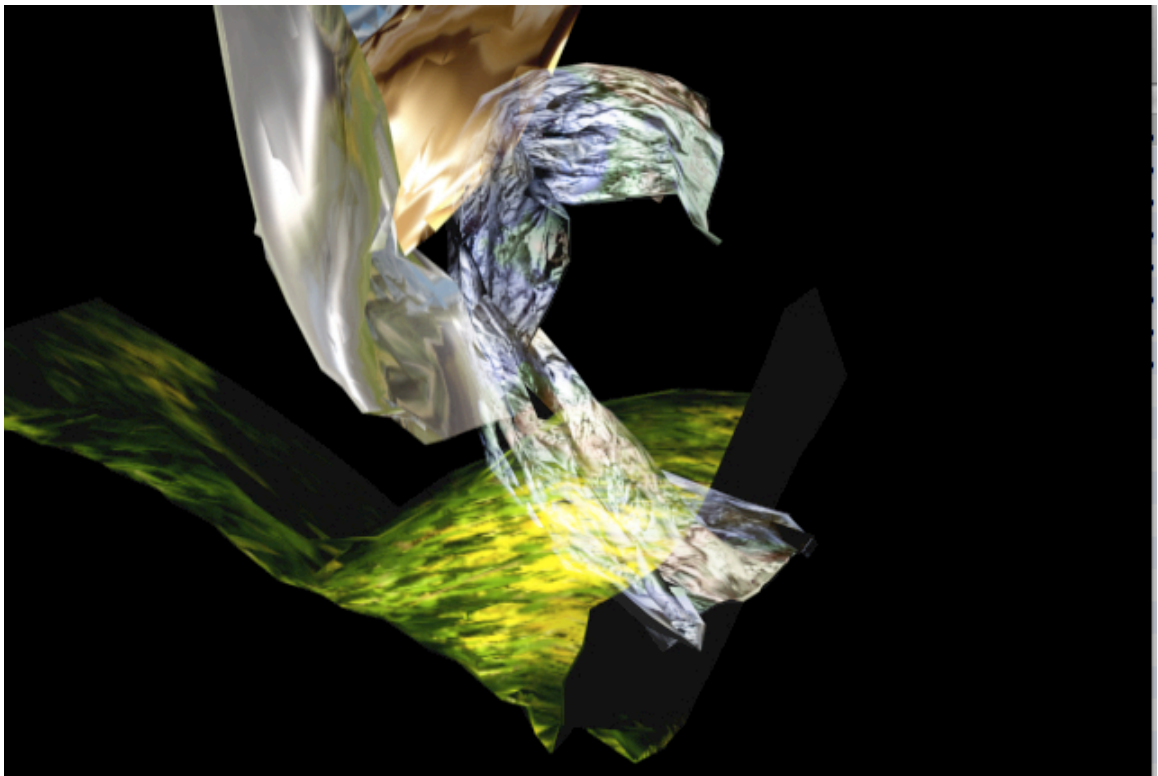


Figure 26: (*Twining Project* 2006; footage in Appendix 4) Animated colorful cyber-textiles capable of behaving like physical silk and silk-like fabrics.

For the *Twining Project* performance event, several generations of colorful computer animated cyber-textiles were created which looked, felt and acted (unexpectedly) like physical silk and silk-like fabrics. They were projected onto a transparent scrim located in the performance space, and were mixed with physical textiles (as demonstrated in figure 5.6, an image from a live performance). As the performer, I was wearing the garment that was fully charged with additional sensorial devices, and real/physical electronically charged textiles. By way of my moving, I was able to manage the interweaving and interlacing of all these elements. Thus, I was able to facilitate easy communication and data/image processing transported between the performer (myself), performers (cyber and physical) and performance attendees. Additional attributes included various aesthetic design elements, computer generated related visual images and interchangeable textual content. The subtlety of the physical human performer gestures were informed and recorded into the sensory sensitive system that was subsumed within, on and around my body.

I have found that due to my ability to detect changes communicated directly into the surface of my garment (my “second skin”), I was able to respond to each muscular or motional flexion and release, each tilt of the body, each rotational gesture of the hand, affecting both the movement and all visual outcome. Utterly experiencing how textiles represent an interconnected collective that links multiple disciplines, I have functioned as the performer, the system and the compositional instrument.



Figure 27: (*Twining Project* 2006; footage in Appendix 4) Animations of cyber-textiles were projected onto a scrim in front of Sharir. He interacted with these cyber-textiles alongside real, physical textiles of various textures, weaving the virtual and real elements together during live performance and eroding the boundaries between the two.

5.4 The Garment Text and Content

Working as a team (mostly from afar), we sought to conceive and construct a technologically advanced wearable communication system. We had to agree upon which methodologies to employ that would facilitate and account for the construction of the most effective moving device (while placed on a dancing body) that was capable of clearly communicating various types of relevant information, deliver instructional activities and

provide two means of input (from performance attendees and/or from the user activator of the system) to performers. At first, it all seemed uncertain and a bit overwhelming due to what we perceived as insurmountable and complicated issues. The idea that a garment made of natural or artificial, impermanent and weak fabrics (that are no more than a network of threads) could withstand the integration of high-end technologies was initially far from our ability to comprehend.

When we were presented with the first, more robust and ready to be deployed garment, it appeared to be sleeker in appearance, lighter, flexible and extremely resilient in the way it responded to the various technologies that were skillfully imbedded into the fiber structure by my collaborator Professor Barbara Layne and her team. Following a close examination of the various components and the newly made options that were made available to us we have learned that “twenty-first century fibers are strong enough to create rigid, architectural components yet still soft enough to cradle a baby’s skin” (Quinn 2010, 7).

On a theoretical and conceptual level we have reached a consensus favoring a moving wearable interactive system and a corresponding system placed in a strategic location in the theatrical space (or a “mother ship,” often in the control booth). This system was (manually and algorithmically) generating linear and randomly selected text messages that served as the primary source of information and the flow of commands inputted into the system in real time. As such, it drew our attention to the idea that the addition of such technologies constituted a possible widening spectrum of what we have previously perceived as performance and a real time synthesis of the combined elements that constitute live performance. The ideas generated for the construction of this set of works have inevitably shifted our focus to the two most important issues: the nature of command messages and the subject of the work.

Although my work is situated in the “genre” of abstract art – whereby modern dance and dance improvisation are somewhat removed from their original philosophical, thematic and theatricality – dance cannot be considered abstract art when human beings physically interact in a performative situation. We created our narrative from pure movement quality and the emotional state and visceral output from the interaction between the physical and virtual dancers. Since our dancing preferences have moved us (most often) nearer to the

point of being considered as abstract by way of execution, we have (as a collaborative team) become more interested in the combined high level of energy generated from formalistic structures, shapes, colors, moods, atmosphere and the emotions they elicit when they come together (or interact).

Command messages included simple calls for actions such as random actions: running while shaping inwardly, aesthetic movement patterns, precise complex upper body articulations, sitting, listening, and responding to what is transpiring around you, walking while identifying movement patterns that evoke or provoke responses. We also engaged in more complex messages and articulations that made the performer employ and occupy the performance space with large, full, and energized movement phrases.

For each of my technologically charged works, new narrative techniques were conceived, team discussions related to the basic concepts of each specific work were conducted, and they have greatly increased awareness “more rapidly by going right to the heart of the matter and address[ing] cognitive issues that may unconsciously be preventing or limiting certain actualizations” (Blom and Chaplin 1988, x). However, we can only identify and speak intelligently about the work structurally and its thematic makeup shortly following its completion. Only then we were able to step out and away, look at it from afar (in terms of distance and time) and draw our attention to the particular modes of structure, composition and a real time combination of multiple tasks, as we most often would by listening and analyzing an electronic music structure or an interactive visual art installation.

Changing patterns and text messages typed into the garment from afar were specifically designed to improvisationally create transitional spaces in which hybrids of physical and computer manufactured agent/performer are formed. Programmable garment display has been used to portray newly inputted instructions for both improvised and direct communication of movement patterns, visual content and narrative. During this ongoing process of changing patterns and messages, we have adapted the notion that “[i]mprovisation in movement is analogous to free association in thought, which is the most spontaneous, primitive, natural and creative process. The kinesthetic self is free to partner the imagination impulsively, without preparation or preoccupation” (Blom and Chaplin 1988, x). Additionally, it can be argued that the liberating aspects of formal, abstract and

improvisational dance lie in its inherent structures, which is to say that movement inventiveness, which taps into our senses and spontaneity, is at the core of our creative output.

As the textile is invigorated into a working surface that holds information, it allows for continuous change. A multiplicity of different types of written text can be accessed through this new way of hyper-narrative generated in real time. We have found that it could best serve as a form for articulating our combined messages, meaning and improvised communication messages, and that it is capable of addressing a wide range of performance and socially-based content that can be mobilized and distributed among event attendees and/or performers alike. Our hypothesis was that other forms of communication such as voice, interpersonal modes and instincts would not be as effective and immediate as typing text messages from a distance into the performers garment as a means of generating real time performance scores. These messages were captured by a video camera and projected onto a large screen, where the information was easily accessed. Although the thematic aspects of this work were seemingly unaffected by rapid growth and technological developments, the performances planned for the *Twining Project* reflected how real time input textual information captured from a strategic location inside the theatrical space addressed contemporary urban life and resonated with the frenetic and chaotic rhythms of our times.

Through physical output of imagery and improvised movement sequences, additional images and messages were generated which aided “interpreting the continuous flow of the internal and external signals and determining the appropriate form of action” (Blom and Chaplin 1988, 3). They, in return, were projected back into my performance space, positively affecting the newly conceived input of instructions that were communicated in the form of textual information; it immediately affected the outcome, the production of content and the overall performance experience. These projected images morphed in and out of the space, temporarily inhabiting the performance area as well as the garment of both the physical and the virtual performer.

Close examination lead us to suppose that choreographed movement, gestures and an overall command of my performance were exclusively (/first) dictated by textual

information, which was continually inputted into the garment. This was an entirely new performance methodology for my work. Consequently, I proceeded to respond by inventing (in real time) movement material that directly related to the content and information derived from this newly inputted text.

In various iterations of this multidimensional work, we were provided with multiple opportunities to witness the positive impact created by the continuous integration of more sophisticated textiles and computing. The use of these technologies, particularly the production of real time data/text processing, has allowed for our dance and live arts performances to remain a thriving expression that has evoked new issues for discussions, analysis and organization. Each generation of wearable garments, continuous technological innovations and overall experience gained over time has counted for augmented levels of artistic output and ultimately toward the reach of our main objective: to allow the technology to disappear all together, meaning to make it less intrusive and as close to invisible as possible.

The mechanisms and procedures developed for making the technology disappear altogether are not always desired elements. In most of our previous works, my collaborators and I have found that the visibility and the crudeness of the technological elements presented a new (and most welcomed) subversive aesthetics, which we fully embraced. In most cases, it evoked a new interest from audience attendees about their ability to identify and witness the cause and effect it generated on the way the work progressed in real time. The mechanical strength of the various computers, sensory devices, video motion tracking systems, projectors and projection screens and scrims significantly elevated their interest in how the technology worked. Conversely, in a work such as the *Twining Project*, the magic of performance augmentation and the large empty space was far better served when the technological elements were deliberately made invisible. It was refreshing to operate in a clean, stark and aesthetically pleasing performative space.



Figure 28: (*Twining Project* 2006; footage in Appendix 4) Sharir wearing the garment designed and constructed by Barbara Lane with the other physical human performers. The text on the garment was specifically designed to conduct improvisation sessions. The word scrolling across the LEDs at this point was “flock.” As the garment was invigorated with technology, it was capable of containing and communicating textual information that allows for continuous directional change of the improvisation session in real time.

5.5 Electronic Overflow, Emotive Interfaces and *CyberPRINT*

During an early iteration of this project, we had to address the issue of electronic disturbance – for us; this was when too much textual and visual information was simultaneously entered into the wearable garment/computer from multiple sources. This overflow of input proved to be too much to handle; consequently, it would be rejected by the system. We have found that facing unexpected difficulties such as random fluctuations of information allowed for new areas and issues to surface. They had to be investigated, properly vetted, analyzed and commented on. Furthermore, video material (extracted from a new work in progress) was projected on top of a physical work while in progress, the purpose of which was to determine the amount of electronic noise that could be generated,

and what level of disruption (if any) could be expected and/or accepted during performance. Close examination led us to determine that in order to configure ways to manage the overflow of information, minor structural adjustments related to our interactive system (the wearable garment) regarding how we sent (output) and accepted (input) commands from various interactive sources were configured. Similarly, issues related to “electronic noise” and overflow of information were corrected by reducing the multiplicity of commands that were simultaneously communicated back into the performance area.

After adjusting and tuning the various technologies to our specific performative needs, we sought to draw our attention to the role of the multiple tangible devices employed in the pursuit of these works. We found that it supported our team’s newly established goal of seamlessly integrating most of our previous iterations of the *Twining Project*’s thematic makeup to the newest system. This quest was made possible by continuous development of “tangible user interfaces” and/or “tangible user devices” (Quinn 2010, 22). It lead us to believe that the output generated from these interfaces would aid us in better assessment and/or more seamlessly interweaving (or reconnecting with) our emotional, visceral senses – both in the physical and virtual worlds.

In *Textile Futures*, Bradley Quinn addresses the following related aspects of emotive interfaces:

The combination of tangible devices such as electronics, sensors and irreconcilable circuits with the ephemeral emotions of anger, fear, sorrow and joy may seem diverse, but there are threads that bind. The sensing and diagnostic abilities that fibers have are forming a new bread of textiles structured by feeling and mood more than by texture and motif (2010, 22).

Emotive interfaces that are integrated with constellations of Electro Encephalogram (EEG) and Electro Cardiogram (ECG) sensory devices were set to deliberately target and collect physiological data from the body in order to stimulate and collect emotional, visceral feelings and ephemeral emotions of anger and joy. Similarly, the same principles were applied to our more recent “tangible user interfaces” that were established to allow the performer to interact automatically with the technology (content) through the manipulation of a physical device (the or interactive system). As Quinn explains, “[b]ecause they can process data automatically and autonomously, textiles can process artificial intelligence

programmes, giving them the ability to react to the wearer's visceral experiences (2010, 22).

This type of research, that stimulates and collects emotional, visceral feelings and ephemeral emotions of anger and joy, is continually conducted and exists at the very core of each of my previous works that comprised this dissertation. Although all of these attributes are mostly stimulated and evoked by technological intervention, it is for the brainpower and newly considered human emotional and visceral feelings that it can freely operate with the virtual makeup of our performative world. All of these are considered to function in *Beyond the Electronic Connection*. A useful hypothesis is that the mechanism, which facilitates the manipulation and the outcome of our work strictly by collecting brain data with our mind, is by far the primary component that lead and is still driving this research and the multiple works for which it accounts. This is done by means of neuro-signal acquisition and our emotional state of being through the use of sensory devices.

These technologies have been first integrated in my work with the pursuit of our landmark multi-collaborative event between architect Julio Bermudez (and his team) and myself, entitled *CyberPRINT*. This work was commissioned and first fully performed in Salt Lake City, Utah by Utah Repertory Dance Theatre for the celebration of the millennium season (2000). Additional various iterations of this project continued up to the year (2004).

CyberPRINT was a probing and representational system that brought together science and art through dance, bioengineering and architectural design. In this work, physiological data (collected from the physical body through non invasive techniques) served as its fluid/liquid building material, and the architectural design served as its expressive intent. Digital and physical space served as its performance location, and multi screen projections were its enveloping and viewing strategy. Additional technologies included user interactivity in the form of a wearable computer, video motion tracking systems and real time audience input. This work epitomized the most productive collaborative cross-disciplinary efforts between architecture, dance/movement, bioengineering, anesthesiology, computer science and electronic music.

Physiological measurements of movement collected through non-invasive techniques were converted into electronic audio-visual depictions in real time during *CyberPRINT*. This fluctuating architecture of data allowed for randomly collected access to information about the physical body. The data was transmitted wirelessly to a computer (the mother ship) placed in a strategic location in the theatre control booth where the outcome (content and images) were then been projected back onto a scrim which enveloped the performers in real time. These images were not only generated by my physical actions and movements, but they also responded by changing size, levels and taking different forms and shapes – all of which attended intuitively and deliberately to performance content, by ways of my moving, as I observed it in the moment.

