Dance Illusioning the Cyborg: Technological Themes in the Movement Practices and Audience Perception of Three Urban Dance Styles

by

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B.Sc., Simon Fraser University, 2005

THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS

in the
School of Interactive Arts and Technology
Faculty of Communication, Art and Technology

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SIMON FRASER UNIVERSITY

Fall 2012

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Abstract

This interdisciplinary research develops and puts forward an exploratory analysis of three styles of urban dance: liquid, digitz, and finger tutting using Laban Movement Analysis, a rigorous methodology for analyzing human movement. I suggest that perceptual and cognitive principles, particularly Gestalt laws of perceptual organization and the spatial cognition principle of 'structure from motion', explain and underlie the visual expressive and communicative strength of these styles through a process I describe as *dance illusioning*. I put forward three dance illusioning modes: *spatial tangibilization*, *rejointing*, and *spatial quantization.* Furthermore, I develop a novel approach to explaining the effects of technology on dance praxis through a close reading of ethnographic and archival data in conjunction with structuralist and cognitive approaches for analyzing urban dance. I provide evidence on how the styles have historical connections with technological aesthetics and how the urban dance community have in part used technological themes to define their bodies and their movement philosophies. I therefore argue that the styles elicit a receptive reading of the dancing body as *cyborgian* in that it is simultaneously organic and technological, and of the performance environment as *virtually constituted* in that it contains invisible, mutable objects and structures that are revealed only through the dancers' movement. In doing so, I contribute to scholarly perspectives on the historical interactions between technology and dance performance. I conclude by outlining directions for further research and propose that illusion-based dance as a community of practice embodies movement expertise that is of value for technology design.

Keywords: Dance Studies; Visual Perception and Cognition; Embodied Cognition; Movement Analysis; Science and Technology Studies

To nanay, who kept my feet on the ground,
to ate, who showed me the sea,
and to tatay, who lifted me to the sky.

Acknowledgements

The most difficult part about this research was deciding what to do it on. My thanks first go to Albert Hwang for pushing me in the direction I eventually pursued, and to Kai for showing me reasons why I ought to keep going. I am profoundly grateful for the support given by my senior co-supervisors—Dr. Thecla Schiphorst, who rightfully called me on my top-down approach early in my academic career, provided a wealth of insight on movement philosophy, interaction design, and research approaches, and taught me that it was possible to pursue what one loves; and Dr. Lyn Bartram, whose class in knowledge visualization and research in motion provided such foundational inspiration for this study, and whose patience in and support for my pursuit of this study made a world of difference. I could not have completed this research without the steady, critical, and expert guidance of Cheryl Prophet on human movement; thank you for reminding me to breathe. I am grateful for the razor-sharp editorial insights and remarkable acts of solidarity that Annique-Elise Goode and Jasmine Trice exhibited. Thanks are due to Pat Subyen for the collaborative research that we have pursued, as well as to Kristin Carlson, Greg Corness, and Aaron Levisohn for our discussions on dance. Special thanks are due to Diane Gromala for helping me bridge a key conceptual gap in this study. This research would not have seen the light of day without the support of the faculty and staff at SIAT; thank you. Needless to say, this research would have been impossible without the incredible dancers whose work I've come across. Whenever I get tired of writing, all I need to do is watch you dance. I am grateful to the dancers who responded to my initial survey, and indebted to those who have taken a step further and generously shared their insights with me in interviews and over personal correspondence: Albert, Kai, Jared Hupp, Houdoken, Lucas Johnson, Liquid Rush, Plainwhite Tom, and the members of the EDM Dance Facebook group. Your dedication, artistry, and embodied skill continue to astound me.

Finally, I gratefully acknowledge the Natural Sciences and Engineering Research Council of Canada and the Canada Council for the Arts, which funded the Meaning from Motion project through which this research was conducted.

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List of Acronyms or Glossary

EDM	Electronic Dance Music
All Access video	The All Access Liquid & Digitz Tutorial video (Dark Matter Squad, 2001)

In this document, terms in `monospace font` are technical concepts from underground illusion-based dance techniques. Terms in *italicized serif font* are term taken from Laban Movement Analysis or Labanotation. This convention both distinguishes a term from its popular usage as well as specifies the context in which the term is used (e.g., `flow` vs. *Flow*).

Preface

In order to keep the content of this thesis accurate and relevant, this thesis features a companion website (www.archive.org/details/Illusioning/) where updates and errata will be posted. In addition, the online material cited in this research reflects only a fraction of the resources available on the Web; the companion website includes additional videos clips, documentation, and links to relevant popular and scholarly material associated with this study.

1. Introduction: Dance and Technology

At a recent showcase of new interdisciplinary performance work that I attended in Vancouver, a community dance group presented a piece of choreography based on the theme of what it means to be a 'machine'. Before the piece began, a visiting theatre artist—who the group had invited to workshop the piece—spoke to the audience. Her message was that we can never be machines, and to be a machine is something that we do only as a matter of necessity. Initially, neither the visiting artist nor the performers were clear about their precise understanding of what constituted a machine, but the ensuing performance suggested a grim perspective. As low-pitched, atonal, ambient electronic music played across the dimly lit set, the dancers moved in unison, their faces masked by identical patterns of face paint, their bodies encased in similarly-cut deep blue costumes that exhibited a metallic sheen. It was difficult to make out which dancer was which. This was surprising even to me, since I knew at least one of them quite well and I was not far from the stage. The imputation, it seemed, was that to be a machine was to divest one's individual identity, to lose one's nuanced ability to feel and to severely limit one's movement repertoire.

What particularly interested me were the dancers' movement representations of 'the machine'. At moments during the dance, they would assume an arm posture that is immediately recognizable: the robot arm. It is a simple but strangely iconic arrangement of limbs. All one needs to do is place the forearm and the upper arm at right angles to

each other, and arrange the hands, fingers, and arm to form a line (or, perhaps more accurately, a boat paddle). These limbs would then move as a unit.[1]

In dance, the arms, hands, and fingers frequently reflect mechanical tropes. The hands—a complex structure that contains 27 bones and a great number of articulating joints within a relatively small volume (T. D. White, Black, & Folkens, 2011)—are capable of a wide range of movement "ranging from fine precision … to great strength" (Calais-Germain & Anderson, 1993). This is arguably a highly articulated and expressive bio-mechanical structure. And yet in most popular, dance-based conceptualizations of what it would be like to have a machine for a body, the hands, arms, and fingers are stiffened and drawn tightly into each other, allowing little to no mobility.

In this thesis, I explore the movement forms and techniques of three urban dance styles that are typically danced to what is known as electronic dance music (EDM), a musical form originating in underground club "subcultures" (Hebdige, 1995; Thornton, 1996), characterized by the extensive use of rhythmic and tonal repetition or "looping" (Garcia, 2005). Various subgenres of EDM exist, including trance, house, deep house, 80s funk, disco, garage, and dubstep. The three urban dance styles studied in this research—*liquid*, *digitz*, and *finger tutting*—focus on the sophisticated use of the fingers, hands, and arms for expressive movement. Dancers of these styles often talk about creating "illusions" (Dark Matter Squad, n.d.-a; Floasis contributors, 2010b; Yejoon, n.d.-a, n.d.-b). These three styles are examples of what urban dancer Jared Hupp (personal communication, July 12, 2012) has described as underground illusion-based dance (Floasis contributors, 2010a, 2011a).

[1] The shape of the arm and the rigidity of the movement, when taken in the context of the dark tone of the scenography of the piece, reminded me of architect Hundertwasser's assertion: "The straight line is godless and immoral" (Hundertwasser, 1958).

Over the next five chapters, I argue that these styles have a unique, multifaceted, extended, and perceptible relationship with technology. Furthermore, the theme of technology underscores *dance illusioning*, a term I advance to describe the approach that underground illusion-based dancers take in developing movement vocabularies based on an understanding of how trajectories, shapes, and textures in space are perceived by both performers and audiences.

In this chapter, I set the stage for the discussion by introducing key concepts that are detailed and analyzed in subsequent chapters, namely 1) technology as extensions of the self; 2) dance technologies and dance techniques; 3) artifacts and know-how in dance; 4) Web 2.0 and online communities of practice; 4) embodied knowledge and technology design; and 5) the notions of the cyborg and posthuman. I then introduce the body of my research by laying out the motivating questions, the stance I take as a technology researcher and an artist, and the methodologies I use. I conclude with a preview of the chapters.

1.1 Technology and human movement

'Technology' is a term that has been defined in multiple, overlapping ways that are as contested as they are wide-ranging. In this section, I review the relationship between technology and movement aesthetics, weaving throughout the discussion distinctions around technology that have been articulated in the scholarly literature. I begin with a review of the notion of technology as an extension of the self to show fundamental connections between technology and human movement.

1.1.1. Technology as extensions of the self

Art forms and technologies--in the contemporary sense of "systems of machines and processes" (Murphie & Potts, 2003)—have interacted with each other for as long as humans have created and used tools. Dance has been no exception. Indeed, there is a long and rich theoretical tradition that situates technology in relationship with the body, such as the notion of technology as an extensions of our organs, articulated by Ernst

Kapp as early as 1877 (Lawson, 2010). Telescopes and oscilloscopes extend our ability to sense both the perceptible and the imperceptible external world. Hammers and automobiles extend our limbs, allowing us to alter the condition of the world and navigate it. The notion of technology as an "extension of ourselves" (McLuhan, 1964) is particularly relevant in an examination of technology and human movement. Drawing on the ideas of Lewis Mumford (1967), Carol-Lynne Moore and Kaoru Yamamoto (2012) describe human movement as a kind of prototechnology in that it is the first way in which we extend ourselves into the world in order to perceive it and make an impact on it.

1.1.2. Dance Technologies and Dance Techniques

If we consider the world not as an external entity that exists 'outside of us' but as a space that we are an active part of, then our intentional approaches towards our own movement can be seen as a technology that impacts the world. It is through Mauss' concept of "the techniques of the body" (Mauss, 1973) that we can talk productively about dance as technology and dance technique as technological tools. I return to Mauss in Chapter 5 to reaffirm the idea of dance technique as technology in relation to the three underground illusion-based dance styles I examine in this research.

Technology and technique are closely related concepts. It was only around the late 19th century that the term 'technology' began to be used to refer to "machines and processes", while technique was understood to be a "method or skill" (Murphie & Potts, 2003). Both words are derived from *technê*, whose original meaning centered around knowledge on a way of doing or making that is recognized, teachable, and certifiable by a community of practitioners (Roochnik, 1996). In this light, we see that analytic frameworks for understanding, notating, and explaining human movement such as Laban Movement Analysis (Hackney, 2004) and Labanotation (Hutchinson, 1945)—both of which are described and applied in Chapter 3 to describe underground illusion-based dance style techniques—can be understood as technologies.

Figure 1.1 Martha Graham performing "Lamentation" (1947).

Photographs by Herta Moselsio. Accessed 2012 June 12 from http://www.loc.gov/exhibits/treasures/tri121.html. Acquired and digitized 2001 by the US Library of Congress Music Division. Reprinted with permission of the US Library of Congress.

Artifacts and Know-How in Dance

Uses of technology in dance can be classified as *material*, *non-material*, and *virtual*. Material uses of technology in dance include costumes, set pieces, and stage lighting. Costumes that restrict the movement of the body are particularly relevant to this research, because they alter not just the dancer's performative experience of the movement, but the audience's perception of the human body in relationship to the space it occupies. Examples from the Western canon of modern dance include Martha Graham's 1930 work *Lamentation*, shown in Figure 1.1., which is subsequently referenced in Alwin Nikolai's 1953 piece *Masks, Props, and Mobiles* (Au, 2002). In both pieces, dancers are encased in stretchable fabric that constrain the dancer's ability to move, yet provide audiences a unique perspective on the relationship of the moving body to space through the curves, lines, and surfaces created by the fabric as it is deformed by the dancer. Writing about 'technologies for dehabituation' in dance, Carlson (2011) notes that "the costume … [provided] kinaesthetic constraints [that] provoked Graham to examine shape and quality of movement" (p. 76). More recent

examples include contemporary dance company Chunky Move's 2011 work *Connected*, in which dancers' limbs are attached by a series of cords to a multi-articulated kinetic sculpture designed by visual artist Reuben Margolin (PopTech, 2011). The dancer's movements entrain movements in sections of the sculpture, creating a perceptible and visually evocative mapping between the (organic) human body and the (mechanical) sculpture (Figure 1.2).

Processes, structures, and algorithms—Plato's technê—are examples of *non-material technology*. In the context of dance, they fall under the notion of 'dance technique', which provides guidance on how to enable the body to move through time and space. Most dance genres and styles within classical, urban, and folk traditions have a concept of technique, a *know-how* for embodied action that is often lexically codified. In hip hop, for instance, fundamental concepts include the *downrock* and *freezes* (DJ Hooch, 2011). Ballet—a highly codified form—works from a large corpus of standard movements, such as the *plié*, the *battement*, and the *port de bras* (Kirstein, 1939). Using ballet as a point of departure, Merce Cunningham—whose work was influenced by both Rudolf von Laban's theories and by computer technology (Schiphorst & Cunningham, 1997)—explored combinatorial and chance processes to shape a unique choreographic vocabulary that is evident in his live work. Both Cunningham's studio classes and his choreographed work have an 'uncanniness' to them in that they invert and subvert typical movement patterns in the ballet tradition, creating bodily shapes that are both intriguing to watch and uncomfortable (at least initially) to perform.[2]

[2] As part of my undergraduate contemporary dance training, I studied with Megan Walker-Straight, a former dancer of the Merce Cunningham Company. In class, we used Laban's directions to enact intricate and challenging movement sequences. Cunningham technique trained my body to relate to space in a rigorous and three-dimensional way and continuous to serve as a kind of *basso continuo* for my personal and academic explorations in movement.

Figure 1.2 Chunky Move rehearsing "Connected" (2011).

Screenshot from "Shorts: Reuben Margolin and Gideon Obarzanek are Connected " by PopTech, 2011, http://vimeo.com/26686517. Copyright 2011 by Poptech. Video licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 3.0 Unported license.