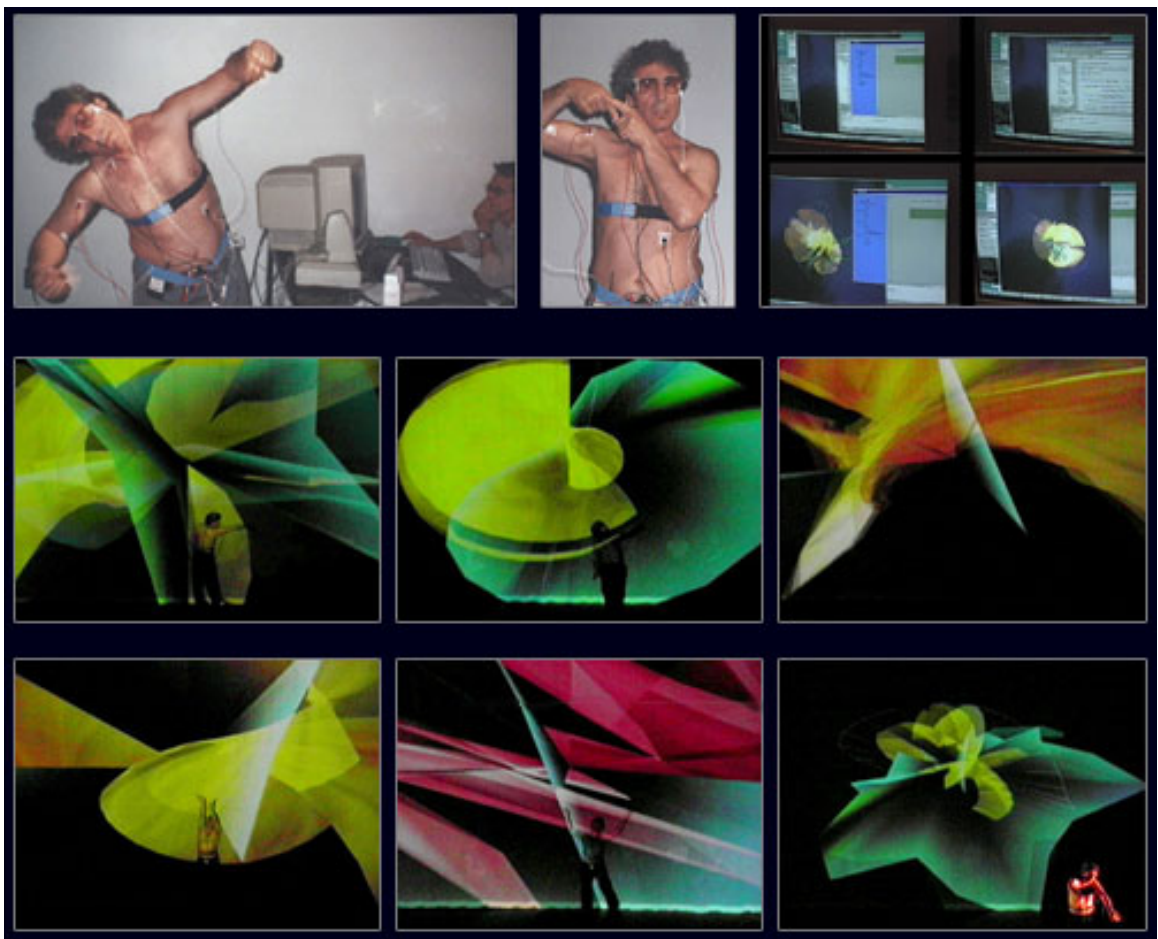


Figure 29: (*CyberPRINT* 2000) EEG and EKG sensory devices were attached to the surface of the brain, heart, onto the side of each eye, upper arms and back and designed to collect physiological data in real time (pictured in the laboratory experiments in the first two cells above) which were processed by a computer (as seen in the upper right cell) in order to convey emotions, visceral output and brain energy (as demonstrated in the remaining cells of performance images).

In addition to acting as the primary performer and the instigator of the technologies involved, in *CyberPRINT*, my primary function was to fully surrender my physical body to the process of gathering internal physiological data from my body and allowing it to be externalized in order to generate real time mutating, invisible, spatial (architectural) fields of energy. This phenomenon at the intersection of science, dance and art was fully present and experienced as the data was collected directly from my brain, from my eyes, heart and upper and lower sets of arm muscles. This data was then projected back into the performance space onto a scrim in the form of large visual images. By activating and/or moving my eyes from side to side or up and down, and depending on my way of moving about the space, flexing my muscles one way or the other, I was able to affect the shapes, size, color and layers, allowing these images to unfold in relation to energy levels, temporality, embodiment and disembodiment – all in real time.

Depending on the selection of imagery, sound-based structures and the choreography, the notion that physiological data being translated into spatial patterns that are invisible until being manipulated into form (by the performer's action) was extremely revealing. It helped clarify how my intervention through a myriad of modes and methodologies must be refined and suggested the need for more experience and experimentation, and it leaves much room for others to engage and challenge these modes. This work's exploratory process and performance experience included very complex issues that took place through a multitude of expertise's and teamwork. The effectiveness of the performance process unfolded in relation to temporality and embodiment via short-lived actions in the moment. This phenomenon was securely situated at the act of live performance where such insights always tend to beget more questions – most of which will never be fully answered.

5.6 Conclusion

The intersections of the multitude of modes, technologies and lessons gathered since the first *CyberPRINT* performance in the year 2000 have established (among our collaborative team) the technical knowledge, technological expertise and a heightened level of experience that lead us to weave the foundations of the *Twining Project*. From “emotive

interfaces,” “tangible user interfaces,” and/or “tangible user devices,” to our first interactive system that allowed user input, to some of the most advanced projection systems screens and scrim, these experiences renewed the energy that led to the creation of all subsequent works. During this time we also learned how to transform theatres and traditional or alternative black boxes into smart, intelligent, responsive and experimental performance locations. Finally, five distinctly different multipurpose generations of wearable computers were created for the following works addressed in this dissertation: *Body Automatic*, *Convergence Identities*, *The Twining Project CyberPRINT* and *Too & For*.

The only commonality that connects all of these systems is the interactive component that is so fundamental to the works we have created in the past and those we are still exploring today which suggest the presence of “chance operation” and “improvisational structures.” As for myself and those collaborating on these works, we had to be retrained, reconditioned and fully adjusted to the specific skills needed for each of these works. All along we operated on planes of dual interchangeable presence beyond what we normally perceived as recognizable representations, from pedestrian to gestural ways of moving and from highly technical to the inclusion of text narrative (while in performance). Our primary aim was to project, communicate and deliver a clear and coherent vision to our audiences of the world from which we were performing.



Figure 30: (*Twining Project 2006*; footage in Appendix 4) Another example of a cyber-human performer in dialogue with a computer generated cyber-cloth, interchangeably affecting each other during performance. While these cyber-human and cyber-cloth sequences were not animated in real time during the performance, the observation of them provides unique inspiration for the conceptualization of new movement material.

These newly acquired dancing and moving skills (which were different for each one of the works) intersected with one another in ways that defied our earlier perceptions and understandings of traditional forms of dancing, often leaving the audience in unfamiliar ways of knowing. Similarly, as the performer wearing a newly conceived and constructed wearable computer, I have appeared as though I have arrived – but did not necessarily belong to – this environment, at times struggling against the flow to present myself in a familiar category, at other times being manipulated by all technologies involved, taking over the operational responsibilities of all existing elements across the performative space/spectrum. As for the scrim, screens and projected images of cyber-human dancers in these works, they appeared (most often) as extended, undulating and/or fragmented body parts. As technologically generated cyber-humans, they have also behaved and looked real enough to trigger a visible digital change, but more often they operated in an unfamiliar

cyberspace as if they were content (albeit momentarily) to disappear, leaving us uncertain whether they were ever present at all.

This sense of duality (operating both in cyberspace while existing in the physical realm) is reinforced in a review by Yunus Tuncel on Jaime Del Val's performance in Mitilini, Lesbos which included surveillance video cameras, projection screens, electronic sound base production, the physical human multitude ways of representation and the opportunity for the spectator to participate as part of the simulacrum (3). He writes:

Here we have a live performance and an immediate projection of that performance onto a screen: two simulacra, two media, the medium of bodily performance is integrated with the medium of digital projection. Neither is the origin of the other: they do not resemble one another, theirs is at most a relationship of similitude. The series, or rather the matrix, that is established here via the sound. Since the sound permeates all media and belongs to both, opens itself up to the audience. This is why it is better to refer to this spectacle as a matrix where there are many open ends instead of two ends as in a series, to which a spectator can insert himself as yet another simulacrum. (2010, 3).

The duality of presentation as described here as “two simulacra, two media” and “the medium of bodily performance is integrated with the medium of digital projection” epitomizes and accentuates the similarities between two entirely different works (*CyberPRINT* and *Twining Project*), pursued at different times and producing totally different results, content and looks. It is for the type of technological exploration and the subject matter of Jaime Del Val's work that a possible connection is made.

Del Val's work is a live art event inclusive of one physical performer (himself) and his own projected deformed, multiple body parts images, as represented depending on his way of moving. It is for the duality of his existence while performing (in the physical world and in his virtual representation) that the connection between our two worlds is clearly present. Two worlds' two entirely different outcomes, the two co-exist in the quest of furthering and augmenting aspects of what we consider live arts.

CHAPTER 6: *Too & For*



Figure 31: (*Too & For* 2012; footage in Appendix 4) *Too & For* was a live, reactive, real time, physical and animated event, employing Multi Touch Screen Technologies activated from an iPad within the performance space. The scrim, which covered the entire proscenium opening, enveloped the performers, as seen above.

This chapter explores my latest and most recent collaborative work *Too & For* as an exploration of advancements in developments in the increasingly pervasive “Multi Touch Screen Technology” and “Plural Touch Technology,” ranging from earlier limited one finger touch intervention with the touch screen interface (in our case, an iPad), to the more recent multi touch (using up to ten fingers at a time). Often used for gaming purposes, Plural Touch Technology increases the level and quality of real time animation options and the various 3D particles imagery that are generated interactively. It is premature to measure the influences and the important impact that these new technologies have had or will have on our understanding of the human body; however, our successful experiences with our newest research and subsequent work *Too & For* clearly challenged our perceived limitations as to how we had to alter the ways we moved and ultimately performed. As these technologies proliferate and become more sensitive in the ways they respond to our fingers, touch and overall manipulation, they will get closer to becoming one with the

physical body, consequently allowing for further investigation into increasing the interdependence between the two. The goal of this interdependence is for the physical body and the system activator to be the event instigators of the corresponding technologies. In support of the technology and the multiplicity of options that were open to us, different visual images were generated for each of the five sections of *Too & For*. The structure included multiple technologies, influences, collaborators and the direct, real time connection (sometimes synchronous, sometimes asynchronous) between performers and the multi touch technologies. All of these have been assembled to defy and question the common threads in my work, attempting to interrogate our reliance on pedestrian movement and improvisation as means for generating new movement vocabulary in a live performance setup. I continue to look for the true meaning of liveness while fostering dynamic, embodied play and gaming to fuse research and production.

6.1 Introduction

It seems impossible to avoid the recent rapid developments of “Multi Touch Screen Technology” and “Plural Touch Technology” (*Engineers Garage*). They are emerging with great enthusiasm, dynamism, ubiquity and energy rarely experienced before. They are all around us, in our pockets, hands and over our ears and heads. It is utterly impressive and reassuring to witness and experience their dependability and the ease with which they are used and applied on Plural Touch cell phones, tablets (including iPads) and large screens with touch-sensitive surfaces. This energized element of creativity is beginning to find its way into the human interest of creating art. It is inevitable that artists and scientists alike would begin exploring the potential uses of these technologies in creative ways. As choreographer and media artist, I have been exploring the ways in which I could utilize some of the more manipulable and easily customized applications (developed specifically for personal use and gaming) in live performance. My primary focus was to nurture, foster and incorporate my past experiences to create a balance between the practical, daily use of these new technologies and the creative re-imagining of possible future uses of these devices.

The website *Engineers Garage* is designed to provide information, advice and products regarding new technologies. Their article on touchscreen technology describes it as follows:

Touchscreen technology is the direct manipulation type gesture based technology. Direct manipulation is the ability to manipulate digital world inside a screen without the use of command-line-commands. A device which works on touchscreen technology is coined as Touchscreen. A touchscreen is an electronic visual display capable of ‘detecting’ and effectively ‘locating’ a touch over its display area. It is sensitive to the touch of a human finger, hand, pointed fingernail and passive objects like stylus. Users can simply move things on the screen, scroll them, make them bigger and many more (“Touchscreens”).

What drew my attention to begin investigating the possibilities of these technologies’ suitability for art and dance making was their primary attribute of “direct manipulation type gesture based technology.” For the user, it meant that no text-based messages (or external controls such as a keyboard or mouse) were needed to enter commands into the system to generate visual information; users were able to move, expand, manipulate and change content in real time by moving their finger(s) on the screen surface. Another very important element of this technology is it can be used with one or multiple fingers simultaneously, as we see with Plural Touch Technology below. Clearly, we are experiencing a proliferation of tactile-based sensations with multiple options.

There are additional varieties of similar technologies that offer variations and augmented operational attributes. The most important for this research is “The Plural Touch Technology”:

The plural touch technology or the Multi touch is a variant of the touchscreen technology, which can detect two or more touches over its display area at the same time. Some of the common functionalities that require multitouch interface are zooming in, zooming out, rotating objects, panning through a document, virtual keyboard, etc. Multi touch applications technology are found in smart phones like iPhone, Samsung Galaxy, Nokia N8, Nexus S, Microsoft Touchtable, Apple’s iPad and many more (*Engineers Garage*).

By studying the potential use and behavioral patterns of the plural touch technologies, we found that we could interact with the iPad screen interface with two hands and ten fingertips, with each combination yielding different results. This provides endless new ways to manipulate the possibilities of 3D particles made available for gaming, play and performance. Plural Touch Technology generated real time, freeform structures that could support the visual output of any desired work. An additional attribute embedded within

these software packages was the ability of the users to animate the content in real time, again offering many new possibilities.



Figure 32: (*Too & For* 2012; footage in Appendix 4) In this additional performance still, another possibility of interacting with an iPad screen interface employing as many as ten fingers at a time is demonstrated.

As a team, we decided to take full advantage of the most attractive element that this technology afforded: the live, real time animation of the particles with the animation generator (João Beira) acting as a performer as well as system activator. This meant that his presence, actions, iPad interface and projectors were visible to the public during performances. While the onstage projections reflected the product of Beira's labor, he sat in the theatre among the audience, and those near him could see the screen of his iPad as he manipulated and switched between programs. Indeed, all actions were transparent, performative in nature and made available (as an added instrument) to the benefit of the overall visual output. As we privileged live performance inclusive of all collaborators, we sought to foster awareness of the creative/creation process by demonstrating what it meant to be a member of the performative team. Like the dancers and myself, João Beira attended most rehearsals, studied the choreographic patterns, video taped the process and was familiar with every move of the dancers. Thus, he did far more than execute visual and audio cues – he was the real time sound and animation performer.

6.2 *Too & For*

Too & For was first performed as a part of *The Catalyst Project* at the University of Texas Campus in the B. Iden Payne Theatre on March 23-25, 2012. It was a multimedia collaborative project that featured sound designer and video artist João Beira, an electronic music score by Tom Lopez, costume design by Kaitlyn Aylward, my choreography and six female dancers. The title *Too & For* homophonically suggests the structure of the dance: two solos (one at a time), one duet, one quartet and closing with one sextet. This work explored the relationships at the intersection of a set choreographic sequences and a variety of touchscreen software by exercising Plural Touch tracking particles and animated in real time. For each of the sections of this dance, a different strategy was developed – meaning different movement material, software, particles, shapes and colors – thus creating a colorful array of unfolding, moving images.

A giant scrim was placed just behind the stage apron, fully covering the proscenium opening. From the audience's perspective, it enveloped the dancers' bodies, as the dancers were lit in order that they could be seen through the scrim. The surface of the scrim primarily featured a particle system generator that served sometimes as the central visual focus and at other times complemented the organic, carefully crafted new movement material. During the first two solo variations and the following section with two female dancers, a continuous array of multi particles and images were projected on the scrim. Together, the dancers and projections generated in real time created a colorful visualization and boundless energy that gave way to a world of virtual existence and the emergence of a hyper-real world. The dancers' continuous movement gave birth to a ritualistic event depicted by the virtue of repeated, rhythmical actions by the dancers. When the scrim lifted, the focus shifted to the dance of four (the quartet), an intimate section with seemingly endless, liquid-like manipulations and movement activities drawn to a central focal point and then pushed outward with gradually increasing energy levels, repeated gestures, postures and movements of the dancers mirroring the centrifugal force of the section itself.

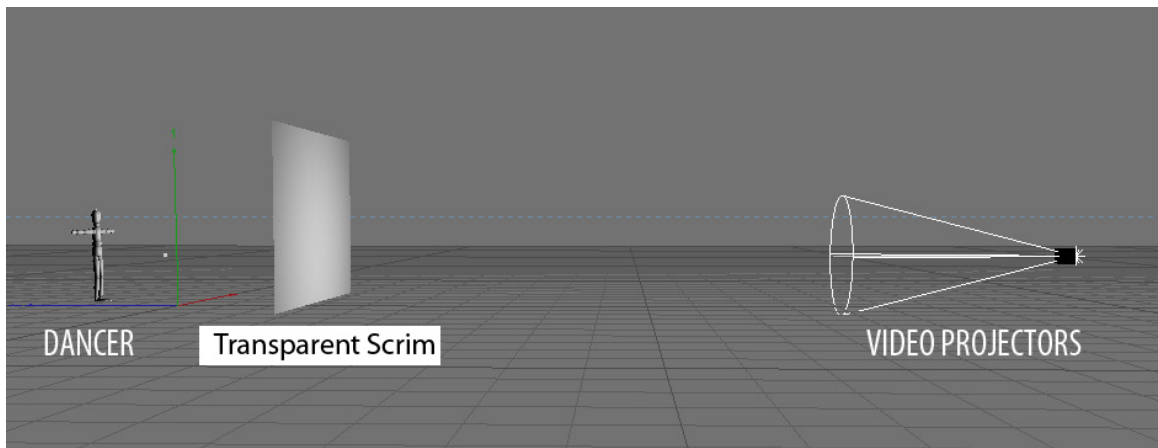


Figure 33: (*Too & For* 2012) A cross section of the stage setup with the stage on the left and the house on the right. Image courtesy of João Beira.