Drawing from Laban and Ullman's (1966) description of Platonic solids and crystalline forms, contemporary choreographer William Forsythe uses *virtual* technologies in a series of videos that he created to teach ballet dancers to use space in novel ways (Forsythe, 2000). In these videos, he superimposes lines and shapes in post-production editing. He instructs dancers to imagine virtual objects in space and interact with them as if they were actually present. Extending the use of computers for inspiring new movement patterns, Carlson, Schiphorst, and Pasquier (2011) used genetic algorithms to generate line drawings based on the human form. These drawings serve as 'movement catalysts' which dancers use to generate choreographic material. The catalysts subvert the dancers' choreographic processes by inhibiting their habitual movement preferences.

In the underground illusion-based styles of dance I examine in this thesis, I show how virtual objects have been similarly used to provide guidance for dance movement. I

also cite an example of technology for structuring space reminiscent of Laban's crystalline forms and that are closely related to the Cartesian coordinate system for Euclidean space.

1.1.3. Web 2.0 and online communities of practice

The discussion thus far has focused on the relationship between technology and the body as a self-contained unit. Technology can also mediate experiences between bodies. For instance, the idea of technology as an extension of the self is particularly applicable in the analysis of online and virtual communities. The explosion of such communities over the past two decades has made an impact on nearly every community of practice in the contemporary world (Bauman, 2005; Pertierra, 2006; Riha & Maj, 2010; Wellman & Haythornthwaite, 2002). "Web 2.0" technologies such as wikis, media sharing sites, and blogs allow information consumers to be content creators as well, generating a liquid flow of ideas, practices, and beliefs that cross geographical boundaries (O'Reilly, 2005; Saloma-Akpedonu, 2006).[3]

This dramatic shift in knowledge exchange has also made an impact on dance communities. Online spaces such as social network sites, mailing lists, and discussion forums exist for nearly every genre of dance. Digital technologies have become so pervasive and embedded in everyday life that online communities, such as Dance-Tech.net, have been created with the purpose of discussing and discussing the role of technology in dance creation and performance. A particularly rich exchange of dance techniques and choreographic concepts can be found on the video sharing site YouTube.com, where dancers and dance enthusiasts post dance tutorials and performances ranging from ballet and flamenco, to hip hop and square dancing. Social networking sites such as Facebook.com host groups and pages where members discuss movement-related issues in a similarly wide variety of dance genres.

[3] The term Web 2.0 has been used to describe Internet technologies that easily allow Internet users to generate content, such as blogs, wikis, and social networking sites.

In this thesis, I source data from three different Web 2.0 technologies: online videos posted on the site YouTube.com, publicly available posts of members of the site Floasis.net (www.floasis.net/smf), and a Facebook group of EDM (electronic dance music) dancers. In Chapter 2, I show how dancers of underground illusion-based styles extensively use Web 2.0 technologies as part of developing not just the social relations within their community but also their "central consumption activity" (Kozinets, 2010), i.e., their artistic practice of dance.

1.1.4. Embodied knowledge and technology design

The turn to embodied experience across multiple fields of academic inquiry has made a significant impact on areas of technology research. These areas include interactive systems (Antle, Corness, & Droumeva, 2009; Dourish, 2004), virtual worlds and characters (Nixon, 2009; Ventrella, 2011), and networked systems (Mitchell, 2004; Schiphorst, 2007; Schiphorst et al., 2007). Rapid developments in ubiquitous and mobile devices (for instance, with gestural and touch-based interfaces) open opportunities for studying movement experience through technology design and evaluation (Levisohn, 2011; Loke, Larssen, Robertson, & Edwards, 2007; Schiphorst, 2011; Wilde, Schiphorst, & Klooster, 2011). In Chapter 4, I describe how the dancers of the underground illusion-based styles are a rich repository of "movement expertise" (Subyen, Maranan, Schiphorst, Pasquier, & Bartram, 2011) for technology design because of their sophisticated movement practices centered on the fingers and hands, as well as their expressive exploration and "phenomenal experiences" (Preston-Dunlop, Sanchez-Colberg, & Rubidge, 2010, p. 219) of space.

1.1.5. The Cyborg and the Posthuman

Concluding this overview of the relationship between technology and human movement, I return to the notion of technology as an extension of the self. As technologies become more embedded in everyday life, not only do they become part of what we do, but also who we are. The notions of the cyborg (Clynes & Kline, 1960; Haraway, 1987) and the posthuman (Hayles, 1999) suffuse aspects of everyday experience. A frequently-cited example of an everyday 'cyborgian' experience is living

with a pacemaker (Rucker, Sirius, & Mu, 1993), a mechanical-digital prosthetic for the heart nestled within the organic folds of the human body. Yet as Mike Featherstone and Roger Burrows (1995) point out, a simple pair of spectacles is a prosthetic device, too. Tomas (1995) calls on Canguilhem (1992) to draw this analysis to its logical end, positing that not just individual artefacts but that "machines themselves" (Tomas, 1995, p. 22) can "*be considered as organs of the human species*" (Canguilhem, 1992, p. 55, emphasis in the original). Citing Rucker et al (1993), Featherstone and Burrows conclude that "we are *already* cyborgs":

> Boundaries between subjects, their bodies, and the 'outside world' are being radically reconfigured [Haraway, 1991; Plant, 1993] … The key analytical categories we have long used to structure our world, which derive from the fundamental division between technology and nature, are in danger of dissolving; the categories of the biological, the technological, the natural, the artificial, *and* the human—are beginning to blur (Featherstone & Burrows, 1995, p. 3, emphasis in the original)

I submit that the notion of the cyborg can be extended not just to our use of material artefacts but also in the way that technology influences the way we move. An everyday example can be found in public transportation. On some buses in the city I live in, exit doors are marked with a sign, "Touch here". Passengers interpret this instruction differently. Some firmly press the door with the palm of their hand. Others slap or punch the door, particularly when the doors fail to respond to their gesture right away. The more impatient they get the stronger and more frequent their punches come. In reality the doors do not respond to pressure at all. Rather, an ultrasound sensor positioned at the top of the door senses an obstruction in a reflected ultrasonic beam. The most efficient way to open the door is either to move your hand towards the door at a slow to medium speed, or gently place it on the sign until the door opens. If your hand approaches the door too quickly, or if it is withdrawn too soon, the system fails to detect your hand and the door remains shut. Some—frequently younger—individuals know exactly what to do. One can spot these "sensor natives", to adapt Prensky's (2001) concept of "digital natives", by the way they mobilize their bodies to interact with this deeply unintuitive system. This is but one example of changes in human movement patterns due to technology. This study on underground illusion-based styles aims to

show how the influence of technology on human movement extends to the way we might dance.

1.2. Reception, Perception, and Kinesthetic Empathy

The application of research from perceptual psychology and cognitive science to dance research is gaining traction, as evidenced by research in mirror neurons and *kinaesthetic empathy* in dance performance (Berrol, 2006; Matthew Reason, Dee Reynolds, Reason, & Reynolds, 2010).[4] Ongoing work by Jan-Gunnar Sjölin (2011) on the visual perception of live dance performance weaves thematic threads spun from critical theory in the humanities, perceptual psychology, and performance studies—an emerging fabric of interdisciplinary discourse to which this study on underground illusion-based styles aims to contribute.

One of the key assumptions in this research is that there are deep links between the performance of movement and the perception of movement. This assumption is founded on the belief that audiences are not 'passive' observers but instead actively construct meaning from sensory input. Indeed the audience-performer connection is in part interpersonal (Corness, Carlson, & Schiphorst, 2011), as scholarly studies around reception theory have shown (S. Bennett, 1998). That these links are both cognitive and embodied is captured in the notion of *kinesthetic empathy*. A growing body of research suggests that physiological mechanisms exist by which an observer neuromuscular pathways fire in response to viewing the performance of movement, particularly (but not limited to) goal-directed and hand-based movements (Gallese, 2001)

[4] Kinesthetic empathy is a concept that has deep cultural resonance for me. In the Tagalog language of the Philippines, where I was born and raised, the word "kapwa" stands for the concept of 'the-self-in-others', that part of me that resides in you (Guia, 2005). I have long understood my experience of the world not as singularly processed in my physical body alone, but distributed in a network of bodies, echoing what Brian Rotman (2008) has described as the "distributed human being".

as well as in dance (Bläsing, Puttke-Voss, & Schack, 2010). In Chapter 4, I describe the notions of spatial tangibilization and rejointing, two dance illusioning techniques which proceed from the assumption that audiences form a kinaesthetically empathetic response to particular kinds of movement techniques performed by underground illusion styles dancers.

These two notions further rely on the perception of *structure from motion*. Structure from motion is a cognitive process by which humans infer 3-dimesional spatial relationships based on 2-dimensional motion (Webb & Aggarwal, 1981; Ullman, 1979). It is one of several theories studied within the field of *spatial cognition*. While I do not cover the theories of spatial cognition—other than structure from motion—to the analysis of underground illusion-based styles, the application of spatial cognition to choreological analysis has great potential for future research, as described in Chapter 5.

1.3. Research overview

The history and social practices of urban dance and club subcultures have been documented and studied by sociologists, cultural theorists, and anthropologists (A. Bennett, 1999; Laughey, 2006; Rief, 2009; Thomas, 2003; Thornton, 1996). What appears to be lacking in the scholarly literature, however, is a movement-centered engagement around the technê associated with these dance practices, as Preston-Dunlop, Sanchez-Colberg, and Rubidge have observed:

> In trying to deal with the problems posed by embodiment, recent dance scholarship has adopted an inter/multi-disciplinary approach borrowing from methodologies in history, critical studies, feminism, linguistics, and gender studies as a way to shed light on the issues of embodiment that relate to dance... The focus in much of these writings has been to adapt, for the study of dance, methodologies and theoretical perspectives coming from fields outside of dance. In so doing, an attempt is made to validate dance study as culturally significant and scholarly relevant. However, what most of these studies have revealed are the limits of this approach in its ability to solve the key problems of 'the body' in dance theory. (Preston-Dunlop et al., 2010, p. 5)

While scholars such as Buckland (2002) and Plant (2000) have used movement-centered language that intends to paint a picture of underground illusion-based dance styles, the analysis has been sporadic and peripheral to the central research problem. What has been lacking is a *choreological* analysis of urban dance that places what Desmond (1997) has identified as an "increased attention to movement as a primary, not secondary social text" (p. 392) in order to arrive at "a synthesis of a 'formalist' description of the [dance] work's surface with perspectives on its cultural context" (p. 5).[5] The research presented in this thesis is a synthesis of such "formalist" methods—namely, Laban Movement Analysis and Labanotation description—and perspectives generated using other methods, including ethnographic and participative inquiry into the urban dance community as well as a close reading of extant texts, including the 'text' of the moving body, using the lenses of critical theory, technology studies, and perceptual psychology.

1.3.1. Research goals

This interdisciplinary research develops and puts forward an exploratory analysis of three styles of urban dance—liquid, digitz, and finger tutting—which generally focus on movements in the hands, fingers, and arms, with active support from the upper torso. The analysis is based largely on Laban Movement Analysis, a rigorous methodology for analyzing human movement. I suggest that perceptual and cognitive principles, particularly Gestalt laws of perceptual organization and the spatial cognition principle of 'structure from motion', explain and underlie the visual expressive and communicative strength of these styles through a process I describe as *dance illusioning*. I put forward three dance illusioning modes: *spatial tangibilization*, *rejointing*, and *spatial quantization.*

Furthermore, I demonstrate that for over a decade the community of these dancers have cultivated specific technical approaches to human movement that are

[5] Choreology is the "scholarly study of dance" (Preston-Dunlop, Sanchez-Colberg, & Rubidge, 2010, p. 1).

sophisticated, expressive, conceptually and corporeally well-defined, and rigorously theorized by some of its members. I provide evidence on how the styles have historical connections with technological aesthetics and how the urban dance community have in part used technological themes to define their bodies and their movement philosophies. I therefore argue that the styles elicit a receptive reading of the dancing body as *cyborgian* in that it is simultaneously organic and technological, and of the performance environment as *virtually constituted* in that it contains invisible, mutable objects and structures that are revealed only through the dancers' movement. To do so, I develop a novel approach to explaining the effects of technology on dance praxis through a close reading of ethnographic and archival data in conjunction with structuralist and cognitive approaches for analyzing urban dance. I thus contribute to scholarly perspectives on the historical interactions between technology and dance performance. I conclude by outlining directions for further research and propose that illusion-based dance as a community of practice embodies movement expertise that is of value for technology design.

1.3.2. Methodological Stances

While this interdisciplinary research relies on a number of interconnected methodologies and approaches that I describe in this section, the overarching stance is choreological in that it directly contributes to the scholarly study of dance. It does so by an 'argument pipeline' summarized in Figure 1. 3. At each stage of the pipeline, I apply a set of analytical approaches that are descriptive, interpretive, and explanatory. I apply well-established methodologies to observe movement in order to arrive at an *analytic description* of the embodied processes of the dancers. I rely on my experiences as a dancer, an occasional participant of electronic dance music culture,[6] and a technology researcher to arrive at *interpretive reading* of phenomena based on these observations

[6] The dancers of the illusion styles I study tend to be scattered across the United States and elsewhere in the world. There are no organized communities of illusion style dancers in the city in which I currently live.

as well as on available evidence gathered from a wide variety of sources related to the history and practices of liquid, digitz, and finger tutting. Finally, I mobilize these descriptive and interpretive readings to suggest possible *explanations* for what makes liquid, digitz, and finger tutting compelling.

To guide the reader through this study, versions of Figure 1.3 will be presented at the start of selected sections, highlighting which node or juncture in the argumentation pipeline the section applies to.

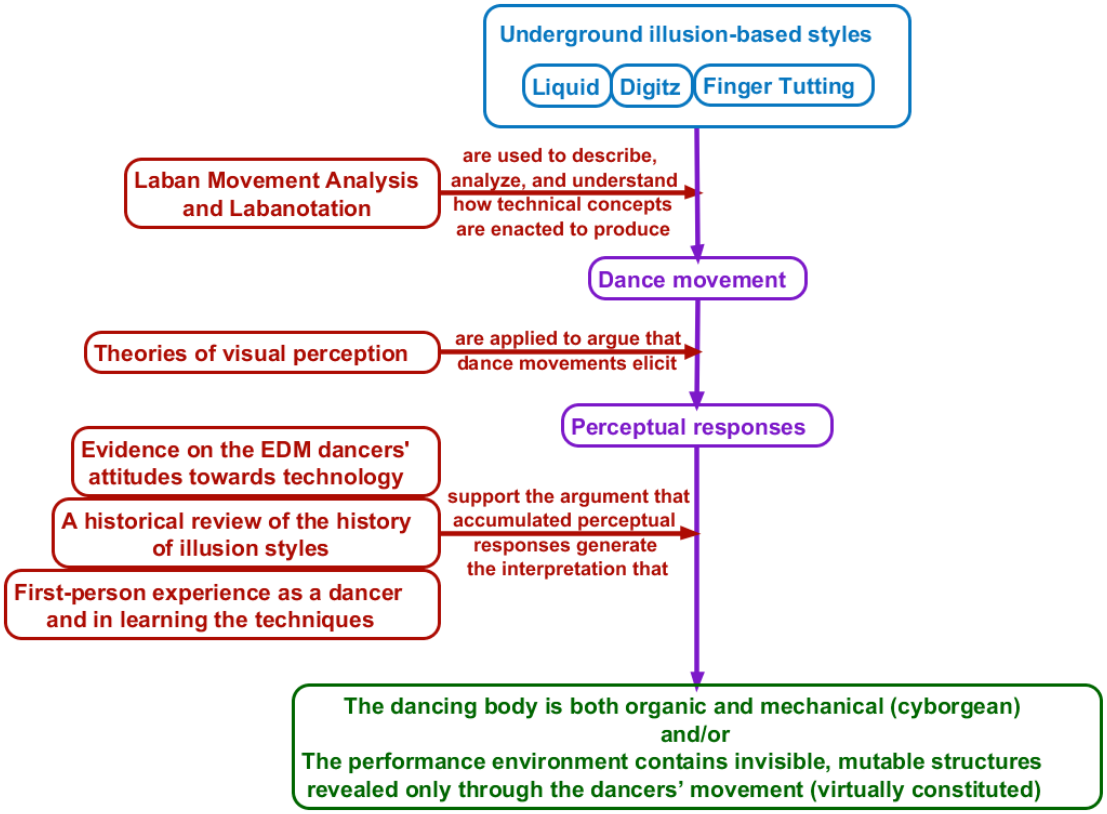


Figure 1.3 ***A diagrammatic representation structure of the explication of my argument***

1.3.2.1. Choreology and collaborative research

The interpretations I have chosen to take are informed by the interests of the various stakeholders in this project. These interests include the research agenda of my department, the School of Interactive Arts and Technology, and Simon Fraser University,

the academic institution of which it is part; the urban dance community; and my own research interests. Triangulating between these interests has meant that I have needed to allow the research to unfold, sometimes arriving at significant conclusions in a “just in time” trajectory. However, by allowing these multiple interests—particularly those of the urban dance community—to shape a research trajectory that led to the ever more precise goals and outcomes, I align my work with the aims of *participatory and action research*. Speaking broadly about qualitative research, Booth et al (2003) distinguish practical problems from research problems. The answer to a practical problem is a change in the state of affairs of the world, whereas the answer to a research problem is knowledge that could be used to effect such changes. Participatory and action research problematize this distinction:

> “Action researchers … are not making a discrete 'contribution to the field of knowledge' when they undertake a piece of action research but are contributing to a stream of action and inquiry which aims to enhance the flourishing of human persons, their societies, communities, and organizations, and the wider ecology of which we are part." (Reason & Bradbury, 2008, p. 4)

Participatory and action research has a natural affinity with choreology, which is “scholarly, but essentially practical” (Preston-Dunlop et al., 2010, p. 3):

> The notion of studio-based research is well known to choreographers. It is what choreographers engage in prior to putting down a work. It is not necessarily understood by academic scholars who have a particular concept of what 'research' means and which some find hard to accommodate to practice. Nor is it necessarily understood by those practitioners who are not makers for whom the term 'research' refers to ways of working not in their domain. However, practical people can and do focus on a dance specific problem, and wrestle with it in ways only available through practice to arrive at new movement, new dance processes, and new concepts. (Preston-Dunlop et al., 2010, p. 3)

Finding a space that comfortably occupies the multiple research and practical interests I have described was challenging. Nevertheless, it is towards the goals of creating value for the urban dance community that I advanced a suggestion for a project

which, as I describe in Chapter 5, I have already shared with a few key members of the EDM community in the hope that it provides value to the community at large.

Indeed, this project as a whole is offered as a service to the urban dance community, of which I participate, albeit peripherally. When I presented a draft of this research to my informants in the course of member checking, the responses I received confirm at least in part the value of this work. One informant appreciated the links the research drew between the dancers' technical approaches to movement and choreological discourse:

> Quite amazing to see all of the correlations … in regards to traditional dance philosophy… This is in a way gratifying on our end, because despite our lack of formal dance training and knowledge, we in some way provided a proper foundation based on many of the principles you bring up. (J. Hupp, personal communication, July 10, 2012)

Another informant felt that by taking their dance practice as a focus of an academic study, this research reinscribes the value of their artistic work:

> This truly means a lot to us in the sense of further establishing the legitimacy of our crafts. (L. Johnson, personal communication, July 10, 2012)

Nonetheless, the significance that this research might have to dance communities remains to be seen. It is my hope that the companion website I have set up for this study, which will allow people to access the text of the research in multiple ways and comment on it, will allow for the critical feedback necessary to validate and add to the value of this work.

1.3.2.2. Multi-sited ethnography

This research borrows approaches from multi-sited and internet-based ethnography. Multi-sited fieldwork traces the circulation of people, material objects, metaphors, plots, biographies, or conflicts across sites (Marcus, 1995), which are flexibly-defined locations that can "encompass virtual and physical spaces, archival and promotional material, discourses, images, objects, or flows of information and resources" (Bettany & Daly, 2008). As I describe in Chapter 2, the liquid, digitz, and finger tutting

communities operate significantly in virtual networked spaces. Though some underground illusion-based dancers are part of a crew that meet in person to dance (J. Hupp, personal communication, June 7, 2012), an examination of the location of the members of the *EDM Dance Facebook group* (which I describe in more detail in this chapter) and the results of the survey I conducted (which I describe in later sections) indicate that many are located in various locations across North America, Australia, Europe, and Asia, with clusters of dancers in major US cities such as Baltimore, New York, and Chicago. Thus, much of the data collected from the community is taken from the Internet or facilitated by Internet communication. Kozinets (2002) uses the term "netnography" to signify ethnographic research conducted using the Internet, which has become an increasingly widely used and accepted method for understanding communities, particularly online or "virtual" (Rheingold, 2000) communities (Ang & Zaphiris, 2010; Cherny, 1999; Kozinets, 2010).

In explaining the approach I take to this ethnography, it would be relevant to discuss my subjective positioning within the underground illusion-based dance community and the approach I took in what is known in ethnographic practice as the *entrée*. The entrée is that "process of initial entry into a new culture or community" which is "sometimes facilitated by social contact" (Kozinets, 2010, p. 190). My entrée was, in a manner of speaking, unintentional. It started by contact I had initiated with information artist Albert Hwang in order to use an exceedingly clever device that he had designed—a low-fidelity volumetric display made primarily of string (Parker, 2009). Hwang identified as a dancer, and a contributor to an online discussion forum for a style that he told me was called liquid. It intrigued me that he identified strongly as a dancer and at the same time had such sophisticated and "maker" approach towards digital technology.[7] The exchange of ideas we had around dance, technology, performance, and computation during that first meeting was to reflect the more extensive exchanges I

[7] Limor Fried, lead engineer of Adafruit Industries, describes the term maker as "the new hobbyist… someone who likes to build stuff with their hands and with tools" (Fried, 2012).

was to have with other dancers from the community at later time. He invited me to contribute my thoughts to a discussion forum on liquid dance, Floasis.net, and introduced me to another dancer, Kai, the administrator of Floasis.net. After some time, I received and accepted an invitation to join the EDM Dancers Facebook group. Over the next several months, I began to understand that liquid was one of numerous styles. I began to explore the community of EDM dancers in greater detail, not realizing that this was later to become the focus of my graduate research. In short, my entrée to the community was not only facilitated by social contact but also preceded any intent of intensive scholarly study. My experience is consistent with Marcus' (1995) reflection (via Haraway) on positioning: in pursuing multi-sited fieldwork, the researcher is "bound to enter discourses that overlap" with their own (p. 112). The nature of my entrée—namely, an invitation to contribute my ideas to the community—also precipitated the participatory stance that I was to assume, and which I describe in detail in the next section. Marcus' exposition on ethnographic positioning had anticipated this particular turn of events:

> In any contemporary field of work, there is always others within who know (or want to know) what the ethnographer knows, albeit from a different subject position, or who want to know what the ethnographer wants to know. Such ambivalent identifications, or perceived identifications, immediately locate the ethnographer within the terrain being mapped and reconfigure any kind of methodological discussion that presumes a perspective from above or "nowhere". (Marcus, 1995, p. 112)

1.3.3. Primary data sources

The data in this research come from a variety of primary sources, including responses to a web survey; informant interviews; online discussion forums and websites on EDM dance and on urban dance; publicly available online video recordings of performances, tutorials, and interviews; personal correspondences with dancers; and rehearsal notes that I kept during the process of learning the illusion style techniques. I organized and coded primary sources using Atlas TI, a qualitative analysis software program.

Examining the breadth of material that the dancers have generated in discussion forums, informational websites, and wikis, one cannot help but regard these dancers as

authors of ethnographic archives that belong to their community's *digital cultural heritage*. As such, they are (as I am) subject to tensions inherent in the curatorial process. Writing about the processes in creating a digital cultural archive of the Doig River First Nation in British Columbia, Canada, Kate Hennessy (2012) speaks to these tensions:

> The act of creation of the ethnographic document and the act of creation of the ethnographic archive to order and preserve documentation of the intangible is far from neutral… Digital heritage is shaped by systems of heritage value and subjective evaluation about what to preserve—in this schema, what to make public---and what to keep in private circulation or allow to be lost. (pp. 35, 37)

It is these tensions that are apparent in the disclaimer that the Liquid Pop Collective preface their All Access Liquid & Digitz Tutorial video (2001): "The Liquid Pop Collective does not claim to have invented the dance known as liquid. They are merely practitioners of the dance. Nothing more, nothing less." The All Access Liquid & Digitz Tutorial (from here on, "All Access") video is a key primary source, as I describe later in this chapter.

The primary sources I have chosen to illustrate each of the three styles capture what I believe to be notable and salient practices and ontologies of the styles, but nevertheless reflect my preferential bias for one set of texts over another. For instance, in a later section, I quote one respondent who objects to the mechanization of dance technê which he observed was prevalent in the community, and another respondent who holds a specific view of the notion of `flow` that differs somewhat from the described by the Liquid Pop Collective.[8] However, I attempt to present multiple views of a contested concept whenever possible since these tensions contribute precisely to the argument that these styles can be read as cyborgian and 'paradoxically' organic-mechanical.

[8] Terms in `monospace font` are technical concepts from underground illusion-based dance techniques

A note on informant privacy needs to be made at this point. As the sections show, data gathered from subjects in this study are from a variety of sources and are subject to differing guidelines around confidentiality. In order to strike a balance between protecting subjects' privacy and giving credit where it is due, I use the following attribution conventions:

- When quoting subjects' posts from Facebook, I anonymize subjects by assigning them the code {F*x*}, where *x* is a unique numbered assigned to each Facebook member.
- When the posts are from Floasis.net, I attribute quotes using the subjects' Floasis.net aliases, which are visible to the public.
- When quoting from responses to the Web survey, I anonymize subjects by assigning them the code {I*x*}, where *x* is a unique numbered assigned to each survey respondent.
- When quoting from interviews I conducted, I use names that participants have provided me with their full knowledge that these names will be used in public reports of the research, unless I have been specifically asked to share their insights anonymously.

1.3.3.1. Web survey

I created a Web survey in which participants were asked questions about their skills, behaviours, and attitudes towards dance and technology (for example, whether they watch online videos or participate in online discussion forums on EDM dance). The survey was advertised through the EDM Dance Facebook group, which I describe in detail in a later section. At the time the survey was advertised, about 480 Facebook users were members of the group.[9] Eleven responded. Though these responses cannot statistically be considered representative, I nevertheless present a few of the results to frame relevant points in the discussion. The survey questionnaire is presented as Appendix B.

[9] The group is located at www.facebook.com/groups/221650201226046. As of this writing, 505 Facebook users are subscribed to the EDM Dance Facebook group.

1.3.3.2. Informant interviews and knowledge exchange

I extended interview invitations to everyone who filled the survey and passed the screening question (question 4 of the survey), which is whether they danced to one or more of liquid, digitz, or finger tutting. All eleven (100%) indicated that they danced liquid and digitz, while nine (82%) indicated that they also did finger tutting. Thus, all eleven received an invitation for the interview, which I planned to last one hour. The first three-quarters of the interview focused on gathering the informants' personal views on dance technique; themes on the body, space, and technology; and the history of EDM dance. The last quarter was structured in part as an exchange where I presented my findings to date in order to validate any interim conclusions as a form of member-checking. If time allowed, we engaged in an improvised dialog where we could discuss any larger issues surrounding EDM dance. The protocol for the interview is included as Appendix C.

Some of the participants were members of the Dark Matter Squad, a registered organization in the USA composed of a crew of influential dancers. In this study, I treat the Dark Matter Squad as key informants. I do so for several reasons. To the best of my knowledge, they maintain and curate the most comprehensive and authoritative digital archive on liquid and digitz (www.darkmattersquad.com). Their mandate centers on the goal of "preserving, documenting and archiving" liquid and digitz, while also offering classes, hosting workshops, and producing musical events and dance competitions (Dark Matter Squad, n.d.-b). Furthermore, some of the members of the Dark Matter Squad were original members of the Liquid Pop Collective, a seminal group that created and distributed the All Access video. In addition, their members administrate the EDM Dance Facebook group (described in the next section), suggesting that they are currently *de facto*—though not necessarily the only—leaders in the community. Finally, the members of the Dark Matter Squad who responded to my requests for interviews provided detailed, nuanced, and layered opinions about the history and practices of the EDM dance community.