It has long been established that the projected image, the design of its selected surface and their location in the performance space play a fundamental role in determining the expressive qualities of the art work, the dance and/or other performance-related works. Contemporary dance, performance art and installations have benefited from making careful and calculated selections regarding the ways images can be projected. Performance has played an important role in driving and encouraging the use of new technologies and research related to the development of various projection means.

One major example was embedded in the need to develop appropriate projected images that could be set in motion while transitioning from one location onstage to the other. An additional example was the need to develop the technology whereby the projector and the light instrument became one unit. Consequently, Digital Lighting versions one and two were developed; these combined new projection technologies and have contributed to an array of new research and performance related to moving images in real time.

I was and am interested in how restricting the field of view (by the way the projections' field of view angles are designed) leads to perceptual, visual and motor decrements in various kinds of performance tasks, though there is some debate about what field of view parameters are optimal in design for computing tasks. New research goes as far as suggesting that large projection screens may be effective substitutes for immersive displays (i.e. virtual reality) such as head mounted displays. We know of very little work that

quantifies the differences between these large semi-immersive displays and regular non-immersive displays.

In *New Visions in Performance: The Impact of Digital Technologies* edited by Gavin Carver and Colin Beardon, my theatre media artist colleague Kjell Yngve Peterson writes:

I have a special interest in how the use of real-time and telematic technology in performance makes it possible to develop a poly-focal approach to the staging of performances, involving many times, places and dimensions at the same time. And how a new reality construct evolves from the stage montage of these not originally related and synchronous events, combining asynchronous and parallel occurrences into a hyper-reality (2004, 31).

Clearly, *Too & For* had very little to do with being a telematic event – however, it has a great deal to do with the notion of developing the “poly-focal approach to the staging of performances.” It is also an event indicative of the duality of its manifestation, at times “synchronous,” in sync and harmony with its environment, and at other times “asynchronous,” subversive and contradicting the energies of the visual output. Structurally, this project drew on our previous experiences in digital dramaturgy and the story told by the array of interweaved particle imagery and how they were embedded as an integral part of the choreography. During performances, the dance, the enveloping projected images and sound design at times purposefully collided with each other in a subversive way, responding adversely to the dancers’ movement and to the images they produced by the ways they moved. At other times, they operated in sync and harmony by attending directly to the movement of the dancers, whereby the cause (enacted by the dancers) and the effect (enacted by the corresponding particle systems) was clear and intentionally visible.



Figure 34: (*Too & For* 2012; footage in Appendix 4) During the duet, the dancers interacted with a projected image. This is an example of synchronous interaction wherein the dancer's movement was extended by/reflected in the projected image.

6.3 The Software

Several live stream iPad application software packages were employed in the pursuit of this performative work, including the following: Uzu, Gravidlux, and, in a very minimal way, Trippin. These allowed the system activator to input commands, which along with the input from the dancer's bodies (by way of sensors detecting their movement), generated the projections. We favored the applications that allowed for their interface to be manipulated and configured attending to the specific aspects of our own work. A useful hypothesis is that the software had the ability to become one's own, for each performance was re-generated anew, a one-of-a-kind event, impossible to repeat. We sought to draw from our experience with the practice of improvisational dance, and each event had its own look, feel and outcome. This dynamism was made possible by the unique, real time combination of the dance, visual imagery and sound integrating, intertwining and becoming a singular, cohesive performative unit.



Figure 35: (*Too & For* 2012; footage in Appendix 4) An image generated in real time with input from the system activator reacting to the movements of the physical human dancers. The projection in this image is an example of the delicate, responsive nature of the technologies used and the more complex and specific possibilities of it in performance.

The Uzu application is a kinetic multitouch particle visualizer described/promoted by its creator Chris Pirillo as follows:

Points of light will shoot across the screen and fly to your command, twirling in a vortex of color and motion. Freeze and move Uzu in 3d space while contorting spirographic curves with your fingers. Uzu lets you quickly switch between 10 different modes of real-time animation by simply changing the number of touches you're using.

Although during *Too & For* we employed two of three different software applications available, Uzu's attributes such as "10 different modes of real-time animation" made it (by far) the most effective, flexible and able to be adapted to our needs, including customizing options regarding color, speed, intensity. One additional relevant aspect was that the outcome depended greatly on the activator's skills and abilities to adapt to change in the moment. No matter how effective and attractive these software applications were, the acquired skills, endless training and coordination of the system activator assured the success of this work and its artistic justification.

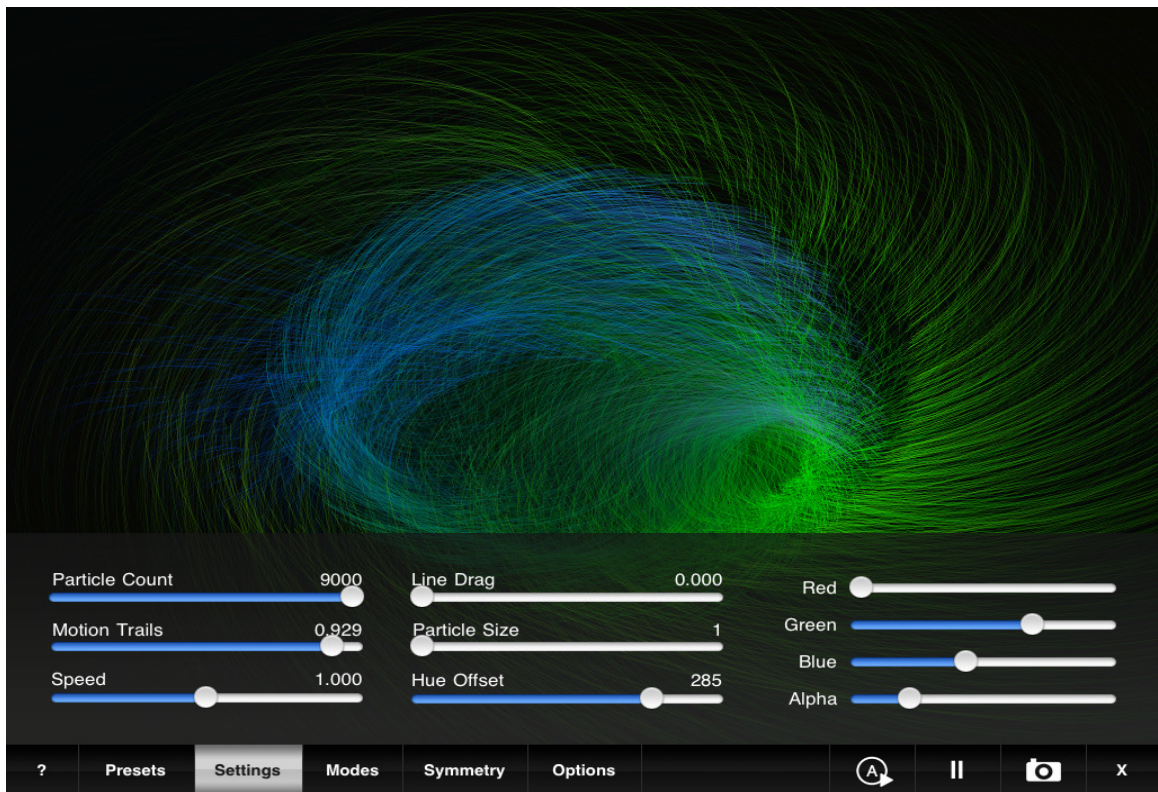


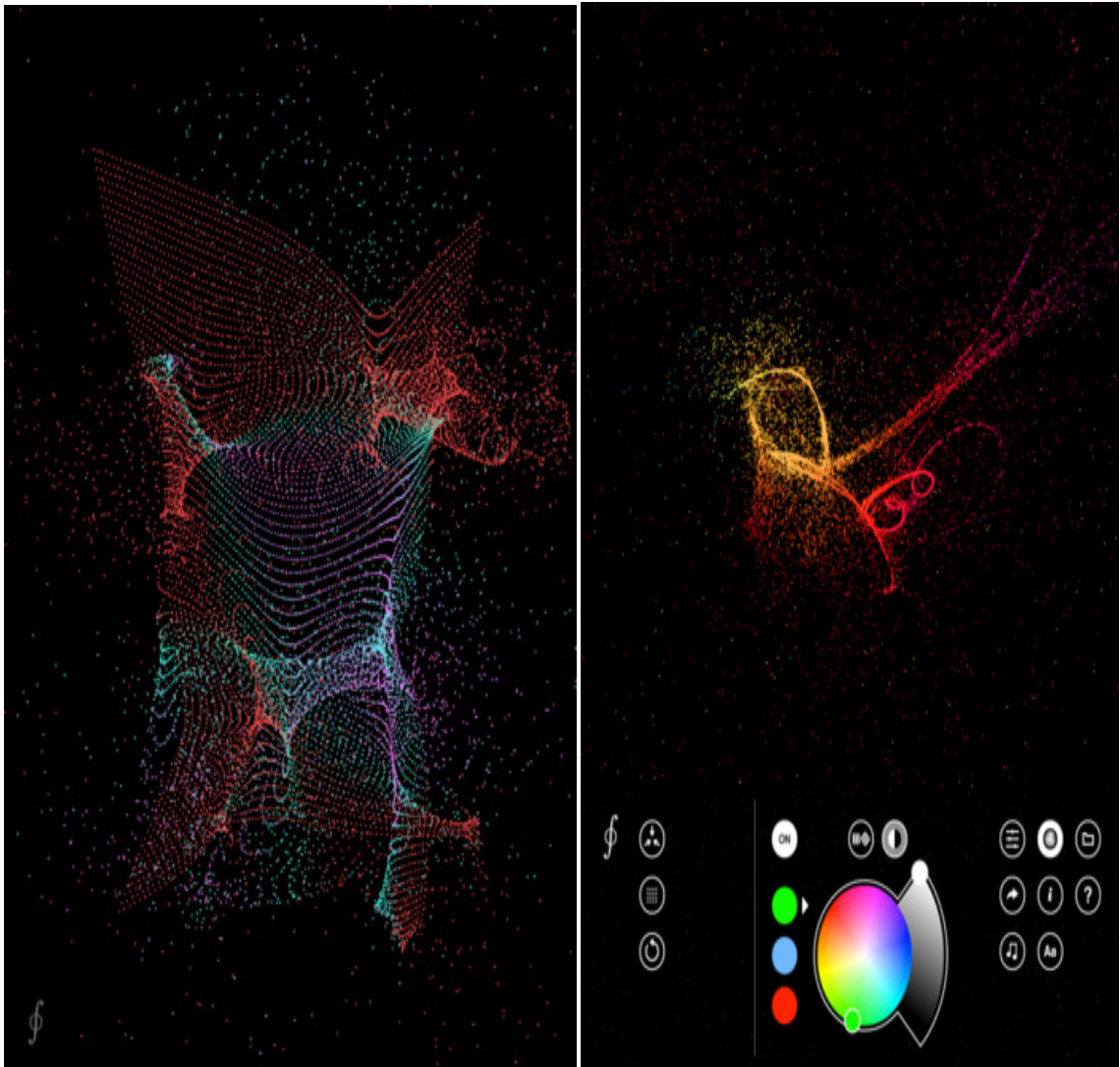
Figure 36: (*Too & For* 2012) A screenshot of João Beira's iPad while using the Uzu application to manipulate the particle system generator interface settings. The control panel, seen at the bottom of the screen, allowed for significant customization. Image courtesy of João Beira.

The Grivilux application is described by its creator, Scott Snibbe Studio, Inc, in this way:

Grivilux lets you draw with stars: it's a combination of painting, animation, art, science, and gaming. As you touch the screen, gravity draws simulated stars to your fingertips. You can tease and twist the particles into galaxies, or explode them like a supernova. You can color the stars by their speed, and make them dance to music. You can change parameters including gravity and number of stars, and enable antigravity, color, make gravitational typography, and upload to Facebook, Twitter, and email. Multiple fingers and multiple people can touch the screen at once, collaborating or competing.

Grivilux is different than Uzu primarily because of its embedded option that allows the user to change important parameters such as gravity. It became very useful to us, particularly in the quartet, because gravity tends to draw the particles and additional visual imagery to the center; therefore, it provided us with the opportunity to consider structuring the dance with the same principle. Following a close evaluation and an analysis process, we determined that it perfectly served the choreographic exploration of this specific section and contributed to the organic merger of the two (i.e. the dance and the corresponding images/system). Since the scrim was lifted for this section, the dancers' bodies and their clothing – purposely designed in white and neutral tones without patterns – served as the

projection screens for the visual material generated in real time, doubling the level and the effect of real time, live arts animation processes.



Figures 37 & 38: (*Too & For* 2012) A screenshot of João Beira’s iPad while using the Grivilux application to manipulate the particle system generator and interface settings. The specific options available in this program prompted us to use this for the quartet section of the piece. Image courtesy of João Beira.

Although the “Multi Touch Screen Technology” and “Plural Touch Technology” are now typical features of everyday technologies (in phones, eReaders, tablets, etc.), these software programs (Uzu and Grivilux) are not easy to master and required much time to adjust their settings to our specific needs. Despite this, their intrinsic operational simplicity (i.e. touch-initiated commands) meant that they were still useful tools for redefining the basic phenomena of performance.

6.4 Creation Process

Too & For was a multimedia collaborative work that was generated in a very different way from which I typically initiate the lengthy process of making a new technologically supported work. Normally, I am drawn to the pursuit of a specific new thematic idea that consumes my attention for a while and/or a new technological development that can ultimately support my primary interest (which is always about augmenting some or all aspects of performance). I then enter the experimental process of assembling a team of potential collaborators in order to attend to the pursuit of making a new work. For each work, I assemble a different team that possesses a new set of skills with individuals demonstrating great enthusiasm about entering the collaborative process of preliminary research and discovery taking place in a digitally charged, responsive dance studio and/or lab. In *Too & For*, I have reversed this process for the first time: I was practically seduced by the technology (primarily the software) and its possibilities outside of their intended uses in gaming. As a team, we sought to investigate the possibility of adapting and manipulating them into tools for live art events.

In *New Visions in Performance: The Impact of Digital Technologies*, Jorgen Callesen, Marika Kajo and Katrine Nilsen describe challenge of their collaborative project in the following way:

The main challenges were to bridge the gaps between research and production, and between theory and practice, involving professionals on all levels. It should not be theoretical studies supported by simple prototypes and it should not be full blown productions with very limited opportunities for experimentation – but something in between (2004, 69).

Based on my experience, the paths taken between research and production are how we discover whether or not the experimentation process and the technology involved actually produce the desired outcome(s). This is why the collaborative lab-like process is so important; it makes space for and attends to the main challenges where the “gaps between research and production” are blurred.

For *Too & For*, we were primarily looking to master the real time “performance animation as a model for interdisciplinary work” (69). While in the pursuit of several of my earlier works, such as *Body Automatic* and *Convergence Identities*, I designed a multitude of

computer animated cyber-human dancers operating in a fully mounted virtual environment, which were always conceived and animated ahead of time. The uniqueness and newly discovered components embedded in the kinetic Plural Touch particle visualizers used in *Too & For* were related to real time animation processes; while utilized in rehearsals and the creation process for the piece, none can occur prior to the event taking place. Although in this case the real time animation attributes had to be reconfigured and made available for our own purposes, we considered this opportunity to be a great asset because it served our artistic purposes.

In *New Visions in Performance: The Impact of Digital Technologies*, Jorgen Callesen, Marika Kajo and Katrine Nilsen continue describing their project this way:

So far this field of artistic practice is new territory where the borders between technology, dramaturgy and esthetics are blurred and highly dependent on each other. To us it is a world of unexplored artistic possibilities, new concepts for physical interaction and theatrical communication, but the field is still very immature in relation to stage arts (2004, 70).

The possibility of exploring new artistic practices and the opportunity to blur the boundaries between the new technologies, the dramaturgy and the imagery produced in real time is a challenge that we fully embraced as a team. Clearly, being somewhat seduced by new software made available primarily for gaming was approached with a great deal of uncertainty and hesitation. However, following our first research period related to the technological possibilities, it became clear to us that this was an acceptable risk from which we have learned a great deal, acquired several new skills and attended to new concepts. We learned how a real time animation kinetic Plural Touch particle visualizer could be reconfigured in order to serve our own particular needs and how to enrich the aesthetic qualities of the program we inherited so that it could be worthy of inclusion as part of a live arts event.