1.3.3.3. Discussion forum posts

The EDM Dance Facebook group was started in September, 2011 by one of the members of the Dark Matter Squad.[10] The group currently has 507 members. As of this writing, its posts are publicly accessible, although one must be approved as a member to contribute content. In the body of thesis, I quote from posts from September 13, 2011 to May 21, 2012. The forum continues to be active, averaging 15 posts a day during the time the survey was conducted. I also cite the discussion forum posts from March, 2009 to April, 2011 on Floasis.net.

1.3.3.4. Archival video footage

In 2001, the Liquid Pop Collective released the All Access Liquid & Digitz Tutorial, a VHS recording that named and described liquid and digitz techniques. It sold approximately 2000 copies worldwide and is currently archived in YouTube (Dark Matter Squad, 2011a, n.d.-c). It remains the only systematic video compilation of liquid and digitz techniques put together in the form of a reference guide. I rely primarily on this source in my description and analysis of liquid and digitz.

In addition, there are currently hundreds if not thousands of videos posted on sites such as YouTube.com of dancers performing in the styles of liquid, digitz, finger tutting, and other related styles. My primary source for which videos to analyze were based on the videos posted on the discussion forum posts I analyzed, as well as specific recommendations by my informants. For instance, one of the ways that liquid dance was brought to a broader attention was through the spread of footage dated March 13, 1999, of a dancer, identified as Liquid Pop Eric, dancing in front of a video arcade

[10] The URL of the group is https://www.facebook.com/groups/221650201226046.

machine.[11] This particular footage was brought to my attention because of an extended discussion on the EDM Dance Facebook group that ensued when this video was posted (EDM Dance Facebook members {FB1}, {FB2}, {FB3}, {FB4}, {FB5}, 2011):

> {FB1}: Pretty much iconic. Probably why most of us are here.
>
> {FB2}: I wouldn't be doing liquid if not for that clip. Thats fo sho. I still watch it once a month or so.
>
> {FB3}: An epic man in the epic footage doing the epic dance, I'm glad to have this vid on my HDD... still watching, never tired :]
>
> {FB4}: This clip started it for me :)
>
> {FB5}: This inspired me to continue :P

Other videos were selected based on recommendations by my informants and by examining the number of 'likes' and the number of comments the video received, as well as the textual contents of the comments that a video posted on the EDM Facebook group. In addition, my previous experience in contemporary dance and movement studies allowed me to pick up cues on which dancers had great facility and could be regarded as exemplars. This heuristic was particularly important for finger tutting, for which no single authoritative compilation of techniques—similar in tone to the All Access video—has yet been released.

The use of online video

1.3.3.5. Expertise and rehearsal notes

Choreological study relies in part on knowledge drawn from first-person, phenomenal experiences in the dance studio (or wherever else the research is being conducted). Like all research in which one's subjectivity is treated not as a hindrance

[11] This footage is available in part on various YouTube channels, including a version uploaded by YouTube member gfunkedup (2008). The video arcade machine is a noticeable feature of the video, referencing a connection to the video game world. Commending a dancer who had posted a video on the EDM Dance Facebook forum, another member remarked, "He's using cheatcodes." (EDM Dance Facebook Group members, 2011a)

but as a tool, this quality of this research relies on the quality of “the researcher as an instrument” (Schiphorst, 2008), My professional experience in movement is thus relevant to this discussion on methodology, I trained as an undergraduate student in a university contemporary dance program for three years and briefly embarked on a professional career in contemporary dance. As part of my contemporary dance training, I took a semester-long Laban Movement Analysis class which, several years later, I re-took as an auditing graduate student. I also have a formal background in computing science, with a specialization in multimedia. These perspectives frame the reflections I have made on my past experiences in participating at EDM events such as raves, which include active participation in the various social practices associated with EDM culture.

Throughout the duration of the research, I attempted to learn some of the techniques from liquid, digitz, and tutting. Whenever possible, I would do so in a club or while listening to EDM. I recorded insights that came to me and filed them away for later use, or would directly work on this document whenever a particularly relevant insight came to mind.

1.4. Summary and chapter overview

In this chapter, I described the motivating goals for my research. I discussed themes around technology and dance that are foundational for the discussion in later chapters. I presented examples outside of underground illusion-based styles of ways in which technology has influenced movement aesthetics of dancing bodies through the use of material artefacts and computational processes. I illustrated how media technologies and Web 2.0 tools have been used to facilitate the development of communities of dance practice. I concluded by outlining my methodological approaches and enumerated my primary sources.

In Chapter 2, I illustrate how the technologies described in Chapter 1 contributed to the development of underground illusion-based styles, arguing that they did so in a way that is rich and unique to these styles. I frame portions of the urban dance community’s history and practice using themes and tropes that are relevant in this

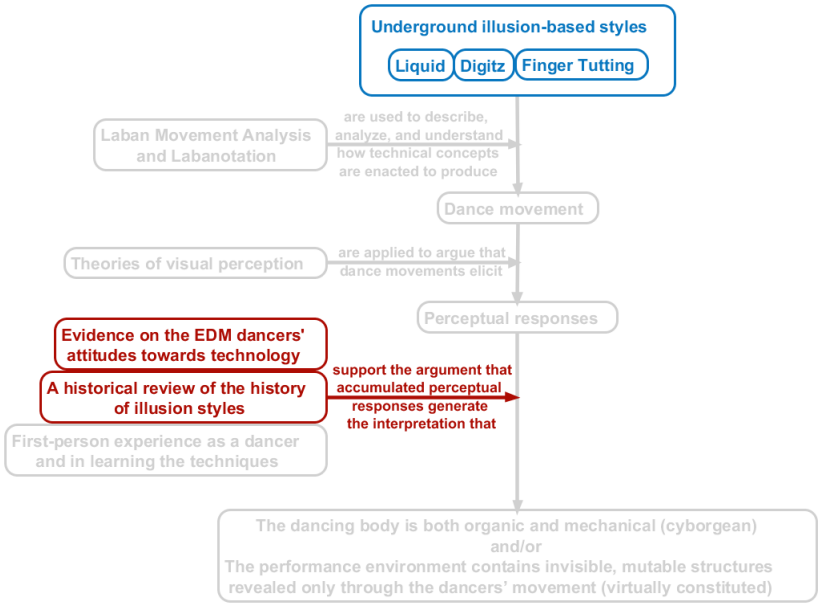
research. I provide evidence from interviews with—and discussion forum posts and online videos created by—underground illusion-based dancers to suggest that through their dancing they reimagine their bodies as in part digital or mechanical, or that they mask identifiably human elements of their embodied identity in performance. I use the 'robot style' of dance as an example of an early form of popular dance in which technology has greatly influenced movement aesthetics. I propose a term, *dance illusioning*, to denote the systematic approach that dancers take in developing movement vocabularies based on an understanding of how audiences perceive the trajectories, shapes, and illusionary effects they make.

In Chapter 3, I provide a brief overview of concepts from Laban Movement Analysis and Labanotation, illustrating both with examples taken from everyday life as well as selected aspects of underground illusion-based dance styles. I describe two theories from the field of perceptual psychology—the Gestalt principles of perceptual organization and the spatial cognition principle of structure from motion.

In Chapter 4, I apply the theoretical frameworks from Chapter 3 to describe in technical detail movement techniques from the underground illusion-based styles of liquid, digitz, and finger tutting, relying heavily on the descriptions that their practitioners have used. I propose that one particular Gestalt principle, the Law of Prägnanz, can be adapted to explain how the underground illusion-based styles convey particular illusions: I describe three illusioning modes: *spatial tangibilization*, *rejointing*, and *spatial quantization*.

I conclude this research in Chapter 5, where I describe two proposals. The first is addressed to the urban dance community, aiming to contribute what I believe is a useful project that they (we) can undertake to further the development of their (our) community of practice. The second proposal is addressed to the technology research community. I argue that underground illusion-based dancers can be considered movement experts that can provide new insights into the design and evaluation of technologies. I describe the contributions and limitations of the study and outline future research directions. I conclude with a call for revisiting the dancing body as a site for technological innovation and sustainable creativity.

2. Underground Illusion-Based Styles

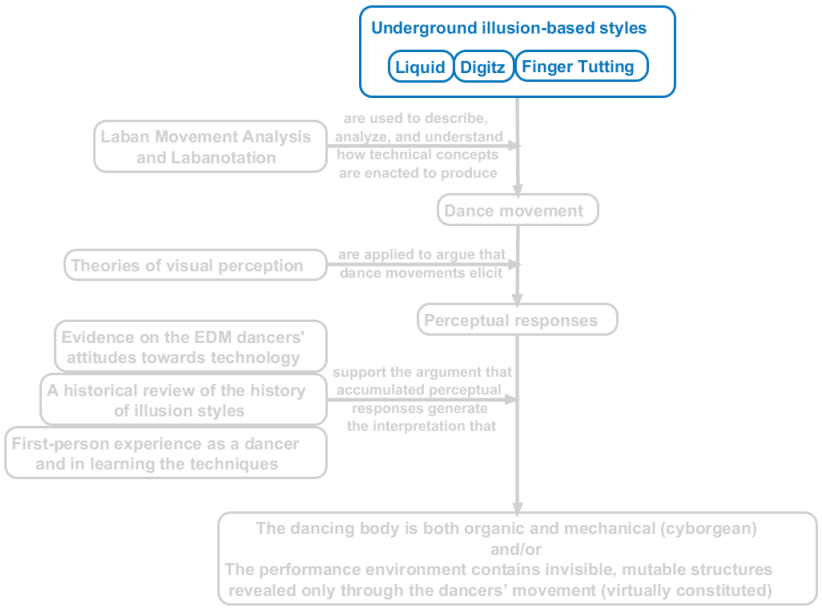


While the expressive mobilization of the hands and fingers are important in the aesthetic forms of many dance traditions (for instance, ballet and flamenco), few dance genres in the Western tradition focus on developing the facility of the hands and fingers as its central aesthetic preoccupation, though many contemporary choreographers such as Jonathan Burrows (2002) have created individual works that principally utilize the hands. Notable styles in non-Western traditions include the *mudras* in traditional Indian dance and certain traditional Indonesian dances (Bagchi, 2010; Gaston, 1990; Hoskin, 2001). Many other practices certainly involve the expressive and expert use of hands and fingers, such as playing a traditional musical instrument; however, it is the aesthetics of the sounds generated by the movement that is taken as significant, not the movement of limbs themselves. Movement of the fingers, hands, and arms is crucial to sign languages where—in concert with facial gestures—the precise mobilization of the

limbs with respect to the torso is used to construct complex information structures (Stokoe, 1976). The aim of sign languages, however, is primarily to communicate these structures, not to showcase the movement as non-signifying or purely aesthetic. A notable exception occurs when interpreting songs to sign, during which the musicality of the movement assumes increased importance and transliteration of the spoken words to sign can hinder the experience of the viewer (Anderson, 2009). One movement-related practice, mime, is frequently cited by liquid dancers as influential and is sometimes mentioned in descriptions of liquid techniques. I revisit the subject of mime later in this chapter.

In the chapter, I briefly describe and provide examples of liquid, digitz, and finger tutting. To show how these styles arrived at their present state, I briefly review the history of these styles, highlighting points in the narrative where technological tropes, artefacts, or processes have been influential. I draw on technology metaphors articulated in the scholarly literature, particularly the notion of virtual reality as consensual hallucination, to link both visual perception and technology to EDM dance history.

2.1. Describing underground illusion-based styles



Reading about dance and watching dance are different experiences. The following descriptions of liquid, digitz, and finger tutting are best taken as material that can be supported by the viewing of live or recorded performances. Online videos are cited in-text; links to additional videos are available on the thesis companion site.

It is important to note that like most dance practitioners, illusions styles dancers know a variety of other styles. There is significant overlap between styles both in theory and in performance. For this reason, the thesis companion site lists examples where all three styles (liquid, digitz, and finger tutting) are combined. Nevertheless, it is useful analytically to categorize the dance techniques, particularly since examples exist which embody what can be regarded as core principles of each style.

2.1.1. Liquid

In Chapter 1, I described a video that was circulated online of a dancer named Liquid Pop Eric and described its important in the popularization of liquid dance. It is not

difficult to see that liquid is aptly named after viewing this video. Nor would it be difficult to see how it is similar to the dancing featured in the liquid tutorials from the All Access video and other liquid dance videos uploaded to YouTube—for instance, tutorials by Albert Hwang (2012), showcase videos uploaded by YouTube members Lunah LaFae (2011) and fivetoflow (2007), and videos shared on the thesis companion site. Figure 2.1 features still captures of a dancer performing a liquid technique, `contouring`.

Figure 2.1 Still captures of a dancer illustrating contouring

From Liquid Pop Collective All Access Liquid & Digitz Tutorial, by Dark Matter Squad. Accessed on 12 June 2012 from http://www.youtube.com/watch?v=eL_ACqibNJg . Copyright 2001 by Liquid Pop Collective. Content licensed under a Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License.

Dancers move their fingers, hands, arms, and upper torso with a flowing, continuous quality, as if these parts were made of a thick silk ribbon. Occasionally, this sinuous, highly-mobile quality is transferred to the lower body. More often, however, the pelvis, legs, and feet move with a different quality or serve to stabilize—without ever being completely stationary—the movements of the torso and the upper limbs, primarily because there are far fewer joints in the upper and lower leg as there in the torso and upper limbs. While the feet are richly-jointed, their full articulative possibilities are rarely explored (as they are in ballet, for instance), particularly since dancers tend to wear shoes that discourage mobility in the feet except at the ankle joint. Strategic use of the ankles can indeed add to the illusion of ‘flow’ in the lower body. Additionally, billowy ‘phat’ pants—though not always worn by dancers—can create a flowing quality in the

lower legs to make up for their paucity of joints. Indeed, billowy pants can be seen as a prosthetic that 'stands in' for articulating joints in the legs that would have probably been used to full effect, had the evolution of the human anatomy produced them.[12]

When I show clips of liquid to laypersons that have never seen the style before, "organic" is a term that they frequently use to describe what they see. Viewing liquid, one gets the sense of arcs and curves as opposed to straight lines and sharp corners.

Drawing from mime, liquid dancers also create illusions of shapes in the air by the rapid and fluid movement of their upper limbs that leverage Gestalt perceptual principles, as discussed in Chapter 4.

Table 4.1 in Chapter 4 summarizes techniques which illustrate in rich detail the variety of movement that constitute the liquid style.

2.1.2. Digitz

As the name suggests, digitz focuses almost entirely on the expressive mobilization of the fingers and hands, as evidenced in online videos by YouTube users DarkMatterSquad (2011b), tiny2love (2012), reggi3noble (2012), kingofsouthcarolina (2012), and Liquid Rush [LiquidRush] (2012a),[13] as well as other videos shared on the thesis companion site. Some digitz techniques (such as finger waves and rolls) recall the sinuous quality present in liquid; indeed, they can be seen as the focused application of liquid to a more confined, more distal section of the body. If in liquid the body appears to be made of silk ribbon, digitz can create the illusion that fingers are made of wire of variable flexibility. Other techniques create the impression of great control over the

[12] The Dark Matter Squad website has posted clips from other dancers describing dance styles such as *waving*, *cobra,* and *snaking*, all of which are from the popping tradition and like liquid relies on the sinuous mobilization of the body (Dark Matter Squad, 2012b).

[13] DarkMatterSquad, tiny2love, and LiquidRush are YouTube accounts managed by the Dark Matter Squad, Tiny Love, and Liquid Rush respectively.

fingers. “Precision” and “isolation” are terms that can spring to mind when watching certain digitz techniques, reminiscent of the kind of facility required to play wind instruments and keyboard instruments at a virtuosic level. Skilled digitz dancers can also and often do control each phalange at a time. Hence, subtle and minute movements are possible, as illustrated in videos of Houdoken uploaded to YouTube by gwoyang (2010) and the Dark Matter Squad (2012a). Figure 2.2 features still captures of a video demonstration of a digitz technique called a `roll`.[14]

Figure 2.2 Still captures of a dancer performing a `roll`.

From “Liquid Pop Collective Digitz Tutorial”, by Dark Matter Squad. Accessed on 12 June 2012 from http://www.youtube.com/watch?v=w0XPJTGaeuM . Copyright 2001 by Liquid Pop Collective. Content licensed under a Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License

Digitz dancers also use time in precise ways to create illusions of relationships between limbs, as if an invisible material—perhaps organic connective tissue or, alternatively, nylon fishing wire—joined the limbs together. When movements happen simultaneously, one can read an element of puppetry, where one or more fingers are seen as controlling one or more other fingers. I call this illusioning principle *rejointing*, as I describe in Chapter 4.

When the movements are separated in time, the limbs can take on more animated characteristics—*anima*, “the animating principle in living things” (OED Online,

[14] Terms in `monospace font` are technical concepts taken from underground illusion-based dance techniques.

2012)—where the hands and fingers can be seen executing and responding to commands, recalling Heider and Simmel's (1944) classic experiment that suggests that humans are capable of creating interpretations on the movement of abstract motion that endow inanimate objects with anthropomorphic behaviour. On the other hand, they can also sometimes be interpreted as part of a system of interlocking, movable parts like cogs and gears. I discuss causal illusions in Chapter 4.

Like in liquid, certain techniques in digitz create the impression of shapes in the air, but the shapes are formed by the hands and fingers almost exclusively, with little to no help from more proximal limbs such as the lower and upper arms.

Table 4.2 in Chapter 4 summarizes techniques which illustrate in rich detail the variety of movement that constitute the digitz style.

2.1.3. Finger tutting

While the stylistic influences of finger tutting is reported to be disputed, there is evidence to suggest that it was "derived through the combination of digits and tutting" ({I2}, personal communication, July 10, 2012). Tiny Love (2010a) attributes the invention of finger tutting to three dancers: Dstrange, ShiftedShapes, and himself. Scholarly study on the history of non-finger tutting is scant, but interview responses and popular sources indicate that tutting's name derives from the Egyptian pharaoh Tutankhamun,[15] which in turn purportedly references the 90-degree angle of the wrist, elbow, and shoulder joints in ancient Egyptian pictographs and murals (Gogerly, 2011). For that reason, tutting is most distinctly characterized by the use of right angles in the

[15] Tutankhamun was the eleventh king of the 18th dynasty of Egypt, and ruled sometime between 1355 and 1346 BCE (Eaton-Krauss, 2005).

upper limbs.[16] Tuts that involve the entire arm are referred to simply as *tutting*, *normal tutting*, or occasionally *king tuts* (floasisdotnet, 2010a). With finger tutting, this focus is brought into the level of hands, fingers, and phalanges. Finger tutters are capable of precisely aligning these their wrists and interphalangeal joints into highly recognizable angles, notably 90-degree and 180-degree angles, but also (to a lesser extent) other angles, such as 45 and 60 degrees.[17] The style places a value on creating legible shapes using the limbs. In order to do so, tutters must 'hit' a shape and 'hold' it long enough for the image to register with the viewer. The use of right angles can result in a 'mechanical' feel to the movement. The ability to quickly but cleanly transition from shape to shape, such as demonstrated in the work of Tiny Love (2010b), requires a embodied approaches described in Chapter 4. All of this is done to music, so the movement must retain a musicality to it as well. Figure 2.3 features still captures of a dancer performing finger tuts.

Figure 2.3 Still captures of a dancer performing finger tuts

From "Epic finger tutting combo (Nathaniel)", by YouTube user nathaniel439. Accessed on 12 June 2012 http://www.youtube.com/watch?v=pgEBgxNcsXE. Copyright 2011 by nathaniel439. Content licensed under a Creative Commons Attribution 3.0 Unported License.

[16] In my review of ancient Egyptian murals, few seem to feature hands and elbows forming right angles. Most of the right angles predominant in the depictions of human figures in ancient Egyptian murals are those formed between the feet, lower legs, upper legs, and torso, and the upper shoulders and upper arms. See, for instance, the Keystone-Mast Collection (Rose, 1870), photographs taken by George Rawlinson ([ca. 1880s]), and William Shea's (1981) study of a well-known mural at Beni Hasan in Egypt.

[17] Current research within the urban dance community includes development of triangle tuts by dancers such as Houdoken.

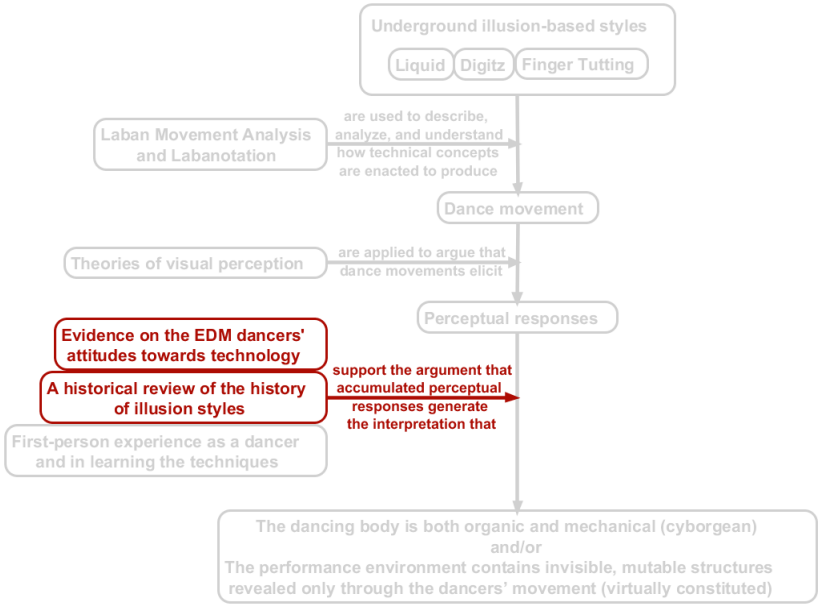
Another notable feature of finger tutting is its use of the `fixed point` concept, which appears in digitz as well. I expand on the notion of the `fixed point` in Chapter 4, but in brief, what it creates is the illusion that a part of a limbs is stuck either to another part of the body or to an invisible spot in the space. The stuck part is stationary while the rest of the body is free to move. It is a visually arresting effect especially when deployed in an unexpected way, for instance after a series of other moves that do not involve a fixed point. Like some techniques in digitz and liquid, the fixed point is said to derive from mime (see Table 4.2 in Chapter 4).

Since digitz and finger tutting are related styles, techniques from one appear frequently used with the other. Tiny Love talks about creating “digits characters” that directly reference mudras and which he envisioned as evoking “seals” (Johnson [Relic Johnson], 2010). Fingers can be arranged to form complex hand shapes, similar to the when hands are used in shadow puppetry or in sign language. The attention of the dancer seems to be on hitting the shapes more than on the aesthetics of movement that happens in between shapes. However, transitioning between complex shapes often does lead to movement that is visually engaging to watch, since the fingers often have to navigate around occluding fingers during the transition. It can suggestive of a game of cat’s cradle, sans string. Again, precision and timing appears to be particularly important.

Finger tutting is also closely related to another style called *finger connect*, in which the transition movement becomes of paramount. Finger connect often involves keeping at least one area of one hand in constant contact with one other area of the other hand, similar to how dancers of *contact improvisation* always try to maintain at least one part of their own body with their dancing partner’s body. With finger connect, the two hands take the place of two contact improvisation dancers. A body part will often move along and in continuous contact with the edges of the fingers, creating the impression that the part is moving along a grooved track. A good example of this effect can be seen in the work of finger connect dancer Ty (uranium092, 2011). Finger connect, in combination with finger tutting and digitz, also appears particularly amenable to collaborative dancing. A particularly visually arresting example involves a

collaboration between Ty and Tiny Love, which was uploaded to YouTube (Love [Tiny1Love], 2010c).

2.2. Virtual Realities and Cyborgs on the Dance Floor: A Technology-Centric View of the History of Underground illusion-based styles



Of the three styles, finger tutting is the most recent. Although the style has not been heavily documented textually,[18] online videos abound of oral histories, with dancers sharing their understanding of the development of finger tutting, usually in an

[18] As of this writing, an entry on tutting is noticeably absent from Wikipedia, whereas entries exist for liquid and digitz, as well several other EDM dance styles.

interview form.[19] Most of the videos appear to be produced by key members of urban dance community themselves, who also continue to develop the style by theorizing, codifying, and extending existing practices (EDM Dance Facebook Group members, 2012d)

While the histories of many underground illusion-based dance styles are not always well-documented, that of digitz, on the other hand, is recounted in detail on the Dark Matter Squad website. Formed by a group of liquid and digitz dancers (including members of the influential group the Liquid Pop Collective), the Dark Matter Squad launched a website with intent of producing "a comprehensive repository of historical and technical information about the electronic music dances Liquid and Digitz … as well as cultural information on rave and electronic dance music history" (Dark Matter Squad, n.d.-d). Based on comments posted on the EDM Dance Facebook group, the group appears fulfills a need in the liquid and digitz community in particular and the EDM dance scene in general. Though some of the styles have been recently highlighted in online advertising (SamsungMobileFrance & Kherroubi, 2011), Hollywood film (Hayward et al., 2010), and television (Simon, 2008), sentiments expressed on the EDM Dancers Facebook group suggest that the public attention on the styles have not necessarily translated to acknowledgment of their contributions to other, more commercially-known forms of urban dance:[20]

> EDM dancers aren't nearly as organized or public as poppers, lockers, and breakers ({FB6}, 2011).
>
> You should see the wiki article on turf dancing. No mention of liquid digits, fingertuting [sic] and connects whatsoever >< (EDM Dance Facebook Group members, 2011e)[21]

[19] See, for example, (DanceMogulMagazine, 2011; Evilnorther, 2011; floasisdotnet, 2007a, 2007b, p. 5; Johnson [Relic Johnson], 2010; Tiny1Love, 2010)

[20] Other online spaces for liquid and digitz currently exist or had previously existed, including Floasis (www.floasis.net), on which past discussions by dancers are archived.

[21] The emoticon >< can be interpreted to convey annoyance.

> That's fail about calling liquid foundation of poppin [sic] but still I am happy that liquid got picked by Yak film[22] (EDM Dance Facebook Group members, 2011f)

Digitz was reported to have begun in the club scene of New York City around 1997 (Dark Matter Squad, n.d.-c). The originator of the style is identified as club goer and dancer named Mario. While at Tunnel, one of NYC's most (in)famous clubs of the 80s, Mario's friend, "Yenal", noted "that Mario's fingers looked like a set of 'mechanical digits'" (Dark Matter Squad, n.d.-c). One could hardly ask for a more evident example of a dance style whose name is saturated in a technological—a 'cyborgian'—trope. I return to the notion of the cyborg in a later section.

The history of liquid appears to be more contested (Dark Matter Squad, n.d.-e, n.d.-f; Floasis contributors, 2009a; Tiny1Love, 2010, p. 2). The Dark Matter Squad lists several influences on liquid, such as *waving* (Dark Matter Squad, n.d.-e), a technique from popping. Popping is a street dance that was developed along the 1970s in California, and is classified as a *funk style* along with other styles such as *locking* and the *electric boogaloo* (Freeman, 2009). In a video posted on YouTube, an influential dancer, Waveomatic,[23] made a carefully constructed argument that a technique in liquid known as `hand flow` shares much in common with the hand wave, a popping technique that Waveomatic reports having observed in the early 80s (waveomatic, 2008). Whether liquid is descended from popping appears to be a source of contention. When shared in an online discussion forum, this assertion led to "flame wars", according to one informant. It is thus unsurprising that the Dark Matter Squad site exercises

[22] YAK Films is a video production company that produces music videos (particularly videos of street dance styles) and commercials. Their YouTube channel, which has 159,930 subscribers as of this writing, states that they are "dedicated to youth-led multimedia production which provides a voice for resistance to played-out mainstream media" (YAK Films, n.d.).