6.5 Conclusion

We did not succumb to the immediacy or the visually blinding effects of the initial looks of the kinetic Plural Touch particle visualizer, which were similar in many ways to computer

screen savers. We drew on our experience to ensure that the dancing and interaction with the technology became a single, integrated whole and an augmented artistic experience. The imagery and artistry were initiated by the dancing bodies, which were, at opportune times, also the instigators of the particle visualizer.

New ideas and/or new technologies are constantly emerging or are being conceived. Normally, much attention is paid to the new, whether it is targeted for gaming or artistic pursuits. These new technologies initially look and operate as if they are worthy of further consideration, exploration and ultimately a performance opportunity. However, like in *Too & For*, we were not convinced that entering the creative process would produce the desired outcome. During this very process the multiple avenues of and preparations for the combined elements of the dance, in conversation with the real time technology, assured us the opportunity to figure out whether the newly acquired technologies and the dance could be interweaved in a way that a coherent, combined outcome could be produced.

Too & For is a work that opened us to new research and artistic opportunities. It included new ways of projecting images that fully enveloped the physical dancers, of reconfiguring a real time animation particle visualizer in order to adapt it to our own particular needs and we acquired additional operational skills related to animation interfaces.

The issue of the projected image and the creation of the appropriate environment became extremely important in the pursuit of this work. The aim was to create a perceived Virtual Environment (VE) not by employing (VE) technologies, but rather, by how we selected the kind of projection technologies we needed, how we engaged the projection surface and its viewing angle and how we made it possible for members of the public to fully experience the intended projected imagery. In *New Visions in Performance: The Impact of Digital Technologies*, editors Gavin Carver and Colin Beardon write about the virtual as stockpiled potential:

Pierre Levy (1997) has long pointed out that the virtual is not opposed to the real, rather the virtual has a material reality just like everything else. What distinguishes it in Levy's view is that it contains at one moment a plethora of possibilities, any one of which can be realized and made actual. This is the view of the virtual as an algorithm or formula that can generate actual examples at will. It is virtual in the

sense that it is not itself a specific actual or realized event, and there is a sense in which such virtuality is lost once it is manifest in performance (2004, 168).

In a performative event, the perceived reality and the created illusion of the projected imagery are the same, as the former is a result of the latter. And although perceived realities and created illusions are created using completely different kinds of technologies, as Carver and Beardon paraphrase Levy's argument in the quote above, they have the same end result since the virtual also has a material reality. In *Too & For*, we chose the illusion of VE rather than the real. In other words, while our goal was to achieve the impact of VE, we chose material means to achieve the virtual illusion. We have selected this approach for two primary reasons: one was based on our previous experiences and expertise in projection technologies (all along predicting the possible positive outcome), and two because we felt that it would provide greater flexibility for us to perform each one of the six sections of the dance in a different way. It was made possible by deliberately creating a different look for each of the dance sections with distinct corresponding environments. Thus, it was not virtual reality per se, therefore it was not lost once was "manifest in performance" (Carver and Beardon 2004, 168).

Too & For is a forward-looking work that suggests we have much to explore. A continued effort and interest in furthering my future research and work is still in progress. It does not necessarily constitute that my next work and exploratory process will continue with this new methodology; however, when a work with its technological exploration merge in a way that suggests a sense of newness and cohesiveness to it, additional iterations with possible augmentation are needed.

CHAPTER 7: Conclusion

As I approach the end of my thesis, it is at this crossroads that I will endeavor to summarize its practical, theoretical and technological research, as well as the performative experience of the ways these were woven throughout this thesis. I hope to reflect (and that I have reflected from the outset) on this journey's content, seeking greater knowledge and expectation for the wealth that exists in the quest for technological intervention, the pursuit of performance augmentation, and, as a matter of utmost importance, looking at what is made possible by the use of technology and what possibilities exist beyond the electronic connection. I argue that my research work and methodologies as presented in this thesis were integral in my advancement in the field, through which I have engaged the work of many important artists that are engaged, described and quoted throughout this document. However, the most important of these was my involvement and association with Professor Roy Ascott's incredible breath of research, work, artistry, innovation, pedagogy and boundless creative spirit. This is what lead me much further in my quest to accomplish the work associated with the singular and significant program, Planetary Collegium.

I consider this conclusion of my thesis to be the bridge and the link to my continued search for new directions in future research, the development of new technologies, and ultimately, the making of new works. My internal drive and interests in the pursuit of discovering new ways of work making serve as the vital force and provides the catalyst for the congregation of the necessary elements.

All along my research pathway and progression into work making, I have sought to follow my longstanding and clear commitment to interrogating performance augmentation and mediation. Technological mediation was implemented to serve the purpose of more intimately connecting the mind, body and emotions, though I was and have remained more consumed with what lies beyond the technological support and ultimately the electronic connection. As I have stated in my introductory chapter, I have primarily searched for the emotional, the visceral, the meaning and the content of a new and vital work with far more

passion and interest than I had in what kind of trendy or fashionable technological invention might be deployed in support of my next exploratory process.

That said, I could not have achieved any of my stated goals without a serious commitment to the development, practice and mastering of the various technologies needed to support my past present and future works. Keeping in mind that technologies are not purely a savior for any single work, I have instead sought to fuse the boundaries and level the playing field between the technological mediation and the physical world from which I have begun my creative journey. This experimentation with and through these technologies would not have been possible without the true collaborations (using zero point methodology and deep listening) with others within the field and across multiple disciplines.

During my time in the Planetary Collegium PhD program, I have endeavored to increase my exploration of the following five major areas related to technological mediation: 1) the use of multiple interactive systems, 2) the conceptualization and creation of five generations of wearable computers, 3) the multiple designs of animated cyber-human performers/dancers, 4) 3D worlds and virtual reality environments, and more recently, 5) the performative exploration of ‘multi touch screen technologies’ and ‘plural touch technologies.’ These research categories have been created for the sole purpose of augmenting all aspects of productions and performance in real time as a means to collapse the distance between mind, body and emotions.

I argue that without the subversive, generative influence of technological intervention that is so vital to my research and work, I would risk the collapse of my creativity in on itself, meaning, compromising all aspects of the works’ initial concepts and thematic processes as they would stagnate in stillness and decay. The impact is similar to the impetus for using improvisation, chance dance and mushi technologies to generate new movement vocabularies. During this period, the technologies as we knew them have proliferated and become more intelligent, accessible, easy to carry and easy to wear. They have also been skillfully embedded into fabrics and textiles and turn performance spaces into smart, responsive and interactive environments. This enables additional research options that helped our various multiple collaborative teams and myself make these technologies fully invisible at times and, at other times, fully visible, crude and subversive.

Before I progress a bit deeper into this conclusion chapter, I have chosen to use this quote from Roy Ascott, as it places emphasis on how the technology is providing us with a greater “insight to see more deeply into its richness” and the corporeal, sensual and tactile experiences of doing. In “Edge-Life: Technoetic Structures and Moist Media,” Roy Ascott writes:

At the same time, as we seek to enable intelligence to flow into every part of our manmade environment, we recognise that Nature is no longer to be thought of as ‘over there’, to be viewed in the middle distance, benign or threatening as contingency dictates. It is no longer to be seen as victim ecology, fragile and fructuous, according to our mode of mistreatment. Technology is providing us with the tools and insights to see more deeply into its richness and fecundity, and above all to recognize its sentience, and to understand how intelligence, indeed, consciousness, pervades its every living part (2000, 2).

Clearly, we have witnessed a revolution related to the cognitive shift and processes of transforming the technologies to enable intelligence which primarily enables us to build our fully charged, responsive performance environments and our various wearable devices. By bringing the technology “closer to middle,” we have greatly contributed to the erosion of what we perceived as accepted boundaries between the physical and virtual worlds. “[T]he tools and insights to see more deeply into its richness and fecundity” have facilitated the creation of desired performative experiences, hailing the audience’s memories of the use of technology in my past work and the development and changes that emerged over time.

As we brought the technologies closer to us – meaning, when they were fully blurred into each one of the works we created – they were no longer considered fictional or made only of traditional methodologies. Rather, when the technologies and the dance were combined, they revealed a new desired narrative. What we have embraced in this process is similar to how we looked at the dance: we no longer accepted the notion of the technologies as static phenomena, but consider them to be a part of a fluid and invigorating process that is in constant transition and increasingly accessible, ecstatic and/or alternatively often in meditative state. As we operated under the assumption that the dance and the dancers were shifting their spatial central point of view within their given performative territory, we sought to establish the notion and ultimately the practice that the technologies are experientially and intentionally operationalized and intrinsically set in motion. Beginning with shifting the projected imagery in real time, we then moved on to light, easy to wear,

flexible, portable, interactive systems and wearable computers, motion video tracking systems and more. The transformation that occurred in the ways we interact with our technologies was quite remarkable; they attended to our new sense of mutual responsibility, but have also become more intimate and personalized. And the less cumbersome the wearable technologies, the closer the knitting between our bodies, minds and feelings.

In his yet unpublished paper entitled “Improvisation and Intimate Technologies,” my colleague Kent De Spain writes:

Digital technologies are, however, intrinsic to our lives now and we have enfolded them within our most valued processes, our most intimate spaces – communication, creativity, memory, love. If we are looking for a roadmap to compelling creative interactions with and through that digital world, simply improvising with the technology is not enough of an answer. Both Life Streaming and Discourse facilitate spontaneity and a shared sense of responsibility – and side step the potential for disembodiment and distance in our encounter with technology – through serious preparation and thought (2011, 11).

Kent De Spain’s statement substantiates the ways I understood the role of technology in the pursuit of creativity while interacting with the physical world. It can be argued that one must proceed with care and be cautious to avoid favoring one over the other – meaning, avoiding side stepping one for the other or allowing the exclusivity of one to overpower the other. In my current process, they have become fully inter-dependent, coexisting in total harmony, one feeding the other, intertwined in the quest to create better work.

It is utterly impossible to ignore how much more we know about our physical bodies today as a result of the myriad technological inquiries and continuous physical research in our studio setup. This knowledge is manifested through our own ongoing quest for and pursuit of new movement material, and through endless exploration of how cyber dancers move and operate, thus affecting and continually inspiring us to maintain a dynamic point of view about ourselves by way of recognizing our physical and mental cognitive capabilities. Following a close examination, we found that the kinesthetic understanding of our immediate relationships to space and cyberspace have been altered and enhanced; consequently, we are more capable of operating while ignoring gravity and shaping our options of operating in the moment, as when jumping in the air or getting very low by way of digging our way into floor patterns. In other words, the lower our bodies were in space and the more we attempted to utilize the floor with our physical bodies, the better our

chances were to push away into the air. We developed a heightened sense of self and the ways our muscles memorize and retain information and movement material. We have experienced dealing with longer, more complex, undulating, gesturing, fragmented movement phrases while operating simultaneously in the physical world and in cyberspace; we defied the physical uncertainty associated with operating in cyberspace and in the process we have become accomplished citizens of cyber and physical space, better able to deal with matters of perception and mediation in both realms – sometimes singularly, sometimes in tandem.

In 1994, my collaborative team and I first deployed our fully matured interactive system and were introduced to the notion of audience intervention and mediated input during the first performances of *Dancing with the Virtual Dervish: Virtual Bodies*. Although this work was created well before I began the journey of the Planetary Collegium PhD program, its monumental scale and the multiplicity of its technological concepts, execution and the experience gained makes it worthy of briefly mentioning the intimate community of artists, technologies and the combined elements that made it possible for us to comprehend higher levels of studies and future works.

Dancing with the Virtual Dervish: Virtual Bodies was a collaborative project in virtual reality (VR) between visual artist/designer Diane Gromala, architect Marcos Novak and myself as the choreographer. It was funded with a major grant from the Cultural Initiatives Program of the Department of Communications in Canada and included a two-year residency at the Banff Centre for the Arts, roughly from 1991 to 1993. *Dancing with the Virtual Dervish: Virtual Bodies* resulted in several virtual dance and interactive performances between 1994 and 2003 wherein the designer, the dancer, the architect and audience members performed and interacted with a virtual environment in real time. Large-scale video projections of what each participant experienced created another level of (VR) within the performance space, and further encouraged audience participation by seeking to shape the possibilities of the moment. The opportunities and limitations of the technology were embraced and explored, resulting in new creative strategies and directions for further technological development. Clearly, this work (of monumental scale and proportions and with multiple iterations) was integral to my preparation for joining the Planetary Collegium PhD program (and for Diane Gromala, who also completed this degree).



Figure 39: (*Dancing with the Virtual Dervish: Virtual Bodies 2002-2003*) The VR as seen by the dancer through the helmet was projected on the screens so that the audience could experience it as well. As the dancer, I manipulated their navigation through the virtual environment (which was the inside of a human body) using a head mounted display and data glove.

After entering the program in 2003, I expected my previously acquired knowledge to integrate seamlessly with the task at hand. Indeed, my experience greatly helped me to reenter the long-awaited learning mode. My primary goal was to let go of predetermined concepts and outcomes of which I have been aware from the onset of this journey. I have fully surrendered to the notion of relinquishing control of what I knew about particular technologies and how I can work in cyberspace and in the physical realm; this meant that I did not allow myself to predetermine ideas about formalism, narrative, storytelling and/or site-specific/site inspired dance. I have also let go of earlier understandings of what I perceived as embracing the participatory power of members of the public; instead, I have reentered the process of seeing, zero point methodology and deep listening (which is very different from looking), all of which I believe to be intellectual exercises. Seeing while fully committed to listening, being ready to change, experience, create and proliferate, means that one is engaged in the ‘act’ or the idea of openness, welcoming the unpredictable

and unknown. This state of mind allows for the weaving of a philosophical and theoretical fabric from the threads of related actions and skill development.

A useful hypothesis is that by letting go of what I knew and my predetermined notions related to technological and work making was of the utmost benefit to my collaborators, myself and the new works we were pursuing. I argue that it allowed us to re-engage our process in a state of zero point methodology and ‘deep listening’ from which we referred to a higher level of concentration that we have only experienced when we were initially learning how the physical human partner engages in performing highly sensitive physical manipulations with a partner that is artificially constructed and placed in a shared virtual performance environment. This practice is inherently transformative, and it reminded of several personal conversations while collaborating with composer Pauline Oliveros wherein she argued that in the state of deep listening we must take advantage of how our minds and bodies are being challenged. She argues that they must come together to accomplish what she referred to as a practice based upon principles of improvisation, ritual and meditation (equally practiced by dancers and musicians alike) in order to reach a higher level of concentration, coherence and clarity. This kind of listening is experientially operationalized and relies on corporeal memory and empathy. It can be elevated with the support of a fully charged sensorial landscape and additional fully designed sound installations.

I have found evidence of my intentional transformation (via deep listening, corporeal intentionality and zero point methodology) embedded within and made possible by my affinity for handling multilevel tasks, which in this case were primarily about learning, teaching, creating new works and conducting research. What I have sought to accomplish is integral to the ethos of this program, which mandated that all resulting work would be grounded in this heightened sense of self and self-awareness. I fully re-committed myself and expected to create works that were vital to my future as an artist and to my newly acquired experiences, and to that end I routinely labored to leave all of my muscle memorized patterns and acquired previous dance vocabularies behind, along with what I have previously perceived as knowing and all of my well crafted methodologies, in order to reemerge anew.

A higher level of technological, physical, virtual and theoretical mediation took place. The newness of this research process and discovery was grounded in the drive for better understanding of corporeal and reciprocal operational perceptions and performance habits between humans and cyber-humans. This reciprocity – as a process – was enabled by the creation of human-like machines, meaning the use of various highly charged (most advanced levels of) wearable computers and additional sensorial devices/interfaces by which the human and ‘machine’ seamlessly redesign and feed each other. This augmented new ground has demonstrated how, as a result, one can erode the distinctions and boundaries between the physical human (with its augmented wearable devices) and the virtual world that it generated. Thus, they become one synthesized unit, operating in an organic manner, all along remaining receptive to the immediacy of space and time consideration and tuning into new sensations and aspirations for the creation of what ultimately became my own narrative. The positioning of myself within the ever-changing notion of embodied cognition related to the aims woven through my quest for physically-based practices in partnership with technologies, arts and the humanities was necessary throughout the creation process.

The nature of learning and research training required for the pursuit of this thesis grew organically within the learning and work process; as such, it was enacted through acute conceptual awareness, constant skill augmentation, papers, presentations, attending conferences, further technological exploration, related background readings and practice through performative and art installation events. These activities inevitably became our laboratory for exploring the lines of interaction between all of these combined processes. There were, however, a few inherent difficulties embedded within this process, such as the quest to find a mutual language between the physical and the perceived intelligent constructs, between human and cyber-human as counterparts and possible integration between the human and technologies involved. One such purpose transforms performative experiences into muscle-memorized patterns, which then become the primary components for which they adapted the identities of our new virtual construct, our cyber-human performers. In other words, the aim is to ultimately identify and accept that they (our cyber partners) are no longer operating outside of us but rather on the inside, no longer considered externalized performers, but rather existing through the work we making. Like most of our technologies, we wear them, we manipulate each other, we learn from each other’s

behavioral patterns and we engage in the magic of performance. The intimacy between human and cyber dancers in performance mirrors the intimacy within the community of international artists working in this field.