[23] A dancer's impact on the history of an underground illusion-based dance style can be discerned from descriptions conferred to them by members of the community. Waveomatic has been described by some of my informants and in at least one comment on Waveomatic's video (2008) as 'og' or 'original gangster', a term that denotes respect.

caution in describing the origins of, as well as non-dance cultural influences on, the style:

> There are many theories about what exactly started Liquid dancing and where. What seems to be evident at least is that the dance is indigenous to the rave culture. Liquid has roots and influences, at least in its primordial state, right around the first raves recorded in the United States in the early 90's...Liquid is a child of rave culture and had it not existed, no other external influence would have had an opportunity to create, mold, develop or influence the style as we understand it today. (Dark Matter Squad, n.d.-e)

The preceding passage hints at a subject that is rarely if at all tackled head-on in urban dance community discussion forums—the (otherwise well-documented) use of entheogens in raves (Kubiak, 2009; Olaveson, 2004; Rief, 2009; Thomas, 2003). While a detailed discussion on the links between entheogens, sensory perception, somatics, and dance is outside the scope of this chapter,[24] I touch on a links between technology *vis-à-vis* virtual reality and hallucinogens in the next section.

2.2.1. Virtual Realities and Cyborgs

Two central themes in this thesis are virtual environments and the notion of the cyborg, specifically in relation to the dance techniques of urban styles. Both reference Baudrillard's (1994) notion of the simulacrum. As I argue in Chapter 3, dancers of styles such as liquid, digitz, and finger tutting use their mastery of movement in ways that palpably reveal relationships to virtual space and cyborgian conceptualizations of their bodies. In this section, I briefly expand on these two themes in relationship to the historical precedents of these dance styles.

[24] As of this writing, Tara Samiy is working on a research at the California Institute of Integral Studies on profound, spontaneous dance/movement during psychedelic experiences ("[Dancecult-l] Fwd: ecstatic dance/movement research," 2012).

2.2.1.1. Virtual reality as consensual hallucination

In this section, I make conceptual links between rave culture, dance, and the utopias of technology. In Chapter 3, I argue that skilled practitioners of underground illusion-based styles pay particular attention to create visual effects that are meant to be seen by the audience by relying on sophisticated use of their bodies as well as an understanding of principles of visual perception. The OED provides several definitions of an illusion, including “the fact or condition of being deceived or deluded by appearances” and “the apparent perception of an external object when no such object is present, or of attributes of an object which do not exist” (“illusion, n.,” 2012). I use the term *dance illusioning* to denote the systematic approach that dancers take in developing movement vocabularies based on an understanding of how audiences perceive the trajectories, shapes, and illusionary effects they make.

It could be argued that to a certain extent, many dance techniques are designed to create illusions in the sense that the dance can “present something different to the audiences [sic] perception of how the body works and moves”, as one EDM Dance Facebook group member summarized the notion of ‘illusion’ (EDM Dance Facebook group member {FB7}, 2012). For instance, in ballet, the leg can be swung around the central vertical axis of the torso (*ronde de jambe*) at the same time that the arm can sweep the space around it (*port de bras)* at the same time, so that it might look like there was an invisible stiff wire connecting the tips of the fingers to the tips of toes. Or, more broadly speaking, ballet technique is often used to convey the ‘illusion’ of weightlessness and effortless, such as in jumps. But the fact that the term ‘illusion’ comes from the dance community itself, suggesting that sensory perception (and challenging it through dance) is an underlying theme in their practice. The provenance and original intention of the term is contested (EDM Dance Facebook group member {FB8}, 2012), but its present day use is prevalent. One EDM Dance Facebook member shares what the notion of illusion means to him:

> with the styles i practice(liquid and popping/popping substyles) the main tools of illusion used are isolation(internal and spatial) and speed control(keeping a constant speed or gradual ramp ups/downs in the case of applying physical properties, i'd go so far as to put groove under this category as well). the next two are related to the first two.

> coordination(ability to isolate and control speed with different muscle groups and parts of the body, like separation from upper and lower half) and musicality, which like groove most people wouldn't think of as an illusion, but i do. (EDM Dance Facebook group member {FB7}, 2012)

The theme of illusion is tied closely to theme of hallucination: both suggest a deception of the senses. But the deception is not necessarily malignant, and it is on this point that both the members of rave cultures and the techno-proponents of virtual reality come to a consensus:

> It's very hard to describe if you haven't experienced it. But there is an experience when you are dreaming of all the possibilities being there, that anything can happen, and it is just an open world where your mind is the only limitation. (Woolley, 1994)

It's difficult to know if Lanier was talking about virtual reality (which he was) or LSD (which he could have been) at the SIGGRAPH 89 opening panel where he made these remarks. It is not difficult to see how dance styles that emerged from the rave culture share—conceptually—a connection to virtual reality. Much as liquid dance is a child of the rave culture, many of the pioneers of the Internet and virtual reality technologies are children of the West Coast American liberalism of the 60s (Flichy, 2007; Woolley, 1994). For instance, Steward Brand and Larry Brilliant, pioneers of The Whole Earth 'Lectronic Link launched in 1985, were "former hippies" who "traveled across the United States in 1964 on a bus, promoting the use of drugs and putting on psychedelic shows" (Flichy, 2007, p. 71). The notion of the digital world as shared, altered states of mind is summed up succinctly in *Neuromancer,* in which Gibson referred to cyberspace as a "mass consensual hallucination" (Gibson, 1984). It is, however, Plant who provides us with the clearest and most evocative links between dance, technology, and entheogenic experience in the 80s. Writing about dancing on MDMA, she observers that "MDMA's users neither trip nor dream":

> They are immersed, entranced … They are dancers, rhythms, speeds, and beats, disorganized and dispersed beyond their own individuation, overwhelmed by their own connectivity. This is a world of rhythm, repetition… MDMA is one of the most influential inside tracks of the digital, sampled world that came on-line in the late 1980s… [It] throws its

> users into new connective tissues of dance, movement, rhythm, sound… [MDMA] was the interior technology for the digital age, the wetware for the software revolution. (Plant, 2000, pp. 179–180)

In watching underground illusion-based styles, one can perceive the inner world that the dancers experience and recreate through their movement. Indeed, it seems possible that their movement aesthetics might in part be synaesthetically influenced by a kind of "sensory substitution" (Bach-y-Rita, 1972). Members of the liquid community have discussed topics related precisely to this in a discussion thread titled "Seeing Music" on the Floasis.net:

> I see music… I see shapes, vectors. I see notes hitting surfaces, and phrases as lines bouncing around in space. (A. [phedhex] Hwang, 2011a)
>
> Genres like dubstep/glitchhop/idm [that] have more textured and unique sounds (compared to a drum machine emulation) … make me imagine objects (or entire scenes) [that are] more based in reality and more complex in general. (tommy VFIII, 2011)
>
> [Do I see music?] Absolutely. This is what I aim to show through my dancing. (a thing, 2011)
>
> i see the music im [sic] listening to. depending on the music the melody or harmony the vocals the beats the drops anything can become either changing landscape or a person acting in a scene and im constantly a running camera capturing every moment of it. each track/song has its own story line a plot and most the time a climax. i see it all as if i was a ghost in that time and place. most the time i see it in vivid colors. my imagination is the best hd available. (dizzyD, 2011)

dizzyD's comparison between his imagination and "hd" (high definition) video points to an internal experience that is mediated by technology. In describing how he perceives abstract figures while listening to music, dancer Houdoken observes that he does so as "bodyless awareness or camera angle" (houdoken, 2011).

2.2.1.2. From Robots to Cyborgs: Dance-based representations of technology on the floor

dizzyD and Houdoken's observations bring us back to the relationship of the dancing body with technology, and to a central claim of this research: Movement that is

based on technological tropes makes us cyborgian. When we embed a technological artifact into our bodies (i.e., under our skin), such as a pacemaker, it seems natural to conclude that we are somewhat of a cyborg. This is not that uncontroversial. When we go through our lives encumbered with a technological artefact is placed *on* or *very near* our bodies (i.e., outside our skin), such as a pair of eyeglasses without which we cannot see or the cellphone that we can't bear to part with, it might be argued that these, too, make us somewhat of a cyborg. This, too, is not that uncontroversial and has been widely articulated by philosophers and critical theorists.

There is, however, no reason why only technological artefacts ought to be the only kind of technologies we consider in evaluating what makes us cyborgs. Technological processes—algorithms, formulas, recipes—are equally worth examining. Consider the extreme case in which an individual has decided that, for the rest of her life, she will walk only in a straight line forward and backwards, and will only switch the direction of her walking by changing her body orientation by 90 degrees to the right. This is an extremely difficult way of navigating the world but it is entirely possible to go about one's life strictly following this algorithm. Indeed, during formal military occasions, soldiers are required to move in precisely this manner, although they are allowed to turn 90 degrees to the left and 180 degrees as well. This application of an algorithm to human navigation subverts and replaces more ‘organic’ ways of navigation, much in the same way that a pacemaker replaces the heart, or a pair of eyeglasses augments optical pathways. *Merely because a technology is not tangible does not make it any less artificial, and while movement patterns are not embedded in our bodies in the way a pacemaker is, it is encoded in our neuromuscular pathways.* If we see our hypothetical individual navigating through, say, an open meadow in such a manner, we would certainly think that it was odd and likely say that it was ‘artificial’.

While the situation just presented is somewhat contrived, one real-life and relevant example in which movement can be seen as contributing to the ‘cyborgization’ of the human body can be found in the *robot* style, an example of a dance practice that predates liquid, digitz, and finger tutting and in which a technological trope is central to movement aesthetics. Like the contested history of liquid, the roots of the robot style do

not appear clearly documented. ‘Robot-like’ aspects appear in early examples of funk styles such as boogaloo. In a video uploaded by YouTube user fredpixlab (2006) of James Brown, which appears to have been originally recorded sometime in the mid-70s, Brown performs a series of postures and gestures that is now iconic of the robot style. He introduces the robot by skittering across the floor, his knees barely flexing. He then fixes his forearms at right angles with his upper arm while moving his torso as a monolithic whole, flexing and extending at the hips, but only minimally so. There is a clear stop with every move, which he accomplishes by jerking the moving body parts briefly and over a short distance, much like a large piece of heavy lifting machinery might bounce slightly off a wall upon hitting it accidentally. With his facility for movement, Brown has transformed his human body into one that could be perceived has having fewer articulating joints. What joints it does have are severely limited in their range of motion. The fingers remain locked with the hand; the opposable thumb (one of the physical markers of humans as tool-makers and tool-users) is gone. Torso flexion and extension are minimal and torso rotation is completely absent, presumably because this re-imagination of the body either features a spine that can only move in a single (sagittal) plane or completely lacks the articulating vertebrae necessary for flexion, extension, and rotation.

Similar movement observations can be made of the performances of Robert Shields and Lorene Yarnell, an American mime team who starred in their own variety show on American public TV in the 1970s (M. Fox, 2010). While Western mime in the first half of the 20th century centered around techniques refined by French actors such as Marcel Marceau and Étienne Decroux (Dorcy, 1961) and references older movement-based theatre traditions in China, India, and Japan (Mawer, 1949), it is more performers like Shields from the second half of the 20th century who had “significant relevance to the ‘robot’ movement”, according to Dark Matter Squad member Jared Hupp (personal communication, July 10, 2012). Shields’ masterful use of his body can be seen in an undated interview uploaded to YouTube where he illustrates the difference between of “a robot trying to be a person” and one of a “person trying to be a robot” (Atlofas, 2006). One impression subtly differs from the other through a sophisticated and differentiated use of muscular tension, postural alignment, and timing. However, the inflexible, non-

rotating torso is present in both impressions. It is notable the absence of rotational movement in the torso is seen by somatic specialists such as Body-Mind Centering practitioners and LMA analysts as indicative of the underdevelopment of *cross-lateral* patterning (Hackney, 2004; Hartley, 1995; C. Prophet, personal communication, June 26, 2012). Cross-lateral patterning is the "most sophisticated" of development movement patterns that humans learn starting from infancy (Hartley, 1995, p. 78). Even as the robot symbolizes technological achievement, it also draws attention to itself as a 'less evolved' and imperfect emulation of the human body.[25] Brown's, Shield's, and Yarnell's embodied interpretation of the robot body have many similarities. The imputation is clear: the robot is clumsy, limited, and—as I argue—technological but anachronistic.

The robot style is an example of a movement-based approach to applying technological tropes to the body. I assert that finger-, hand-, and arm-based styles such as liquid, digits, and finger tutting are related to but depart from this earlier conceptualization of the technological dancing body. It is worth noting that the sequence of limb development in young children proceed from proximal parts of the body (those that are closest to the core) to the extremities such as the hands and feet (Hartley, 1995). I revisit developmental movement patterns in Chapter 3. What is important to note at this point is that whereas the immovable torso suggests the 'primitive' robot of the Industrial Revolution, the complex use of the fingers and hands suggests the 'sophisticated' cyborg of the Information Age. Underground illusion-based styles are to the robot what the aerodynamic, corner-rounded form factor of today's personal computing devices are to their clunkier, more angular ancestors. Mechanical but organic. Precise but liquid. I expand on these ideas in Chapter 4.

[25]Applying Baudrillard's (1994) notion of "orders of simulacra", one could conclude the performance by a mime or a dancer of the robot is a second order simulacrum of a second order simulacrum.

The notion of the organic is now more deeply intertwined than ever with the technological, a conflation that arguably can be traced back to those very same West Coast ex-hippies from the 80s who dreamed of a world where technology brings people together in an “internet imaginaire” (Flichy, 2007) built on openness, connectivity, and freedom. It was in the mid-80s that Donna Haraway published her seminal work, A Cyborg Manifesto (Haraway, 1987), linking notions of hybridity, gender, class, and cybernetics with a dream of a “liberating utopia” (Flichy, 2007, p. 152). Dark Matter Squad's account of Mario’s experiments in “finger manipulation and synchronization” situate Mario and Yenal in a “melting pot of races, genders, cross-genders and classes” (Dark Matter Squad, n.d.-c). In hindsight, it seems inevitable that such a cyborgian street dance style emerged in the middle of the dance floor where techno music was played; under the auspices of “huge disco balls spraying the dance floor with a kaleidoscope of whirling dots”; at a Manhattan venue that regularly drew in “more than 3,000 weekend faithful every Friday and Saturday night” (New York Times, 1996). Here, the liminalities of identities and ontologies were explored, pushed to their limits, and celebrated.

2.2.2. Technology and the EDM Dance Community

In the previous section, I roughly sketched out an argument drawn from historical accounts of both technology and EDM dance to suggest that in certain dance styles, the dancing body has been treated as something that owes part of its identity to technology but not entirely so, something essentially human but not inevitably so. I expand this analysis and examine the role that technology has played in other areas of practice and beliefs in the EDM dance community, use examples drawn from the data I collected during the research.

2.2.2.1. Online community of practice

Informant interviews, personal correspondences, and survey results seem to indicate that unlike most communities of dance practice,[26] members of the EDM dance community interact with each other significantly (if not primarily) using digital and Internet media. Speaking about the liquid community, for instance, one informant says that they "really only [physically] meet once a year" at Axiom, an annual conference dedicated to EDM dance.[27] It is difficult to estimate how many individuals globally identify as underground illusion-based dancers and, of them, how many are collocated and along what patterns of distribution. However, ten of the eleven survey respondents were distributed across six US states while one lived in Australia. Nine respondents (81.2%) reported discussing dance-related online as often as (36.4%) or more often than (45.5%) they do in person. These suggest that the dancers are generally dispersed and engage in dance discourse significantly (or perhaps even primarily) online. Furthermore, some have reported participating in improvisation sessions known as ciphers, both face-to-face but also using videoconferencing technologies, as described in a later section.

2.2.2.2. Digitizing and mechanizing the human

Sometime before I committed to doing my thesis on EDM dance, I shared a video I took of myself improvising in a dance studio with one of my informants, Albert Hwang, whose dance background is primarily in liquid. His feedback was as surprising as it is foundational to insights on the phenomenal experience of underground illusion-based dancers:

> You have trained a lot of shapes that are common to modern dance into your body. It looks like these shapes are used for connoting a human body. While this is useful (and interesting to watch, actually), it goes against my personal philosophy about liquid, which is that it's

[26] See for instance Buckland (1999) and Davida (2011) for ethnographic studies of traditional and contemporary dance communities, and Schloss' (2009) study on hip-hop culture in New York.

[27] The agenda from the 2011 conference is available on http://www.darkmattersquad.com/events/axiom2011/details/

about abandoning human form in favor of digital ones. (A. Hwang, personal communication, October 5, 2011)

Hwang's philosophy of favouring digital tropes in his dance is reflected in other aspects of the urban dance community. A sampling of names and profile pictures of the Facebook profiles of the EDM Dance Facebook group and of various liquid and digitz dancers' YouTube channels suggest that Hwang is not alone in recasting at least part of his identity as digital, mechanical, or cyborgian. On the Floasis.net forum, one member goes by the handle 'Mechanical psuedohuman'. Another member uses an animated GIF of a highly geometric form as an avatar picture. One dancer's online handle in the EDM Dance Facebook group includes the word "Waveomatic", while another member is part of a gogo dance troupe is called "Electrocute". The Facebook avatar of dancer Jared Hupp (who goes by the dancer name CodeRed) features him with his arm around a retro-looking robot. A dancer who goes by the name ShiftedShapes has observed the similarity between a now well-known gesture in finger tutting and the logo of a camera shop that was visible from the lineup of one of the clubs that EDM dancers had frequented in the past; the gesture mimes the viewfinder of a camera (Tiny1Love, 2010, p. 2). Most significantly and telling of all, the Dark Matter website's header features a set of robotic fingers (Figure 2.4).

Figure 2.4 The Dark Matter website header

Image copyright 2012 by the Dark Matter Squad. Provided by the image author. Reprinted with permission.

Such textual and visual representations are signifiers that 'perform' particular identities and tropes that dancers choose to represent their selves—or, at least, their online selves (Goffman, 1959; Van Der Heide, D'Angelo, & Schumaker, 2012).

It could be argued that the dancers have significantly different online and offline performances of their identity. Furthermore, other online profiles feature textual and visual signifiers that do not carry technological tropes as strongly, if they do at all. EDM dancers hold different opinions on theme of the nonhuman. Dancer Plainwhite Tom sees dance as "an expression of the soul" (Plainwhite Tom, 2012), resonating with a Modernist stance to dance that places an "emphasis on the expression of feelings" (Au, 2002, p. 119):

> When I first came into the liquid scene, I noticed a lot of the dancers not really expressing their emotions, on the dance floor, as well as off… I really enjoy seeing someone shine through as clear as day when they are flowing… This dance (in my opinion) is highly organic, it's extremely lucid, and to mechanize it would be a travesty. (Plainwhite Tom, 2012)

Plainwhite Tom's concerns echo those of the community dance group I discuss in Chapter 1.

Haraway suggests that binaries such as organic/mechanical are problematic. Flichy interprets Haraway's cyborg not as "a semi- or completely artificial being" but as an awareness "that relations between humans and technology are so close that it is not possible to say where one stops and the other starts" (Flichy, 2007, p. 151). Haraway and Flichy's point is perhaps best exemplified by a dancer who posts *gloving* videos on YouTube and goes by the handle 'BinaryPLUR'.[28] PLUR is an acronym used in rave culture for 'peace, love, understand, respect', mirroring the Internet's utopia of connectivity and openness.

It is notable that dancers improvise ('jam') or compete ('battle') collectively in a circular formation known as a *cipher* (DJ Hooch, 2011, p. 20), from the Arabic word for zero, *sifr*. Writing on hip hop culture, Jeff Chang (2006) suggests that the term draws

[28] Gloving is an EDM dance style where the dancer dons gloves whose fingertips are lit by LED lights. I discuss gloving in later chapters.

out the notion of the “zero-point, the point of vanishing” (p. 228)—the transcendent experience which “lies beyond thought and language” (Shaw, 2006, p. 3), on which philosophers such as Lyotard (1994) have expounded and through which the rave experience has been reinscribed in recent scholarly writing.[29] The cipher, however, is also a term used in cryptography denoting a secret system of writing by which a piece of plain text is encoded to and decoded from an enciphered—and otherwise unintelligible—message (Gaines, 1989). Ciphers are the foundation of modern digital security systems. Though ciphers certainly predate digital technologies, the use of this term lends weight to a technology-centric reading of the practices of urban dance cultures, particularly since digital computation relies on the binary system in which the symbolic vocabulary take one of only two values: 1 or 0. *Sifr*. Through the cipher (which sometimes happens over online videoconferencing, as I describe in a later section), dancers come together and exchange phenomenal experiences encoded in their bodies.

2.2.2.3. Abstracting the human form

However, even if the intent of dancers is not to *actively reimagine* themselves as nonhuman, their physical appearance occasionally is evocative of an intent to *suppress* what is identifiably human about them. Some of the dancers in the online videos that I watched perform wearing items that cover certain areas of their body: bandanas over their mouths (LiquidRush, 2012b), sunglasses over their eyes (floasisdotnet, 2010b), caps or hats on their heads (floasisdotnet, 2010b), or loose clothing such as oversized hoodies and baggy pants (fivefoflow, 2007). Often, they wear some combination of these items together. Reasons for doing so might include a desire for anonymity and/or

[29] See, for instance, Sherk (2010) and St John (2009).

physical comfort, as much as it demonstrates a within a taste culture.[30] Nevertheless, the fact remains that without seeing the eyes, skull, mouth, and/or much of the skin of the dancer, viewers can be led to focus on moving body parts instead of a moving and thus see the dancing as a pure movement form almost in the way that we might watch and appreciate kinetic sculpture. Returning to the theme of costuming as technology from Chapter 1, a parallel can be made to the clothing choices made by urban dancers to Graham's stretch fabric tube costume in *Lamentations*, which—as Carlson (2011) observes—"obscured Graham's physical form and often her face," allowing the audience to experience "expressive qualities beyond the traditional narrative dance" (p. 76). In Chapter 3, I discuss how this phenomenon plays a role in the perception and interpretation of dance movement.

2.2.2.4. Mediatization

Performance studies scholar Philip Auslander (1999) has documented the ways in which "almost all live performances"—from sports events to rock concerts—have been "mediatized" (p.158). While this can be said of many genres of live dance performance, media technologies have played a particularly salient role in the popularization of EDM dance styles. Many of the performances are crafted particularly to be captured by consumer-grade video recording devices, uploaded to YouTube.com, and to be viewed on a computer screen. This is significant since finger-based styles are best viewed within a particular range of distance. Indeed, many of the performances that are available online of digitz or finger tutting were made for the camera. Following McLuhan's (1964), Auslander (1999) notes, "the live event itself is shaped to the demands of mediatization" (p. 158). For instance, some recent digitz techniques, such

[30] My experience in raves in the past indicates that these choices around accessories and clothing are often (though not always) made by ravers. In fact, they are so common as to have been parodied, such as in one video that was posted in the EDM Dance Facebook group (ryanjasonsteele, 2012). When I had attended raves in the past, I chosen to wear very similar attire, particularly if I had ingested any entheogenic substances, which sometimes inhibits circulation in my body. Swaddled in a hoodie and loose cargo pants, I would feel safe, sheltered, and warm.

as the minute movements that dancer Houdoken demonstrates using his most distal phalanges (gwoyang, 2010) are perceptible only at close viewing distances. Furthermore, certain illusions require specific sightlines in order to work, such as in a liquid technique called hides, as dancer Liquid Rush explained in one interview (Liquid Rush, personal communication, June 7, 2012). These requirements are difficult to meet when performing in a cipher because the audience surrounds the dancer, unless the single vantage point that a camera provides.

While video presentation of dance creates both choreographic opportunities and limitations, much of the movement analysis in this thesis remains valid for live performances. The mere fact that a dance performance is archived in YouTube does not necessarily mean that it was created for the camera. Examples of performances that were captured on camera but were performed primarily for a live audience include videos uploaded by Love [Tiny1Love] (2012), Love [Tiny2Love] (2011), and floasisdotnet (2010b). In the previous chapter and earlier in this chapter, I mentioned the footage of Liquid Pop Eric dancing in front a video arcade machine, dated 1999. Liquid Pop Eric was not performing for the camera then; his performance was captured on video and distributed sometime soon after it was first recorded through peer-to-peer networks and downloaded with programs like Kazaa.[31]

While most of the dance examples available online are generated by the community, a notable exception is a video entitled *Unleash Your Fingers* (SamsungMobileFrance & Kherroubi, 2011), which the Samsung Group released as part of a marketing campaign for a line of mobile phones. The video featured a dancer performing digitz and finger tuts, with visual effects added in post production that appear to show lines, planes, and solids that appear to be defined by or emerge from the

[31] Kazaa was a peer-to-peer file-sharing service that was widely used up until about 2006, during which time it lost a lawsuit filed by major record labels in the United States ("Kazaa site becomes legal service," 2006).

shapes of or movement trails left by the dancers' hands and fingers. The video, which was uploaded to YouTube, 'went viral' and has generated over 7.5 million views as of this writing.

In the early stages of this research, I had expected to encounter community-generated dance videos that featured visual annotations such as those featured in *Unleash Your Fingers*, but found none. Indeed, when asked about their opinions on visually annotating dance, dancers responded with mixed opinions. Some were enthusiastic:

> I think it helps. It gives a visual reference of what the illusion is suppose to look like that you are trying to create through dance. {I9}
>
> I[t] can be a beneficial thing for dance because it can create a visual representation of the synchronized geometry that is used in many dances. {I10}

Others were supportive but advised restraint:

> It can def. help if done right. Too much and in my opinion it takes away from the focus of the video. {I7}
>
> They add great depth to the over technique and grids to many dance styles. However, they will never be able to show you the ra[w] emotion felt when dancing. {I1}

Some of the respondents stated that visual annotations are useful as a teaching aid but not as essential to the dance practice:

> Visual annotations are fine when understood to be used as training tools, with the knowledge that eventually the training wheels must come off. {I8}
>
> They do add to the teaching aspect of dance and are very helpful. A friend of mine Kai uses them in his tutorials and they make it easier to learn from. In a normal dance video i prefer not to have the visual annotations. {I11}
>
> Though I believe using digital sources as a means to learn, it does not replace the necessity to learn in person with physical contact and discussion with a teacher. {I2}
>
> Nothing beats having someone show you in person but in my opinion a good tutorial does not necessarily need to have visual annotations.

> Annotations can help describe the more ambiguous dance ideas such as flow or creating space. {I7}

Thus, though there are mixed sentiments towards the use of visual annotation, they indicate that they have pedadogical utility. To what extent these visual annotations can be considered canonical—in that there is a one-to-one mapping between the movement and the digital forms—is not clear and is one area of future research. Albert Hwang notes in his survey response that tuts are more straightforward to visually annotate “because the annotations are just lines on a grid”.

2.2.2.5. Media-Sharing Technologies and Web 2.0

While Auslander asserts that the properties of a medium shapes the message it carries, McLuhan makes a much stronger claim that the medium is the thing worth analyzing, in the sense that it is the properties of the medium that creates significant effect on the user engagement with the content, not the what the content actually signifies semiotically: "It is experience, rather than understanding, that influences behavior, especially in collective matters of media and technology, where the individual is almost inevitably unaware of their effect upon him" (McLuhan, 1964, p. 318). For instance, Efrat Ben-Yehuda's (2007) articulates patterns of gifting relations—i.e., interactions—in technological societies as facilitated by technological developments such as Web 2.0, the Open Source and Free Software movement, and social networks. Ben-Yehuda uses the Burning Man community as a case study of these interactions. Similar human-human interactions predicated on values of openness, sharing, and community can be found in the underground illusion styles community, as evidenced in their use of wikis, discussion forums, and online videos to document new dance techniques and to mentor new and emerging dancers.

The use of video to share dance knowledge extends to real-time videoconferencing. As I noted in a previous section, dancers from the EDM Dance Facebook group have participated in “online video-chat Ciphers” (uppercase in the original), which they “use[d] to do pretty regularly but they kinda died out” (EDM Dance Facebook Group members, 2012a). Online ciphers have been used as venues for both teaching and showcasing dance skills (EDM Dance Facebook Group members, 2012b),

and have relied on real-time video conferencing tools such as Skype™, Tinychats, and Google Hangout.[32]

2.2.2.6. Technology Use Outside of Dance

Another reason to suggest that technology might play an important role in the way the dancers construe their identity rests on their ability to work with digital technologies. Five out of the eleven respondents of the survey I conducted said that they work in a field that regularly requires them to program, design, or build digital artifacts such as software, websites, plugins, databases, robots, or computer hardware. Four indicated that they had basic knowledge of an object oriented program language, and two had an advanced knowledge of it. Two respondents indicated that they basic knowledge of a low-level programming language such as machine code or assembly; two indicated an advanced knowledge of a low-level programming language. Because of the sample size, it is impossible to conclude with any level of certainty whether these are representative of the trends within the community.[33] A comparative study of technology literacy between dance communities would be useful. I return to limitations of this study in Chapter 5.