What I have sought to accomplish was to make a habit of crafting my research, learning and work as a pragmatic, honest, transparent endeavor. Part of this was always writing about work and research following a performative experience that normally requires further observation and analysis before premising my claims based only on assumptions. Clearly, for myself, the experience gained from performance coupled with its conceptual development better validated and authenticated the overall results. It gave the writing about the work the legitimacy it was lacking. I may go so far to say that it has become a tenet of the way I write about how I make work, and this critical reflection has, in turn, affected the way that I make work.

It will do very little justice to my thesis if I will refrain from referring once again to the profound influence and inspiration I drew from choreographer Merce Cunningham and his long time collaborator John Cage. Both artists and innovators did not hesitate to create their artwork with utmost integrity and courage. Their developed understanding and vision of how radical new ideas can eventually be accepted at face value forged a comfortable mode of working for both artists without a prescribed hierarchy of elements or requirement that they be developed before the performance and in conversation with one another. The introduction of various methodologies such as ‘chance operation’ have served them well in (randomly) generating last minute compositional decision making, how to begin making dance and music at the root, and the development of concepts such ‘beyond plotless’ and ‘open form.’ Each of these were (and continue to be) utterly fresh and continually vital for these and other artists.

In the introduction chapter of *Merce Cunningham*, editor James Klosty writes, “Cunningham’s association with Cage was as much an idea as it was a fact. Their working together brought forth a new aesthetic holding that dance is dance and music is music – an aesthetic so simple that few were able to accept it with equanimity” (1987, 11). Cunningham’s and Cage’s methodologies related to their commitment of freeing the dance to be dance, music as music (co-existing in space and time), working ‘beyond plotless’ and

‘open form’ served as guidance for my work created exclusively when I served as the director of the American Deaf Dance Company (1979-1983), and later on working with technological mediation. It reinforced and legitimized my ideas about the need to completely free Deaf Dancers/performers from dependability on traditional music compositions, which they could never hear or follow. The option of employing sound based music compositions that did not necessarily adhere to repetitive or more complex rhythmical patterns facilitated the creation of a more cohesive and coherent set of dances (free from the need to follow the music). Interestingly, members of the audience were often under the impression that the dance and the music were indeed created for each other. However that was not the case at all – it was the consequence of ‘chance,’ ‘randomness,’ and the co-existence (dance as dance and music as music) in space and time progressing in parallel to one another that prevailed.

In the introduction chapter of *Merce Cunningham*, editor James Klosty has this to add about Cunningham’s ways of developing choreography:

Cunningham proceeds to develop a choreography and a technique based on the kinetic integrity of the body unconstrained by the rhythmic, melodic or formal proposals of an external music. It was a concept of dance quite beyond plotless Balanchine or Ashton’s *Symphonic Variations*, those highly refined examples of an art that has always been subsumed in implied or explicit musical structures. Cunningham chose to begin at the root. He turned dance back upon itself, focusing on its primary component: each movement as an atomic gesture in time. He felt that dancing need not concern itself with narrative nor with philosophical, psychological, or mythic pretensions. Presumably, if one danced, and danced well, that ought to be enough both for the dancer and for his audience (1987, 11-12).

I find it most intriguing how Cunningham “turned dance back upon itself” and the noble notion that “if one danced and danced well it ought to be enough both for the dancer and for his audience.” In actuality, this requires greater attentiveness, focus and concentration from the part of performance attendees; the absence of a ‘plot’ allows more freedom for each attendee to make up their own view, narrative and create meaning for themselves. For some audience members, it was a not always a welcomed responsibility – some not only had a hard time relating to the work, but often simply left before the performance event concluded.

As a practicing artist, researcher and teacher, I have endeavored to accomplish the upgrading of knowledge and experience, whether that knowledge is pursued through technological exploration, through all related and background readings, or through additional learning. The nature of research training required for the pursuit of this thesis was the foundation for the work process, incorporating a range of methodologies that have been deployed in support of a heightened sense of extended knowledge. As such, it was ongoing throughout the research thesis, practice period and beyond. It was enacted through acute conceptual awareness, increasing behavioral competencies, constant skill augmentation, continuous research and applied new discoveries related to how the body works in virtual environments and in the physical world.

One of the primary aspects contributing to the training in the Planetary Collegium program were the required, organized upgrade report meetings (composite sessions) and the subsequent related open international conferences. These were held three times a year for ten working days in various locations around the world. Within this valuable supportive learning environment (a microcosm of the larger network of artists using technology), we were also left with ourselves within our own specific understanding of our world. I have managed to emerge from this world and create my own narrative, and in doing so, I have always invited performance attendees and the reader to explore the various options made available to them, whether through input into the multiple interactive systems or through the many ways made available to them to become co-creators. For them, it was not only a matter of experiencing the work, but also a matter of choice and agency.

My intention as an artist with a commitment to collaboration, innovation and experimentation is to continually immerse myself in the ongoing process of technological exploration, situating technology as a means to an end. I am also committed to the serious questions that emerge suggesting ‘topologies of temporality’ (meaning how would I address the greater notion of space and time). How would I participate in the global quest for determining the role of the physical body, resisting what it could become (i.e. a limitation of mobility, etc.) and embracing the notion of embodiment with/in/as a partial machine (the cyborg condition resulting from the use of wearable technologies)? I flirt with the subversive qualities of suggested magnified understandings of representation. In other words, the cyber-humans begin to experience the intersections between the grounded

human, or their own physicality experienced in physical space, and the immersive/virtual experience occurring simultaneously – the duality of existence. No matter how deeply involved I become in this process, the major issues and questions remain, suggesting the dramaturgy of performance content, internal and external time and consciousness continually reframed.

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APPENDIX 2: Performance Technology Collaborators

Body Automatic

Anita Pantin: visual artist, designer
Russell Pinkston: electronic music composer, programmer
Yacov Sharir: choreographer, principal animator, performer

Convergence Identities

Diane Gromala: VR design, concept
Tom Lopez: electronic/interactive music composer, interactive systems activator
Yacov Sharir: VR concept, primary animator, choreographer, performer
Chris Shaw: VR programming
Wei Cheng Yeh: wearable computers versions one and two design and construction, digital technologies

IntelligentCITY

Sophia Lycouris: choreographer, media and video artist
Yacov Sharir: choreographer, animator
Stan Wijnans: multimedia composer, sound designer
Wei Cheng Yeh: digital artist

The Twining Project

Hesam Khoshnevis: wearable technologist
Barbara Layne: wearable design, construction, weaving artist
Ray Schwartz: choreographer, performer
Yacov Sharir: choreographer, performer
Jack Stamps: composer

Too & For

João Beira: media, sound designer 3D video artist
Tom Lopez: electronic music composer
Yacov Sharir: Concept and choreographer

CyberPRINT

Jim Agutter: wearable computer design and construction

Julio Bermudez: architect

Tom Lopez: electronic music composer, interactive video tracking system activator

Amarante Lucero: high-end lighting designer

Anita Pantin: art designer

Yacov Sharir: computer animation 3D modeling, choreographer

APPENDIX 3: Technology Used in Performance and Research

Body Automatic

A touch-sensitive dance floor/Musical Instrument Digital Interface (MIDI) controller, capable of transmitting precise position coordinates, velocity and pressure information in the form of standard MIDI messages, was developed as an environment for the creation of interactive dance works. The surface consisted of a large number of Force Sensing Resistors (FSRs), which were attached to heavy-duty plastic sheeting and covered with polyethylene foam. The sheets could either be placed on top of or beneath a standard dance floor.

Computer animation designed in Poser version 5 and then transported for further manipulation in 3D StudioMax versions 4 & 5

softVNS, an intelligent external video motion tracking (MIDI) processing system invented by David Rokeby

Projection system and rear projection screen

Convergence Identities

Computer animation and 3D modeling worlds

Virtual reality technologies, head mounted visual display and navigational data glove

Several generations of animated cyber-human dancers designed in “Poser” version 5 and in “3D StudioMax” versions 4 & 5

Two generations of home made wearable computers

softVNS, interactive, intelligent external video motion tracking MIDI processing system

Three projectors with distinct appropriate lenses (wide, long throw and mid range), placed/suspended in strategic locations in the theatre

Front projection scrim and rear projection screen

IntelligentCITY

Projected large animated and physical images, projection scrims and screens, multiple high-end projectors/systems

3D surround sound (the sonic material, processed through MAX/MSP)

Multiple interactive sensory-based systems (inclusive of bend sensors, proximity, force resisting, touch sensitive, weight- and heat-sensitive sensors)

Three wireless surveillance video cameras

Two (home made) generations of wearable computers

Several mothership computers placed in strategic locations in the performance space designed to synchronize large-scale data collected from the various technologies distributed in and around the performance area

Several generations of animated cyber-human dancers (designed in Poser version 5 and in 3D Studio Max 4 & 5)

Three projectors with distinct appropriate lenses (wide, long throw and mid range) placed/suspended in strategic locations in and around the site-specific areas, front projection walls and rear projection screens

The Twining Project

Three generations of the wearable garment

Video motion tracking system

Computer animated textiles and physical corresponding textiles

Hand woven fabrics

Light Emitting Diodes (LEDs)

Electronic circuitry

Computer animated cyber-human dancers

Laptop mothership placed in a strategic location in the theatrical space

Interactive text messaging system with a hardware connector that links the computer directly to the “Basic Stamp” software

Too & For

3D video recording system

“Multi Touch Screen Technology” and “Plural Touch Technology,” ranging from earlier limited one finger touch intervention with the touch screen interface to the more recent multi touch (using up to ten fingers at a time)

One iPad

Two projectors placed on top of each other (5,000 lumens each) synchronized to maximize high level of image clarity

Projection scrim suspended in the very front of the proscenium line (designed to fully immerse the dancers on stage while in performance)

Six dancer costumes (designed to accept projected information, thus serving as additional projection surfaces)

CyberPRINT

BioRadio 110 (made by Cleveland Medical Devices Inc)

Physiological sensors (EEG [Electroencephalography] and ECG [Electrocardiography])

PC mothership placed in the control booth located at the rear of the theatre

Projection system and projection scrim

Large scale projected images

softVNS, interactive, intelligent external video motion tracking (MIDI) processing system

Sonic material, processed through MAX/MSP (visual programming language for music and multimedia)

APPENDIX 4: DVDs of Related Performative Works

The footage and images on these DVDs represents samples and iterations of some of the works discussed in this thesis.

DVD #1: *Too & For* (2012)

- *Too & For* includes a short and long version of this piece in performance which includes six physical humans and projections of real time generated single- and multi-touch technologies.

DVD #2: *Twining Project* (2006-present)

- *Twining Project* includes samples of animated cyber-textiles and physical textiles interacting with a physical performer, animated cyber-textiles interacting with a cyber-human, a set of still images of a performance and an improvised session with physical humans and wearable computers.

DVD #3: *Body Automated, Lullaby* (2004-2005)

- *Body Automated* includes four phrases of animated cyber-humans in performance.
- *Lullaby* is an example of an interaction between cyborg, cyber-human and physical human in performance.

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Keywords: Gestures, Rippled/Waved Bodies, Interactive Visual Language, Cognitive Linguistics.

"A journey from the physical to the virtual and back again"

The initial pursuit of the journey from the physical to the virtual and back again is based on a unique ongoing research process that had to be conceived, constructed, and tested over a period of ten years. It included several technologically mediated productions, design elements, performance space, content and meaning. Dance practitioners and choreographers are traditionally engaged in an on going process specifically designed to discover how else the human physical body can be challenged and move in so many ways that are yet to be conceived. This ongoing practice takes place in the physical realm/space whether being performed in a theatrical, alternative or site-specific space. The technologically charged mediation employed in the pursuit of this on going research and work such as the use of sensory devices, wearable garments, smart intelligent textiles and computation is dramatically affecting the outcome of what we currently know as formal dance. The perception of what is possible and or what it might lead toward strictly as organization of bodies- physical and virtual - in space and time - are re-examined, allowing us to greatly contribute to this very important effort and other related new options.

Background

As a dancer, choreographer, media artist, and researcher in the mid to late 1980s, my work has been in the forefront arena of technological development. I was one of the first artists to conceive, manufacture, and interact with cyber-human performers and employ virtual reality technologies for the pursuit of performative dance/arts events. The research and creative works presented in this lecture have been experienced and operationalized, and they continue to explore physical and performance augmentation with the use of wearable computers, real time interactive systems, computer animation, 3D worlds designs, and virtual reality/environments; thus, my dance artwork, research, and technologically charged practice are profoundly embedded within the emergence of the larger trans-disciplinary community of practitioners. This background is central to the work outlined in this document, leading toward the realization and completion of my pending and future works. It provides the resources that fuel the methods of this body of practice and research.

This lecture also addresses the practical performance practice, the thematic ideas, and the theory base that specifically attend to the **"technologically manufactured cyber-humans and their co-existence with physical-human/counterparts while engaged in performance."** These concepts were set to examine, establish, and gain experience that applies not only to the cyber-human but primarily to the human dancer/performer and to the way his/her ability can be augmented in order to exceed the physical boundaries of what is defined as "dance" in the way we currently know it. Questions arise as to how is the art of dance affected when we employ interactive systems? How is the act of choreography altered while immersed simultaneously in a physical and in a virtually constructed environment? Is it

possible to design/create a highly intelligent mover (cyber-human), which is indistinguishable from a human dancer?

My over all research/work/interest lies in the following four areas:

- The use of multiple interactive systems distributed over multiple locations
- The creation of wearable computers/devices
- The design of animated characters/cyber-human performers
- 3D worlds and virtual reality/environments

These research categories are created for the sole purpose of monitoring controlling, and augmenting all aspect of production/performance in real time.

Convergence Identities

For dance practitioners the interface between mind and body is a field of energy "vital force" often referred to as the "Core". Through practice and performance dancers acquire the skill to apply and manage "vital force" by mobilizing several body and mind centering techniques, and acquire the ability through increased awareness to productively distribute this power where it is needed at a specific moment. Together they create a link between the physical existence and the spiritual state of transcendent consciousness, assuring a coordinated operational continuum between the two.

Dance, movement, yoga, and martial arts, are all forms of somatic practices. All can be used as physical performative communication modalities by uniting the physical and the spiritual as an integrated whole. It is important to note that although all of these practices require a simultaneous physical, and spiritual connection, it is the act of performance that grounds them in the body, which is continually engaged in a transformative process. Questions arises as to what are the opportunities presented to us when we consider interactive technological mediation? How can performance be augmented with the use of these technologies? How can the physical human body and the artificially constructed cyber body can operate autonomously?

"One of the aims of the cutting-edge French experimental performance group "The virtual Tightrope Walker" team¹, Michel Bret, Marie-Hélène Tramus and Alain Berthoz" is "to create arts installations showing virtual actors who are endowed with artificial perceptions that enable them to react in an autonomous way to the cues given by spectator (or by the physical performer/operator), thus opening art and cognitive science to a whole new range of possibilities for the exploration of virtual life". Further more, they now believe that "the sensorial aspect also may be envisaged from the point of view of the work of art itself, as the work has become endowed with perceptions of its own". This raises one of the most crucial questions in contemporary digital arts: that of the relationships between natural and artificial "perception-movement-action" and "function".

This important notion of the virtual actor endowed with "artificial perception and autonomy" is consistent with my attempt to share similar experiences that arises from many years of shared performance space and practice with multiple generations of computerized cyber

¹ "Interacting with an Intelligent Dancing Figure": Artistic Experiments at the Crossroads between Art and Cognitive Science Michel Bret, Marie-Hélène Tramus and Alain Berthoz, 2005 ISAST LEONARDO, Vol. 38, No. 1, pp. 46-53, 2005 47

human characters. I have continuously experienced the presence of a shared energy field (of sort) that is present in performance much similar to the energy shared between two physical human bodies/dancers as they interact in more traditional dance forms, partnering work, and as practised in dance contact improvisation.

Steve Paxton. One the most influential pioneers of contact improvisation. Describe "Contact Improvisation (CI) as a means to explore the physical forces imposed on the body by gravity, and by the physics of momentum"².

"Touch is a non- verbal language and very richly evocative in intention, direction, suggestion, and refusal, through the point of contact there is a two way system of communication, listening and responding, commitment and questioning, leading and waiting".

In this situation, trust becomes a top priority. The improviser Paul Langland adds "the performers need to release tension and uncertainty and meet one another in an open, relaxed way, otherwise they will not be able to establish the connection that is essential to the process of reciprocal improvisation"³. Similarly to CI, in addition to the obvious electronic connection, the partnering movement actions between a physical human and a cyber-human is improvisational, and sensational.

While in performance a 'reflection' of my own physical representation is projected on a see through surface in the form of a cyber-human. My physical actions, movements, and gestures are enacted; at this point, the wireless electronic and physical contact (from afar) between my cyber partner and myself become more intensely intertwined and committed to the moment-by-moment unfolding of the "duet". Through repetition these enacted gestures and moves are muscle memorized and can be performed intentionally or unintentionally by either one of us depending on the situation at hand. As in CI, the success of such tactile, physical, virtual, and spiritual interaction necessitates mutual support and trust, which is to say that there are many levels by which we are interacting over and beyond the range of our ability, our experience, inhibition, and electronic connection.

Definition

By attempting to define my shared experience, I am seeking to identify other artists and scientists that are conducting similar or related research that can shed some light or suggest ways for sharing similar performance experiences.

I work in the context of interactive performance, and in relation to the artificial construction of virtual worlds and performers that eventually can take on life and actions of their own beyond the electronic connection. At this time I am speaking from my own performance experiences, but I am also relying on research, performances and a series of references that I am now presenting (non exhaustively at first) by other practitioners, ultimately leading toward the delivery of clarity in definition and realization of my stated assertion, question and purpose.

My research is not limited exclusively to how my assertion is supported through technological mediation; I am also looking at alternative communication modalities such as in "cognition",

² Steven Paxton, "My Rise and fall in Contact Improvisation" Contact Quarterly winter, 1990

³ Paul Langland, The Illustrated Encyclopedia of Body-Mind Disciplines, Nancy Allison, CMA Editor, "The Development of Contact Improvisation"

specifically in the realm of the body mind centering techniques, "energy expansion" within the context of dance, duet partnering, and contact improvisation, "transformational, and transcendental actions", researching exciting dormant powers, primitivist and spiritualized vision of "action patterns", zero gravity, inertia, friction (between two bodies), centrifugality, and momentum within the context of ever-varying internal and external states. Thus I hope to demonstrate the need for better understanding of this phenomenon.

Interactivity and suggested "Second Interactivity"⁴

I do not necessarily consider interactive art as highly communicative in its principal practice, but rather I am fascinated with the option for the construction of sort, and the introduction of certain type of sensorial understanding. More specifically, I am interested in the consequences of audience participation and their contribution to the process of shaping performance in real time. They too develop a point of view that may need to be considered more seriously. Although (traditionally) the same type of sensorial understanding and practice is primarily exercised by the physical actor/activator, I am looking at the model of arts installations emerging as a more suitable forum for attendees to better understand the importance of their contribution.

In order to move toward what they suggest as "second interactivity," in reference to "second cybernetics"⁵. "The Virtual Tightrope Walker" team, conducted research drawn "from cognitive science and biology, especially connectionism, genetics, and the physiology of perception and action". "Second Cybernetics" as in dance improvisation also "deals with more complex and fuzzy relationships that are closer to intuitive human behavior, compared with previous cybernetics".

Like in dance practice, Tramus leads us to an often unknown and undervalued form of thought that she calls "body-thought"⁶. To that notion I would add the term often used in dance practice as "muscle-memory" and unplanned "action-patterns", in order for us to better understand how an artificial construct/counterpart can begin to behave on his/her on. Berthoz calls this counterpart the "doppelganger". "To self-configure, would be favorable for the development of experiments on the body-brain-environment and interactions of a virtual creature"⁷.

It is within that context, that my artistic practice have converged—literally and figuratively—in this realm of utilizing interactive sensorial based systems that are activated through human postures; gestures, movement and communication between real and the perceived/virtual.

"Communication scholar Sheizaf Rafaeli suggests that "Interactivity is an expression of the extent that in a given series of communication exchanges, any third (or later) transmission (or message) is related to the degree to which previous exchanges referred to earlier transmissions". Sheizaf Rafaeli⁸.

4 "Interacting with an Intelligent Dancing Figure": Artistic Experiments at the Crossroads between Art and Cognitive Science Michel Bret, Marie-Hélène Tramus and Alain Berthoz, 2005 ISAST LEONARDO, Vol. 38, No. 1, pp. 46-53, 2005 47

5 E. Couchot, M.H. Tramus and M. Bret, "La seconde interactivité," in *Arte e vida no século XXI*, Organizadora Diana Domingues (Brasil: Edition UNESP)

6 M.H. Tramus, "La question de la multisensorialité dans les arts numériques interactifs," paper presented at ISEA 2000, available on-line at Actes ISEA 2000 <<http://www.isea2000.com>>.

7 A. Berthoz, *La décision* (Paris: Editions Odile Jacob, 2003).

8 Sheizaf Rafaeli "Wikipedia" paper, *Interactivity: From new media to communication*, In Sage Annual Review of Communication Research: Advancing Communication Science, Vol. 16, eds R. P. Hawkins, J. M. Wiemann and S. Pingree, 110-134. Beverly Hills, CA: Sage.

Rafaeli's concept of three way communication exchanges clearly suggests that interactivity is not merely a mouse click-web surfing mechanism but rather a more complex communication modality that must produce a three ways action/reaction in real time. Thus allowing a third party (of choice) to participate in contributing to the creative process.

To this end in his article "The Importance of Being Interactive" technologist-artist Mark Coniglio suggest "By using new technology to allow our performers to become real-time creators, and by asking our audience to be present to their on-the-fly artistry, we ensure that each performance of a work is absolutely unrepeatable, which may be the boldest move of all"⁹. Interestingly Both Rafaeli's and Coniglio's notions (presented in this case from two very different sensibilities) requires the same technological support that can enable that high level of participation.

I am gradually realizing however that the technological exploration, tools and, sophisticated interactive systems alone will not lead to a final conclusion. A workable language must be developed to better understand and describe the interactive performance experience with an intelligent, autonomous, artificially constructed humans and how they can take action on their own.

The self-descriptive, self-reflexive and recursive processes of consciousness reveal themselves as a dance of real and computer manufactured (virtual), flesh and re-configuration, sensory presence and re-presentation, cognition and re-cognition. In the ordinary flow of conscious experience, these pairs are not encountered as binary oppositions in conflict, but in a continual dance of transformation, one into the other. I converge with my own creations—the technological tools—and give birth to untested tools and new gestures of both consciousness, leading to physical actions.

The Emotional, Poetic, and Spiritual Connection

The emotional engagement to which I can attest is most potent while the physical and the virtual characters are engaged in attempting to touch, interact and or find ways for manipulating each other. These emotions and feelings are affecting the actions and the outcome of performance in ways that are unpredicted prior to the act of touching. They are situated within the phenomena of "autonomy" (for both the real and the virtual actor). According to Varela "autonomy means internal law related to self-generation, self organization and the affirmation of identity"¹⁰.

The online Magazine for artists embracing technology "Digital Performance" fall 2004 conducted a conversation with Sarah Smirnoff and Hal Eagar the creators of "The Adaptation of The Sandmann".

"Terra, the performer manipulating the digital puppets, mentioned that she was better able to synchronize her manipulation of the digital characters when she was looking at Tony, her fellow performer, and making an emotional connection with him on stage"

"I did not feel that the characters were successful in making an emotional connection - BUT - I do think we are closer to figuring out the steps to understanding how and what the actors need to connect to each other while using the technology"

⁹ Mark Coniglio, "New Visions In Performance" 2004, "The Impact of Digital Technologies" (p.12).

¹⁰ F.J. Varela, *Autonomie et Connaissance. Essai sur le vivant*, édit (Paris: Le Seuil, 1989).

Jools Gilson-Ellis asserts, "Technology has made different kind of poets out of us, referring to his collaborator Richard Povall. Together we sing ghost songs. We have haunted mouths, and speaking flesh. Together we imagine impossible things that I can write, but not make"¹¹.

Alternatively, in my work I can make things that are possible to experience but difficult to describe. They can be seen they can be felt but are lacking the technological and scientific justification that can support clear definition. By that I mean what exactly takes place when a cyber counterpart behaves autonomously and take life/behavior on it's own? What (if any) is the combined mechanism that facilitate for such a phenomena?

"Together we make things that I can't imagine. We barter noisily like grandmothers. Because I am a writer, and trade in poetry, so I tempt technology to do the same".

Rational

It is important to note that because many of us in this medium of interactive performance, are usually doing quite different things, I see remarkably little mutual understanding taking place, not just in aesthetic, but also in fundamental approach. There is as yet not much of a workable critical theory around most of this work, and therefore there is little commonly understood language to describe what we are all trying to do. Consequently, too much inevitable hype and rhetoric has been introduced without any apparent "product to showcase". Beyond that, this lack of productivity is only serving to intensify some of this uncertainty and confusion that have accompanied most of the makers.

That said, great advances have been made in several areas related to performance arts and interactive "intelligent installations". Internationally recognized collaborative teams conducting important experiments at these crossroads include the following unusual combinations: cognitive science and biology (1), connectionism, genetics, and physiology of perception and action (2), neural science and networks (3), and artificial, "haptic teleoperation" (3). Also the introduction of notions such as "Second Interactivity" (4), and "Body-Thought" (5) are very important and intriguing, they can potentially lead to some very important different research areas and combinations.

The Absent Body

"The Absent Body Project"¹² is a computer generated cyber human dance that exclusively employs computer-generated characters/performers stored on a mother ship that is placed strategically in the performance space. Very clean and clear computerized animated images/cyborgs were created with illuminated passages and transitions, a kind of work that does not need a linear plot, but rather, inhabits a browser of sort, or a search engine attempting to search for the performers past experiences and or knowledge. This work did not need to be choreographed since it has neither a beginning nor an end. These characters are activated by/from a wearable suit/computer worn on a physical human performer (myself). They are activated in real time by utilizing a set of commands originated in this case as hands movement material "a way of remembering." These characters are commanded to operate in a structured improvised and random way by the wearer; they can be activated to move forward

¹¹ Jools Gilson-Ellis and Richard Povall, "New Visions In Performance", "The Impact of Digital Technologies" 2004, (p. 55).

¹² "The Absent Body Project" was first performed by the Sharir+Bustamante Dance Works at the University of Texas at Austin, McCullough Theatre, 2003.

or backward, fast or slow, start or stop, fast-forward and or rewind as needed in the moment. Additionally, the wearer/user can select to move instantly to the next set of characters/material that is waiting to attend performers. Thus, the dance is one of a kind sequence as it is experienced in the moment.

Computers typically respond to our direct commands for well-formed actions, but not to our spontaneously evolving inner desires and emergent ideas.

My way of working suggests that gestural recombinant knowledge and space visualization is a mean for augmenting creative innovation in a performative situation/set-up. My creative process is supported by a mode of textual human movement that is recognized by and through the use of multiple sensory devices and motion detectors. These devices then translate the material by numerical orders and or by an algorithm customization program(s) and mapping processes, providing me with the unique seductive power, agency, and the movement linguistic that continue to fuel my imagination.

The complex layering of language, image, and communication between worlds, both human and cyber-human, visualizes the shifting strata of memory, dream, and conscious visualization and meaning-production. The technologically supported feedback that loops between the real and the virtual have produced profound shifts in consciousness, experiences of being both embodied and disembodied at the same time "a duality of existence."

Wearable Interactive Devices

Wearable interactive devices and systems are in most cases either subsumed into the personal space of the user, controlled by the user, and or placed in a desired location where the performer can activate them as needed. They possess operational command systems when placed on the physical body of the user/performer, and interactional constancy when used as an interactive element, i.e. while used in performance they are always on and always accessible. Most notably, these devices have become an integral part and extension of sort of the user body, and into which the user can always enter commands while operating in and around the communication area.

By using/exploring the use of interactive technologies in performative conditions I am seeking to discover how electronic and sensory devices affect the way we communicate, how we can alter the mind, zone of awareness, feelings, and the walking consciousness. Interactive systems are much more than just wristwatches, jewelry devices, regular eyeglasses, different types of floor pads, and or motion tracking devices. They possess the full functionality of being a computer, a wireless communication system and by being fully interactive. They are also inextricably intertwined with the wearer either when placed on the physical body, on the performance floor, or when it functions as a motion tracking device/system.

Continuous research facilitates the augmentation of these systems operational sensory devices and attributes so they can fully function as a medium for inscription. They accept/detect human moves, morphing, scaling, making color changes, and adding new dimensions of expressivities and meaning to performance. As for members of the public/the users these systems provide them with the ability and opportunity to interact, and manipulate the display of information/images both virtually and physically. Images can be displayed onto large screens subsumed into the performance/installation space. The ultimate intention is to surrender total authorship to the user, and it is expected to be highly engaging, playful, and

somewhat provocative.

Considering my past experiences in the creation of virtual reality works such as "Dancing with the Virtual Dervish"¹³ and my current preoccupation with the creation and use of wearable computers and interactive technologies the "Automated Body Project,"¹⁴ I am planning to explore/research in the following areas/ways: how can we spontaneously detect evolving inner desires? How can we consciously form creative and fluid intentions and find the ways/means for interactively expressing these intentions? What kind of an interface can be created that can embody the creative, the informal, the fuzzy, and the physical?

The methodology suggested for such alternative research subjects/new work/process are as follows: An invisible/virtual door space "a means/metaphor for entering the creative process" is suggested/proposed; an interface of sorts will be created. Participant enters, sees and or experiences choreographed gestures and mappings that can recognize different degrees of intensity for single or multiple gestures. The used space is visualized through a vision-based gesture organizer and video motion captures (front and side views) using the record mode for the gesture recognition program. Eyes see simulations of creative intentions, and a model of parameter adjustment and content is facilitated.

Together they explore the interaction of gesture as language—as in dance, sign languages, and mudras—and the capacity of an inscribed language itself to embody and generate gesture. Human and cyber-dancers create and use the physical gestures and cybernetically inscribed movement intention to communicate amongst themselves. The visual language itself models sentience, having the technologically mediated property to absorb or sense meaning and then communicate, both within and to itself, and outward to its environment.

The gesturing or moving and its communicating environment become a visualization of the self-reflexivity inherent in the workings of both language and consciousness. I demonstrate and report on this dance between worlds of humans, cyber-humans, and language in the transformational domain of visible thought. The technologically mediated feedback loops between the real and virtual have produced profound shifts in consciousness, experiences of being both embodied and disembodied at the same time, both human and cyber-human, visualizes the shifting strata of memory, dream, and conscious visualization and meaning-production.

Conclusion

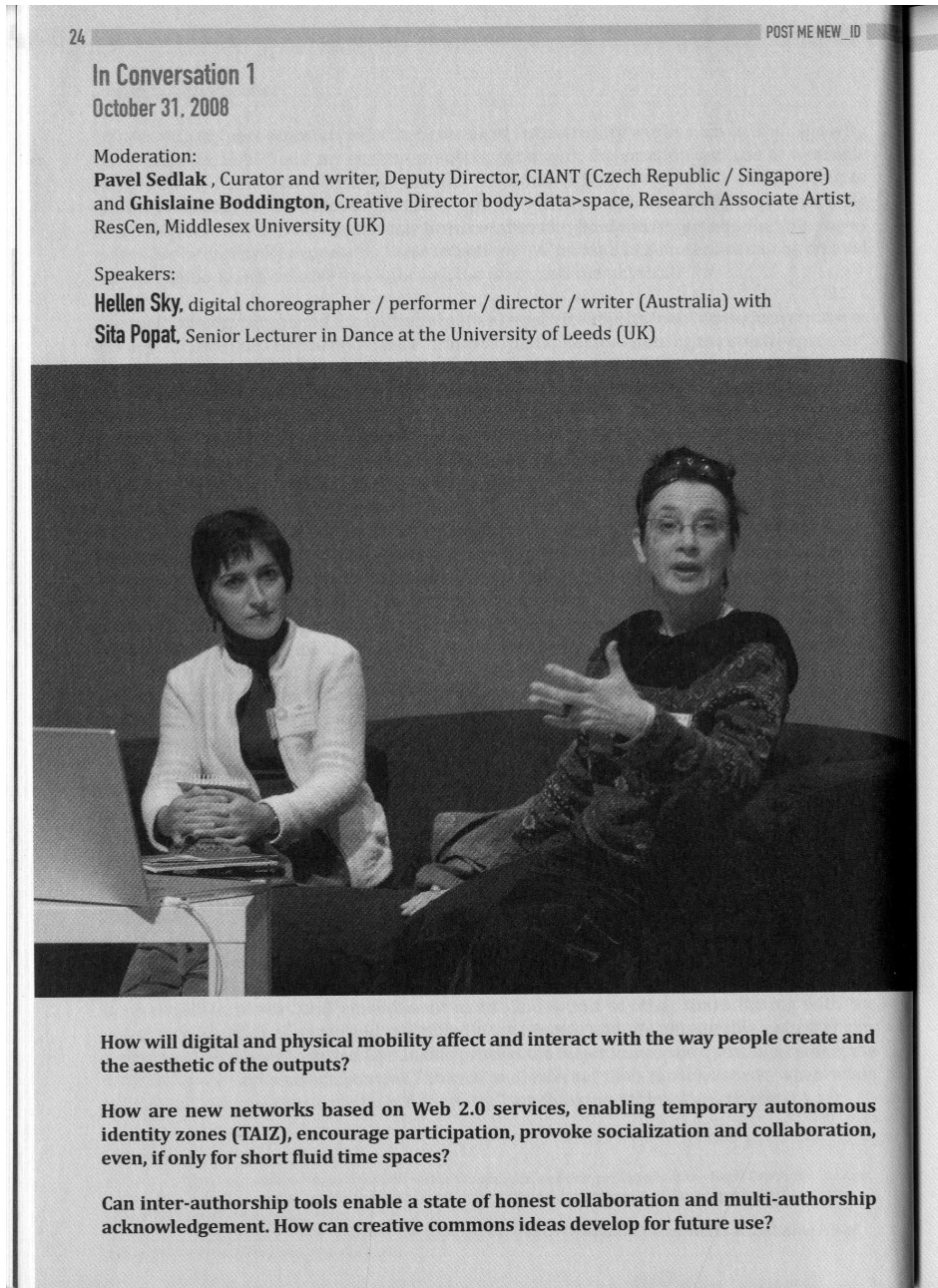
As I am heavily immersed in an ongoing process of technological exploration, serious questions emerge suggesting topologies of temporality. Questions arise from the physical body, resisting automation of sort and embodiment as machines and at other times flirting with the subversive qualities of suggested magnified performance and the pleasurable pain it elicits. No matter how deeply involved I am in this process the major issues and questions remain the dramaturgy of performance content, internal and external time-consciousness, when-when is/was/will-be no longer, or at least differently, I am thinking-I think-I am- thinking I...

13 "Dancing with the Virtual Dervish" was commissioned and first performed at the Banff Centre for the Arts, Canada, May 1994. It was also performed as an installation at the National Museum of Contemporary Art in Athens, Greece, "Synopsis 2-Theologies" 2002.

14 "The Automated Body" was first performed by the Sharir+Bustamante Dance Works at the University of Texas at Austin, Oscar Brockett Theatre, 2000.

Sky, Hellen, Sita Popat, Martin Kusch, Johannes Birringer. "In Conversation 1." *POST ME_NEW ID: The Post Human Condition of Modern Europeans* 14, no. 30 (2009): 24-29.

- Text of the panel discussing Yacov Sharir's Keynote address at the POST ME_NEW ID conference held between September 29-October 4, 2008 in Dresden, Germany.



As networks become components of our all of our everyday lives how will our networked identity/ies, practiced in WEB 2.0, move from semi-passive to truly active? Will we gather a feeling for a collective networked identity? Will identity itself be the main theme of the work to emerge?

This day will explore the physical and digital, the social and work based networking of creation processes for interdisciplinary artistic and technology projects. The aim is to envision the creative outputs of generations to come in relationship to the emergence of second generation realtime globally networked tools.

What is the relationship between identity and digital culture? How does the use of digital tools and network potentials shift identity psychologies in Europe in the 21st century?

Are the "I" politics of the west in the 90s dominant or is there now a space for "we" potentials of the next generation to emerge and make new multi-identity citizens?

Are intergenerational identity misunderstandings becoming restrictive to the evolution of new processes and new ID politics?

In the opening part of the conversation, the speakers deliberated on the issue of specifics of their line of work. They referred to Sharir's speech in which he claimed that any situation would actually involve both the physical and the virtual body and that, in his view, there was no separation between them.

What **Sharir, Popat** and **Sky** have in common is that, coming from performance history, they are all considering and dealing with the body. This is certainly a particular position when it comes to shaping their way of thinking of bodies and the extension of bodies through networks. It comes from the notion of how we move and perceive our moving, and also from the intelligence that we build up through our sensory perception because we have been moving for a long time and in different sorts of systems.

Popat noted that we were living in a world of partial attention, constantly aware of ourselves as present through a range of multiple media: talking to another person, working on a computer, picking up a phone or sending an e-mail. We live in multiple lines and we are partially attentive and partially inattentive; this could be described as a new kind of schizophrenia.

Both **Popat** and **Sky** are using network technologies in their work and therefore deal with a large number of collaborators; one of the things that occur in such work is certainly the language barrier. Some are also using communication-over-distance, video conferencing, phone and e-mail. Hence we are simultaneously negotiating our identities *in* and *with* different media. For **Sky** as a practitioner, those complexities are seen from yet another perspective: they depend on the context in which she is working at the time and the resources she would have at hand. Working within institutions, as complex as it might be at times for an artist working with her/his own set of rules and regulations, proves to be fruitful in terms of providing conditions for developing new technologies and new perceptions.

Sky further elaborated on the very evolution of perception enabled by new technologies: from how we inhabit the distribution of our senses into how we consider work but also how we consider our body as data. Once we do that, a dimming of a light can be perceived as a gesture. This notion of transformation is a great palette for a choreographer to start thinking within. The change that happened in the cinematic field when the still became movie could

be compared with the quantum leap in choreography that was enabled by the introduction of Motion Capture, which actually brought movement from the 2-dimensional video depiction into a 3-dimensional sphere, providing volume to virtual space. This and similar leaps were made possible because artists could work within institutions.

Popat added that such leap also happened when wires were replaced by different wireless technologies, when suddenly the interface became embodied rather than wired, which offered more options for dances and performers. So the level of quality of the merging and blending of body and technology really relies on some of the sophistications that have recently occurred. Popat's work is particularly concerned with using gestural interfaces i.e. acknowledges the body as a physical being, and then takes that and involves the motor senses. Popat together with her colleagues' focus was lately on promoting body as a subject rather than an object as present in the video-based work.

Sky made a brief overview of the evolution of distribution of senses in her performances. She started off with telematics using an ISDN line, which she had to fly to another country with a codec, and her image would be distributed via 3 different telephone lines as well as her partner's on the other side of the world. She then moved on to Motion Capture. Still, she has also worked with the whole history of movement: from ballet to circus, different relations with gravity, cellular perception, different types of postmodern attentions; she was interested to see how they would become expandable in the spaces she performed in. As she puts it in words "it is great to feel oneself as sound or light as opposed to an even non-figurative avatar". Popat and some of her colleagues were working on exactly that aspect of translating human gesture into other different dimensions/aspects.

In terms of network identities and the ways we work with other people, we are still confined to 2-dimensional video-based communication devices; we are still suffering from special divisions and a very strong difference in the way we communicate with each other. **Sharir** mentioned in his keynote speech that, instead of asking a question to his colleague through a computer he would simply walk around the corner to another department. In remote collaborations, Sky noted, this "going around the corner" seems also to be necessary and of vital importance. As an example, she has had a collaboration with a colleague from Western Australia and they have actually achieved much more during a week Sky spent there than in all the time while communicating remotely.

This necessity occurs also in the gaming world. **Popat** has been involved with online gaming for several years – primarily World of Warcraft – and the communication with people in the virtual world has its own characteristics, rules and regulations. She made some friends through the game in Denmark and has had an exclusively text-based communication with them. When she met them she was struck by the disparity of her idea on them and how they were in reality. As opposed to that, she has had an audio communication for six months with friends she made in Norway and when they finally met, her expectations pretty much stood the reality check. The voice conveys much of the physicality of the individual and the inflexions of the voice give away much of the character. Even the 3D environments e.g. Second Life constrain so much of the body experience; they still take away a lot of our ability to express ourselves. She quoted Edward Castronova saying that "the character that we meet in the game world is the sum of physical characteristics of the avatar you have chosen, designed or created, and the non-physical characteristics of the person who is operating it".

Sky and her collaborator in Western Australia were using Second Life to do a simulation of the

physical staging of a work she was beginning to develop. Her colleague built himself an avatar that looked pretty much like himself and people who saw that stage of their work were struck by this similarity because it is rare to see an ordinary person in Second Life. There is a need for making a critique of the systems that are provided to us, e.g. mobile telephony and the Internet. In all probability, they are still imposed upon us by a certain type of economy and we should think in terms of subverting them: like, for instance, the Linden dollar - the monetary unit in Second Life - that has created confusion in the American tax department faced with the emergence of another little capitalist world in the virtual real-estate.

In the concluding part of the conversation, **Popat** and **Sky** mused on the present and future of multiple identities. **Popat** noted that we were becoming increasingly comfortable in living multiple identities simultaneously, slipping between them as we use different modes of communication; it has become part of our everyday performance. **Sky** underlined her curiosity in how we were evolving as a human species regarding our usage of multiple identities. She is particularly interested in how it will evolve among young people who are dexterous and at ease with it in an unprecedented way.

Speakers :

Martin Kusch, artist, kondition pluriel (Germany/Canada) with

Johannes Birringer, artistic director, DAP Lab / dans sans jeux (UK)



Birringer suggested, since the meeting was revolving around exploring the status of collectivity and new paradigms of experiences of artworks, to begin with the notion of time, on the line of necessary equipment mentioned in Sharir's keynote speech. From Kusch's perspective of an artist working with new technologies and also teaching, it is much about the lack of time for truly studying and understanding how a certain software or technology works because in a span of few months new software and new technologies come and one is forced to move on to them. There is an overall acceleration in processes and very often no time to develop a work artistically and content-wise. Presumably there is a constant pressure imposed on artists working in laboratories on collaborative projects to upgrade and use the latest versions of tools and to be innovative and new. Elaborating on the subject of time, Birringer mentioned the example of YouTube as a medium providing masses with Warhol's 3 minutes of fame but with aesthetics and an artistic content that would be forgotten the next day. At the very beginning of his work, Kusch saw some of the inherent elements in new media that had not to do with sustainability of the work but with its presence; in fact, with the ephemeral quality of their presence. As to the quality of YouTube's sustainability, **Kusch** noted that, by following the communication of his students via university mailing lists, where they often use the best and funniest YouTube links as citations, he discovered a whole new world of communication.

Birringer raised the question of the importance of the conditions of distribution of artworks - how the work is being shared, passed on or seen and experienced - particularly contemporary collaborative performance media interactive real-time works. Both Birringer and Kusch agreed with the point raised by **Sky** that online collaboration had to be fortified by encounters in flesh. **Kusch** is not certain on what network collaboration means in terms of changing the way people communicate or what impact it would have on future generations. Answering Birringer's question on whether collaborative network scenarios have helped him to develop better performance techniques, Kusch said that the network communities did not help in the work itself, which is very physical and tied to a concrete space, but what they did provide was answers to different questions, whether on technology or on content. Birringer also raised the question of embodiment and technique, assuming it took years to develop the capability to work in a complex sensorial interactive system; is it possible to teach and convey this knowledge? **Kusch** thinks it is possible to transfer knowledge up to a certain point but it all takes a long time to let loose from what one has learned before and be able to grasp new concepts and approaches.

Birringer mentioned the issue of European community project collaboration and the criteria applied in choosing partners in other countries. In Kusch's view, the basic element is the human condition, not the expertise. As a starting point, you have to step back from what you usually do in order to be able to open and share.

In the concluding part of their conversation, the two speakers focused on Kusch's work *Passages* as an example in the debate on participatory projects that involve the audience up to a point where they become co-creators. **Birringer** wondered whether this was the position of spectators in *Passages*. Kusch explained that the piece originally started as a trio: an installation without objects but with just three dancers featuring different approaches to choreography and using different technological interfaces. But the process of work made it clear to them that a simultaneous performance was not possible: therefore they came up with a solo version with objects in the space. Certainly, some responsibility of the unfolding of the event lies with the spectator - his/her actions define the course of action - but for the authors it was important to create conditions of listening first, then perhaps understanding something

and eventually trying to intervene; in that sense, the audience is co-authoring the work.

At this point in the conversation, members of the audience entered with their questions and comments. Answering a question on the future of work as such in light of its changing nature in new media and the world of technology, **Kusch** thought that work itself would not change that much because even 50 years from now classical forms of artwork will still exist. **Birringer** finds important the existence of prizes for excellence or for expertise because they are also applicable to new media and technologies in arts. When a work is successful, it humanises the technology: suddenly everything seems all right. When, on the contrary, a work does not work, we tend to resist and blame the technology for it. Going back to the issue of institutions, he noted that while it was true that most of innovative works in the US happen within the academic institutions it is refreshing to know that in Europe young artists are developing work outside of them.

Commenting on some reactions from the audience that were rejecting the distinction between the audience and the artist, **Popat** said that there was still much limitation in that the audience is still bound to operate within a frame created by the author; therefore the illusion of freedom. On the other hand, in environments such as YouTube where identities and values are being negotiated, there are no boundaries – there is a constant state of becoming – but there is also a constant changing and we may ask ourselves whether we can talk anymore about completed artworks or there is something beyond that, possibly a post-human state where we never reach conclusion just as the co-author project may never be completed.

In the dialogue between **Birringer** and **Sky** on the existing gap between the audience capability of grasping more complex interactive works and the subsequent hesitation of institutions to further programme and sponsor such works, Sky emphasised that it depended on how we would encourage the audience to be in and deal with such kind of work; what sort of mind setup and history they are bringing to this work.

Kusch stated that in his and his company's work the emphasis was not on interaction but rather on socialisation, the quality of listening and the communication between people. They are working indeed with interactive i.e. responsive media but their work is a hybrid between installation and performance where they are trying to determine what it means to combine time-based and non-time-based art and what type of aesthetics and experience they can create.

Sharir, Yacov. "Learning Through the Re-Embodiment of the Digital Self." In *Educating Artists for the Future: Learning at the Intersections of Art, Science, Technology, and Culture*, edited by Mel Alexenberg. UK: Intellect Books, 2008. 217-228.

LEARNING THROUGH THE RE-EMBODIMENT OF THE DIGITAL SELF

Yacov Sharir

This chapter discusses technologically mediated interactive art and the complex ways by which it can be applied in educating artists. Its aim is to demonstrate how performance augmentation (as a practice) can serve as primary objective for implementing a viable learning process. It explores how the disembodied digital self is re-embodied in cyber-bodies occupying increasingly immersive cyber-worlds. Through interactive collaborative art that embodies the principles of team "deep" listening processes, the ability to converse and respect each other's ideas, conceive, and conceptualize, students ultimately learn to create artworks where art, science, technology, and culture intersect.

I draw upon my own lifelong quest as an artist to come to understand this complex multidisciplinary trans-cultural learning process and its implications for educating young artists. My artistic journey from creating ceramic sculpture to dance, from choreography to digital animation, from collaboration to interactivity, and from Israel to Texas, color my work as a teacher addressing the remarkable growth in experimental, interactive, technologically mediated art with research related to human and social issues. These experiences spring from a field with a multi-disciplinary and trans-disciplinary character based on the foundation of the last several decades of experiments, developments, and growth.

Learning through Body (Dance) and Material (Clay)

My artistic quest had its origins in my violin lessons at age eleven in Israel in the late 1950s. My violin teacher immigrated to Israel from Rumania. His way of teaching and playing his instrument embodied the gypsy way of experiencing music, which is to say

– you are wearing the music over and on you as if it has become your second skin. Music was his way of life, all day, every day.

The uncompromising value related to my first art teacher's artistic way of teaching lies in his insistence on embodying in me/his students notions related to the overall mood, the atmosphere, the colors, and the appreciation of/for meaning. "Tell me your story," he would say. "This is not very interesting," he commented while all I was looking for is to survive, to clearly deliver my notes. Nothing was predetermined in the structure of his lessons. They had more to do with his workshop-like way of teaching, as if we were in a lab of sorts. Paying insufficient attention to his instructional messages with all of its multiple meanings was not the thing to do.

Looking for the mood, the atmosphere, the colors, the meaning, and the story deeply influenced my artistic development, my ways of working and teaching. Time and time again, I am finding myself instructing my students as to how they can mutually build content and meaning before they embark on the pursuit of their technologically mediated collaborative assignments.

Clearly, this invaluable experience was not exclusively about the music per se, it was as much about the aesthetics, unity, and coherence by way of demonstration and execution. The impact of my first encounter with the pursuit of my music/art studies was immeasurable.

At age thirteen, I joined Kibbutz Mesillot, a communal farming community in the northwest part of Israel. Initially, the break away from home was quite difficult. However, life in the kibbutz proved to be extremely stimulating, productive, well structured, and disciplined. Needless to say, I was grateful for this opportunity. I learned about contributing back to my community by way of working and learning and most importantly, I learned ways of sharing personal responsibilities and resources. However, unlike my violin lessons where the music, the concepts of aesthetic and emotional experience, could be personal and sometimes vague, no room for ambiguity and hesitation was allowed in this communal way of growing up.

Soon the sense of immediacy and appreciation struck me, without postponement. I joined the regional choir and the regional folk dance company where I picked up the skill of fast and diverse footwork and the rhythms that represented multiple cultural sensibilities from throughout the world simultaneously converging in Israel while attempting to co-exist in harmony. The versatility and skill of my newly acquired footwork and communal way of dancing proved to be important and useful for my later studies and professional work as a modern dance practitioner with the Bat-Sheva Dance Company of Israel. Interestingly, the clear sense of enjoyment and appreciation of meaning and value did not deny the opportunity for reflection and greater intensity needed for the pursuit of my tendencies for multi-tasking and varied interests.

By the time I completed my high school studies at age eighteen, I could play the violin, sing in a choir, and perform folkdances. Most importantly, I learned how to listen, which later on in my life was most valuable and instrumental in the creation of collaborative trans-disciplinary artworks. Although these various abilities may seem to belong to very different disciplines, for myself they were all situated in the body with all of its preliminary explicit kinesthetic understandings, increasingly occupying the space around me in more educated intelligent ways from sculpting the body to learning how to dance and sing. Emphasizing the body's expressive role allowed me to attend and listen to it, gradually figuring out what the body could say about itself.

Then the big change, on to military service. Like every other Israeli citizen, the pursuit of my art related studies was interrupted due to my service in the Israeli Navy. However, that did not constitute an interruption in my overall growth and learning process. Three years of service proved to be an invaluable asset, learning about responsibility, discipline, leadership, and most importantly perseverance. Once these assets and qualities were acquired they have been applied in all of my future endeavors.

Although military service was a profoundly valuable growing and learning experience, my heart, wishes, and aspirations were in continuing my pursuit of art studies and practice. Acceptance to the premier Israeli art school, Bezalel Academy of Arts and Design in Jerusalem, was at the time a life-changing experience and one of the happiest periods of my life. My major and concentration were in ceramics and sculpture. However, studio art studies at the academy included drawing, painting, and art history courses and occasional meetings/interactions with prominent visual artists from around the world who were visiting Jerusalem. Simultaneously, I entered as a part-time student at the Jerusalem Rubin Academy of Music and Dance and began a more formal modern dance training regiment.

Working with the body (dance) and with material (clay) imaginatively with all of the possible potential collaborative and creative potency helped me to pick up fruitful ideas related to my own creative process and art-making beyond what I have experienced prior to joining the academy. This time was central to my artistic development, relentlessly and rigorously expanding the pursuit of my primary objectives.

Interestingly, in my work it became clear that the "body" and "material" are two co-existing entities having two related purposes. The first was to explicate what the "body" is in term of its potential expressiveness. This became a central and distinctive aspect of my live-art work. The second and main purpose is to argue that body, like material, when serving the same purpose, is an efficacious means in the development, understanding, and promotion of my artwork.

As I became increasingly more experienced with the technology of my dancing body, I entered the process of understanding the totality of its wisdom and its intelligence from

within, consciously considering the fullness of bodily sensations governed by a greater kinesthetic acuteness – “proprio-ception.”

Meanwhile, armed with these new notions – collaborative working and learning across disciplines – I began to understand what was required in order to attend to new ideas primarily related to consensus formation. The opportunities to design for dance performances required developing new skills of inclusiveness (directors/performers), dancing and posing for drawing lessons, required unconquerable enjoyable self-assurance and exhibitionistic tendencies. In short, crossing the boundaries between the various disciplines was not enough, sharpening perceptions, mutual development of accepted language were preconditions and practices necessary to assure productivity.

My first sensation related to the use of my body in support and on behalf of my friends/students was in drawing lessons at the academy. Experiencing both, being the student and the model, questions arise as to how I can refigure (as one or the other) in order to juxtapose myself in the foreground of everyone else’s drawing papers/canvases. Identity related issues emerged; images of the self without acquired memories of spoiled or fouled identity.

An additional significant activity while pursuing my studies in Jerusalem was my association with the Jerusalem Students Folk Dance Company, a very well machined and still fully active touring and performing organization. A serious regiment included weekly regular practice hours, performing and touring, and attending international folk dance festivals.

Following my graduation from Bezalel, I moved to Tel Aviv, opened my own private ceramics school, admitting individual independent artists. I practiced ceramics, sculpture, and set design for the next thirteen years. Simultaneously, I was asked to join the prestigious newly formed Bat-Sheva Dance Company, a professional modern dance troupe of the highest international level/quality and reputation. Being a member of the company while I was also practicing my ceramic/sculpture work, positioned me very well to also design sets and costumes for several of the shows where I was also acting as a performer. At this point in my professional career, considering the various and multiple disciplines I was passionately pursuing, I was not at all sure how to measure importance any more. Initially, I felt a need to sort out my confusion as to where my emphasis should be placed. But then more precisely, a major question arose – for what and in which context?

Reflection on artistic and aesthetic experiences can form part of that experience itself. Whether I dance, choreograph, sculpt, or make pottery, I experience things from my own physical point of view. What I see is usually a function of what might be and the attitude I adapt that is relative to the subject at hand. Interestingly, at this point in my professional development I served as the “performer” – as a dancer – and as the “creator” – ceramicist/sculptor. Confusion? No. I enjoyed the immediacy, that creative

moment to be treasured as it comes. Focusing exclusively on the artistic and aesthetic output lead to an embodied experience and a deeper sense of elevated self-worth in ways that made it more central in addressing concerns and anxieties related to how to handle it all.

Extensive dance performances and international touring schedule followed, simultaneously, museum and solo art gallery's commissions materialized, too. Needless to say multidisciplinary collaborative partnerships were integrated to the fullest in order for me to deliver the works. Also considering the increased experience about the technology of my dancing body, I had realized the process of understanding the totality of its wisdom and its intelligence from within, consciously considering the fullness of bodily sensations governed by a greater kinesthetic acuteness and the three-dimensionality of it all, both in the physical realm and as applied in my studio art work/output.

Twelve years of professional work followed, dictated by very stringent criteria to satisfy my personal needs as a creator and as a performer with the Bat-Sheva Dance Company of Israel. Ultimately this was an extremely rewarding experience reaching in practice at all levels, professional growth, acquired life images, visually rich, subtle with clear three-dimensional characteristics followed by appropriate praise and recognition.

However the boundaries of my cross-disciplinary experiences started to blur, my feeling was that I was beginning to rotate around my own axis, questions regarding the non-singularity of being and the sense of self as linked to time and place surfaced. What does that mean as this reflects upon my inter-dynamics of the work I was making? It appears appropriate now to consider where my dance performance and creative media art content platform are.

Before embarking on reviewing my past thirteen years as it applies to future projects, new options, practice, and conceptual concerns, I began to plan my future well into the next decade and beyond. It was evoked by a sense of "settled in familiarity" that began to cause mental and physical fatigue. Operating on muscle memory alone and responding with a great deal of familiarity was not a desired experience for continuing to provoke my creativity.

In 1979, I responded positively and enthusiastically to an offer from Texas to establish/form the first American Deaf Dance Company and the offer of a teaching position at the Department of Theatre and Dance of University of Texas at Austin. The opportunity to become a member of the faculty at a major research university facilitated new and exciting teaching, research, and professional work. Under my artistic directorship - shortly following its inception - the American Deaf Dance Company became the University of Texas College of Fine Arts "Company in Residence." It fostered new alliances with members of the fine arts faculty, architecture, engineering, and computer science that instantly lead to collaborative teaching, research, and

performance. My important and unique program was supported by the National Endowment for the Arts, the Texas Commission on the Arts, the City of Austin and major local, regional, and national foundations and corporations.

The artistic works I have been exploring at that time led to analyzing the very initial implications of suggested use of digital technologies specifically as they related to artmaking, early ideas on interactivity, and some talks about the Internet that allow people to shift their visual experience of seeing what happens simultaneously together with everybody else.

Art/Dance and Virtual Environments

Pioneering networking efforts among faculty at the University of Texas led to very fruitful collaborative and team teaching alliances not only locally but also through the formation of sister classes with other major universities in the USA and Canada (Seattle, Washington, Salt Lake City, Utah, Vancouver, British Columbia). These efforts soon became our learning grounds. Students and faculty alike conceived and made work locally and through distance by utilizing early means of visual communications (the first version of “see-you-see-me” software among other options). The aim was for both artists and technologists to collaborate across disciplines and across geographical borders. Anything we could find/make/invent at the time was put to use for the realization of this purpose. Distance learning was conceptualized and set in motion.

The electronic music faculty and graduate students had a much earlier head start over all other participants with the use of electronic and computerized technologies for researching and creating new sound-based material/works. Music technologists also were ahead in conceiving and making extensive use of gestural interfaces (instruments) for sonic production and processing. This was of huge importance for supporting our purpose at the time, specifically the interface idea being made tangible as mappings between performative input (gestural) and output (aural). These materials and related research were generously shared and put to use in our collaborative teaching and artmaking for the benefit of all participants.

The introduction of the personal computer (Mac +) revolutionized our ways of thinking and conceptualizing in relation to teaching and artmaking. Our initial intent in the introduction of computer technologies was to reinvent and explicate what collaborative and joint teaching could achieve as pedagogical practice and as an art form. It evolved, however, into a distinctive new field.

Some of the faculty and students involved argued that the introduction of technologically mediated studies might jeopardize the original pedagogical purpose. However, it created new terms in aesthetic theory, reconceptualized narrative structure, and employed new sound effects. Its very physical and virtual embodiment was too important to ignore. We recognized that the practice of technological augmentation in artmaking is not only an excellent vehicle for the promotion of

transdisciplinary collaborations, but it created a new paradigm for what it is and what it could become.

In 1991, our collaborative team responded positively to a call for proposals from the Banff Centre for the Arts in Canada inviting artists or groups of artists to submit ideas for projects. This call initiated the first and only arts and virtual environments project to date. Its stated purpose was to provide opportunities for artists to work with emerging technologies as a means of forging new artistic options that facilitate the mutation of cultural practice. A new medium like virtual reality challenges traditional conventions. Douglas Macleod, the Virtual Environments project director, stated: "Artists no longer sit on the sidelines eventually to become grateful users of borrowed tools but have become active in development, creating a disturbance in the field with new contingencies."

My artwork, *Dancing with the Virtual Dervish: Virtual Bodies*, was conceived and set in motion. In the book, *Immersed in Technology: Art and Virtual Environments*, I wrote:

As a choreographer and dancer, I create work kinesthetically, emphasizing movement, space, and the body. Through the Virtual Environments project, I questioned what worlds open when, as a dancer, I consider virtual environments in relation to the body. What artistic, intellectual, kinesthetic, and emotional issues could be addressed using this technology? How could these technologies affect the creation and experience by a dancer and by others? (Moser and MacLeod 1996: 283)

The opportunity to co-exist during performance – simultaneously – both grounded in physical space while at the same time being fully immersed in the virtual realm was the primary factor that stimulated my imagination and ultimately allowed the concept of the dervish-like experience/tradition to emerge. I continued to explain:

Through the pursuit of this fantastical opportunity/project I begin to understand that virtual technologies allow us to manipulate, extend, distort, and deform information as well as our experience of the body. Furthermore, they serve as a vehicle that enables us to extend and color work in many ways, some of which are not possible in the physical realm and/or by traditional means. They offer a way to augment and extend possibilities creatively, experientially, spatially, visually, sonically, and cognitively. (Moser and MacLeod 1996: 283)

Dancing with the Virtual Dervish: Virtual Bodies is among the first virtual environment projects to synthesize immersive digitized new dance in a distributed performance environment that includes a head-mounted display, data-glove, three-dimensional sound, and interactive video projections. These technologies combined and set in sync and harmony, allowed me in performance to create multidimensional dance while interacting, navigating, and experiencing the environment virtually.

By the end of March 1994, visual artist Diane Gromala, architect Marcos Novak, and myself completed a two-year fellowship at the Banff Centre for the Arts, where we had collaborated on *Dancing with the Virtual Dervish: Virtual Bodies*, which was first performed at the Arts and Virtual Environment Symposium held in conjunction with the Fourth International Cyberspace Conference at Banff in May 1994.

Clearly the augmented level of knowledge, technological know-how, and experience gathered during the two-year fellowship working toward the realization of this project hugely impacted my personal, present, and future perceptions related to pedagogy, team teaching, and collaborative transdisciplinary work-making and consensus-building. Consequently, changes had to be considered and implemented in ways that positively and productively reflected the newness of what I had learned and accomplished.

Additionally, the magnitude, the scale, the attention, and efforts needed by each team of seven to bring these projects to a performative conclusion were beyond what we had originally anticipated. Participation in these projects contributed to our better



understanding of earlier perceptions related to the extravagant promises of technology. How will it make our students smarter and better artists? If we could place students in computer labs and smart classrooms, we would revolutionize the learning experience and see a miracle occur by real performative magic. We need only watch it to take place. A course, "Virtual Reality and Cyberspace in the Arts," was conceived and offered without interruption every spring semester since 1995. This course is preceded by a computer animation and 3-D modeling course offered every fall semester, thus allowing students from across the disciplines at the University of Texas to complete a sequence of two classes in new media arts. During the last three years, this sequence has been integrated in the "Bridging Disciplines Program: Digital Arts and Media" program at College of Fine Arts at the University of Texas at Austin. Teaching these courses has led to my doctoral dissertation at the Planetary Collegium, "Beyond the Electronic Connection," in which I explore theories related to convergence identities - the technologically manufactured cyber-human and its physical-human counterpart engaged in performance.

Computer Animation, Virtual Reality, and the Immersive Body

How can a learning community begin to engage in a process of conceptualizing and making art in this emerging field that integrates art/dance with science/technology? What are the worlds that open up to us when we consider interactive technologies and the studies of virtual environments in education? What are the artistic, intellectual, visceral, and emotional issues which can be addressed using the opportunities of these technologies?

My pedagogical program focuses on the intersecting location of where science, art, and technology merge. It includes a sequence of two back-to-back courses that complement each other by means of their content and pedagogy. The first course, "Computer Animation and 3D Modeling," concentrates on concept-building techniques and on the creation of multiple projects. My theoretical focus is to develop the platform for class attendees to act as producers of meaning, employ strategies and develop skills that are essentially conversational in form.

This course includes a strong and fast turnaround of several small works that facilitate students acquiring technological knowledge, and, most importantly, the art of understanding how to engage in internal conversations and mutually arrive at a consensus about the creative process and the task at hand. Studies are supported by presentations and reading assignments (see bibliography) that are designed to provide students with opportunities to become familiar with cultural backgrounds, critical theories, and analytic tools. An additional strong component in this course includes discussions and critiques of mature finished works and related writings.

Course objectives include: the introduction to concepts of computerized, high-end, human character animation programs, the creation and understanding of 3-D virtual worlds, and how interactive technologies can support/augment many aspects of

performance. Students learn how to explore the various software-editing programs as effective tools for the creation of human pedestrian movement, video games, and avatar personalities. Additional choreographic, theatrical, directorial, and or compositional tools are also explored.

The studies overall line of energy is motivated by the seductive powers and agency of interactive art and virtual reality that stimulate students' imagination as learners and researchers. As these options are explored, students notice that their disembodied self can be re-embodied in cyber-bodies occupying increasingly immersive cyber-worlds through the powerful sensations of wearable computers. The self-descriptive, self-reflexive, and recursive processes of consciousness reveal themselves as events that simultaneously express the real and virtual, flesh and re-configuration, sensory presence and re-presentation, cognition and re-cognition. In the ordinary flow of conscious experience, these pairs are not encountered as binary oppositions in conflict, but in continual events of transformation, one into the other. Students experience convergence with their own creations and learning utilizing various technological tools – giving birth to new ideas and new gestures of consciousness. Their interests, artistic learning, and practices eventually converge – literally and figuratively – in the zone of postures, gestures, gaming ideas, and communication between real, and virtual worlds, and the effects on consciousness of such cognitive spatial practices and learning.

Following the conclusion of the first technologically charged semester they are armed with augmented vision about making artworks and with technological knowledge. They are better able to conceptualize and see things from places where they are not necessarily physically present. With time-shifting technologies, they can also see things flow into the future and understand times and places they may have never have visited before.

The second semester course, "Virtual Reality and Cyber Space in The Arts," represents a progression into studies that primarily require collaborative efforts leading toward the realization of a fully integrated interactive work. The course is an intensive general introduction to the theory, principles, and practice of performance augmentation through the construction and use of an original interactive system of choice. It initially facilitates a set of conversations, learning about the notion of deep listening and the art of conversation and collaborative thinking towards generating a narrative. It then provides an overview of leading theories related to interface design and opportunities to work with interactive equipment and multiple sensory devices that serve as the core elements for the production of an interactive work of their own. Students collaboratively seek to create an intensive, highly productive workshop/laboratory environment. Their hands-on artmaking is supplemented by lectures and presentations on such topics as art theory, communications, choreography, cyberspace philosophy, robotics, privacy, and electronic publications. The works created must demonstrate that they can exist in a virtual environment. At the conclusion of this semester, students demonstrate their understanding and use of sensorial devices, motion tracking systems, real-time video manipulation, and virtual reality immersive environments.

The technological exploration in the classroom is mediated through the use of computerized information and content that typically responds to our direct commands for well-formed actions, but not to our spontaneously evolving inner desires and emergent ideas.

A topic of discussion and theoretical exploration addresses issues that suggest the creation of alternative systems, such as gestural recombinant knowledge and the human body and space visualization systems as a mean for augmenting creative innovation. Further exploration in the classroom deals with ideas of complex layering of language, image, and communication between physical and virtual constructs. The intention is to bring to the forefront the shifting strata of memory, dreams, and conscious visualization of content and matter, as we/they know it at the current level of inquiry.

As students become immersed in the ongoing process of technological exploration, serious questions emerge suggesting topologies of temporality. Questions arise as to the role of the physical body, resisting what it could become and notions of embodiment as machines. Students flirt with the subversive qualities of suggested magnified understanding of representation. In other words, they begin to experience the intersections between the grounded human, their own physicality experienced in physical space, and the immersive/virtual experience occurring simultaneously – the duality of existence. No matter how deeply involved they become in this process, the major issues and questions remain, suggesting dramaturgy of performance content, internal and external time, and consciousness continually reframed.

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