2.2.2.7. Electronic music

Regardless of how or to what extent dancers see their identities and dance practices as influenced by technology, across all the different styles of EDM dance, there is agreement that electronic music is a primary motivator for dancing (Hupp, 2012; Johnson, 2012). Members on the Facebook group report dancing to particular types of electronic music styles, and some are genre agnostic: “I love all music [no] matter what

[32] Skype (www.skype.com) is a popular video and chat product by Microsoft Corporation that allows users to videoconference for a fee. Google Hangout and Tinychats by Google Corporation and Tinychat Corporation offer videoconferencing capability for free as of this writing.

[33] It is worth noting that two of the respondents are members of the Dark Matter Squad, and one was an original member of the Liquid Pop Collective. Their status as originators, organizers, and historians point the community towards particular directions.

the genre," says one member of the EDM Dance Facebook group (EDM Dance Facebook Group members, 2011b).

Reflecting on the topic of virtuosity in dance, one of my informants noted that the best performers are those that use their movement to highlight aspects of the music that would otherwise remain unnoticed, such as changes in musical texture or instrumentation. For instance, dancers pay attention to the rhythmic qualities of the music, as the Liquid Pop Collective has observed:

> The most important thing when doing liquid is dancing to the beat. This may be the single most overlooked aspect of the dance. As such, later in the video, we will be discussing various ways to help make your liquid look rhythmic. (Dark Matter Squad, 2001)

It would be reasonable to propose that various aural aspects of electronic dance music found an embodied form in dance the techniques of liquid and other dance genres. For instance, while other underground illusion-based dance styles such as hip hop use dramatic shifts in the dynamics of weight, tension, and speed to accentuate the downbeats of hip hop music, liquid's emphasis on continuous movement would seem to resonate with the more trance-like quality of, say, deep house music. The quantization of space in both tutting and finger tutting allow the dancer to 'hit' the beat of music both in terms of dynamics and in space. For instance, in a video recording of a tutting rehearsal by a dancer named Dementia (dementiaABM, 2007), many of the tuts terminate at the precisely the end of the downbeats of the track being played in the background. Plant (2000) draws connections between a genre of electronic music called *jungle* and bodily response by quoting Simon Reynolds*:* "Jungle is the metabolic pulse of a body reprogrammed and rewired to cope with an era of unimaginably intense information overload" (Reynolds, 2012, p. 252).

Much as EDM dancers love the music they dance to, one member makes an observation on the EDM Dance Facebook Group that drives an important point home: "Documentaries… always miss the main point: [Electronic] Dance Music = Dance. We all went to these spots to dance" (EDM Dance Facebook Group members, 2011g) . One could make a similar observation about scholarly study of EDM culture. What studies exist on the technê of the artistic practices surrounding rave culture tend to pay attention

on the music; what movement analytic studies exist on the technê of dance genres leave 'the children of rave culture' behind. Part of the challenge is in establishing a movement analytical language that can be widely shared and understood as, say, Western music notation is shared and understood. It is in this light that I mobilize the use of Laban Movement Analysis and Labanotation in this research and use it to draw some conclusions about the expressive power of EDM dance styles—specifically underground illusion-based styles—to elicit particular perceptual responses in their audiences. This, I argue, is a crucial component of underground illusion-based styles' dance technê. This kind of analysis is overdue, given that these styles have been around for, at the very least, fifteen years. Perhaps it needed to take this long for the Internet to develop to point where the meeting of ontologies, epistemologies, and "taste cultures" (W. A. Fox & Wince, 1975) could come together. The Internet, after all, is how I myself was introduced to the urban dance community.

The fact remains, however, that in my review of the academic literature—scouring listserves, connecting with researchers, performing various combinations of terms that could possibly be related to EDM dance—I had been unable to locate a scholarly engagement with the embodied practice of EDM dancers. Showing why such an engagement would be valuable is one goal of this study.

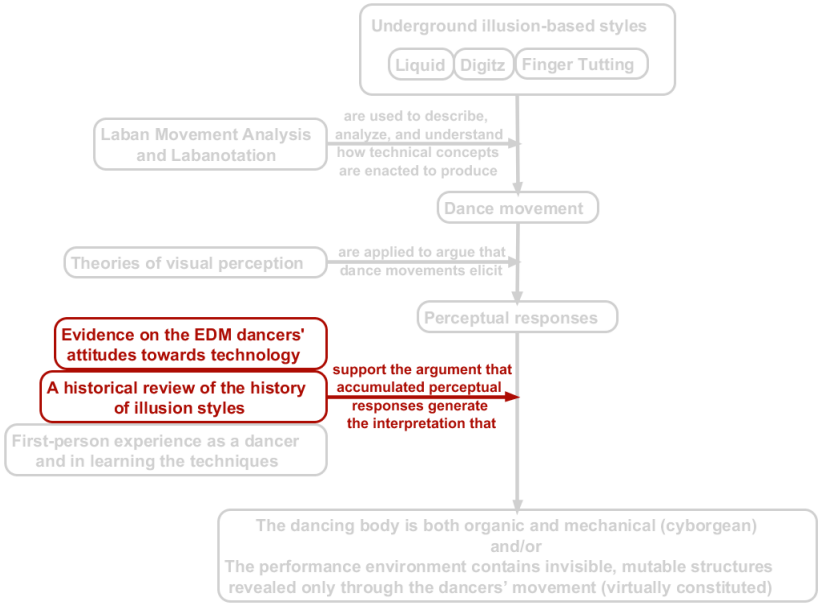
2.3. Summary

In the chapter, I argued that the embodied identies of EDM dancers can be construed in part as technological in general, and cyborg specifically. I framed the history of EDM dance styles in the context of historical developments around the Internet and virtual reality technologies, using the notion of a consensual hallucination as a central theme. I supported my claims through a purposive sampling of data gathered from online spaces and from the data I had collected from informants who had specifically participated in this research. The remaining chapters leverage these findings by using them as an interpretive framework for the perceptual interpretation of underground illusion-based styles.

3. Movement Interpretation, Analysis, and Perception

This chapter introduces concepts from Laban Movement Analysis, Labanotation, and perceptual psychology. In Chapter 2, I make the case that the styles have palpable connections to technological themes, both historically and culturally. In Chapter 4, I extend the argument further by demonstrating how technological themes permeate even the movement aesthetics and the phenomenal experience of the movement. This chapter provides the theoretical frameworks and descriptive lexica that are used in Chapter 4 to substantiate this line of argument.

3.1 Laban Movement Analysis



The ongoing evolution of street dance styles challenges attempts to arrive at a conceptual framework and descriptive language to consistently characterize the various styles and techniques. However, the work of Rudolf Laban and his associates—such as Frederick Lawrence, Irmgard Bartenieff, Lisa Ullman, and Warren Lamb, among others (Hackney, 2004; Laban & Preston-Dunlop, 2011; McCaw, 2011)—provides a foundation for a consistent conceptual framework and language that can be used to evaluate the movement techniques and somatic principles that underpin EDM dance styles. While human movement is continuous, dynamic, and ever-shifting (Sheets-Johnstone, 1980), a trained observer—such as a Certified Laban Movement Analyst—can educe patterns in the movement. [34]

In this section, I introduce concepts from the four categories of Laban Movement Analysis (LMA): *Body*, *Effort*, *Shape*, and *Space* (Hackney, 2004).[35] These four categories are typically presented in this order and shorthanded as *BESS*. The mnemonic also suggests a progression in the analytical approach taken in LMA, which connects the body (*Body*) to its movement qualities (*Effort*), its relationship with its environment (*Shape*), and its connection to the larger world (*Space*). Taken together, all four categories comprise a rigorous and systematic framework for describing and understanding movement (Bouchard & Badler, 2007; Moore & Yamamoto, 2012; Schiphorst, 2008). They are presented in the order of importance that they assume in analyzing illusion styles in particular. I use examples from illusion styles to clarify concepts when appropriate.

[34] Certified Laban/Bartenieff Movement Analysts (CLMAs) undergo a certification program administered by the Laban/Bartenieff Institute of Movement Studies; a typical certification program consists of up to six sessions a week conducted over eight continuous months (Laban/Bartenieff Institute of Movement Studies, 2012). Sections of the movement analysis I employ in this study were generously reviewed and validated by CLMA Cheryl Prophet.

[35] Throughout this document, I will be using *italicized serif typeface* to indicate that a term is drawn either from LMA or Labanotation. This is to distinguish it from both from popular usage of the term and from technical terms used within the urban dance community.

3.1.1. Body

An analysis grounded on the *Body* focuses on the organization of the body and relationships within the body or relationships of parts to the whole: "'How is the whole body organized/connected?' … 'Which body parts are moving?' 'Where in the body does movement initiate?' 'How does movement spread through the body?' (Hackney, 2004, p. 238). In Chapter 2, I alluded to the concept of progression in the development of human movement in describing how absence of torso rotation in the robot style suggests under-development of cross-lateral patterning. Peggy Hackney (2004) describes other developmental movement patterns, including *breath*, *core-distal connectivity*, *head-tail connectivity*, *upper-lower* (*homologous*) *connectivity*, *body-half* (*homolateral*) *connectivity*, and cross-lateral connectivity. While these patterns are listed in the order of complexity, one does not achieve mastery of each in a strictly stepwise fashion. Like in many other fields of human activity where a developmental sequence is used as a narrative device to describe a process of change, the development of movement patterns is iterative, not linear.

Developmental progression is one of several principles in a system known as Bartenieff Fundamentals, which supports analyses grounded on the *Body* category. Some of these principles are presented in Table 3.1.

Table 3.1. Selected Principles of Bartenieff Fundamentals

Principle	Description
Total Body Connectivity	The whole body is connected, all parts are in relationship. Change in one part changes the whole.
Developmental Progression	Basic body connections are established through a stage-specific developmental progression early in life. These basic connective patterns become integrated in the adult and function as patterns of Total Body Connectivity.
Intent	Organic connections are influenced by intent. Intent organizes the neuromuscular system. Clarity of intent enables the body to find the motor pattern to fulfill that intent.
Complexity	Movement is multifaceted. There is always more than one thing going on in any movement event. Every movement event is a whole system, highly orchestrated with interactive elements of Body, Effort, Shape, and Space.

Function-Expression	Functional and expressive aspects of movement are in an intimate relationship. Their integration in a specific context creates movement meaning.
Stability-Mobility	Stabilizing and mobilizing elements interact continuously to produce effective movement.

Adapted from "Making Connections Total Body Integration Through Bartenieff Fundamentals" by P. Hackney, 2004, p. 39-40. Copyright 1998 by Overseas Publishers Association, Routledge.

Each of the principles bears upon the performance of all movement, including dance in general and underground illusion-based styles in particular. In this chapter and the next, I describe how the virtuosic performance of underground illusion-based styles necessitates an attention the patterns of total body connectivity, breath support, intent, function-expression, and stability-mobility.

A detailed account of concepts subsumed under the *Body* category is beyond the scope of this chapter. However, one particular concept relevant in this research is movement *Sequencing*, which can be used to characterize the differences and similarities between the various illusion styles and technique:

- In *Simultaneous Sequencing*, two or more body parts "make an action at the same time" (Hackney, 2004, p. 239)
- In *Successive Sequencing*, the movement of one part of the body "flow[s] successively into the movement of the next adjacent body part" (Hackney, 2004, p. 239)
- In *Sequential Sequencing*, the movement of one part of the body "flow[s] sequentially into other non-adjacent body parts" (Hackney, 2004, p. 239)

The fundamental movement techniques of illusion styles generally play constantly and inventively between *Successive*, *Sequential*, and *Simultaneous Sequencing*, creating interesting patterns of finger, hand, and arm movements. Because each style tends to *Sequence* body parts in different ways, different abstract patterns result. For instance, in order to create "an illusion of a '`flow`' going through or around the body" (Dark Matter Squad, n.d.-g), liquid dancers must rely on *Successive Sequencing* of joints. Tutting, on the other hand, tends to use more *Sequential Sequencing*. I expand on these ideas in Chapter 4.

3.1.2. Effort

In a foundational text on art and visual perception, Arnheim (1956) draws from a range of disciplines (he cites Bartenieff, Laban, Michotte, and Merleau-Ponty in the span of a page) in order to distinguish motion from expression:

> The dancer … has sensory experiences of what happens inside and outside his body, and also feelings, wishes, goals. As an artistic instrument, however, the dancer consists—at least for his audience—of nothing but what can be seen of him… What counts for artistic performances is the dynamics conveyed to the audience visually; for dynamics alone is responsible for expression in meaning. (Arnheim, 1956, pp. 403–404, 408)

The same movement, performed using different dynamics, can result in a radically different experience for both the performer and the observer. A gentle pat on the back, for instance, is not at all the same as a vigorous slap on the back. The spatial trajectory of the movement is the same, but while one version of the movement is comforting, the other can enliven (or possibly enrage!) the recipient of the gesture.

The distinction between the two can be described by analysis grounded on the category of *Effort*, which can be understood not only as descriptive of movement *quality*, but as interpretive of the connections between "outer movement" with its "inner intention" (McCaw, 2011, p. 198). *Effort* looks at human movement using four factors: *Space*, *Time*, *Weight*, and *Flow*.[36] In *Effort* analysis, each factor is seen to be a continuum bounded by two extreme values. One of the values is the result of "indulging" or "yielding into" the *Effort*, while the other extreme value is the result of "fighting against" or "contending with" the *Effort* (Laban & Lawrence, 1974; McCaw & Laban, 2011, pp. 352, 357). In both cases, the inner attitude of the mover is paramount; *Effort* is both

[36] *Space Effort* should not be confused with *Space* nor with the general notion of space as location.

intentional and attentional. The *Effort* elements are observed through their fluctuations; that is, the *Effort* elements are noticed when the movement qualities change. Because *Effort* tends to elude definition (McCaw, 2011), an 'inductive' approach is often useful in describing each of the *Effort* factors—accumulated examples can illustrate the concepts better than a single definition can.

3.1.2.1. Flow

Flow is related to the 'ongoingness' of actions and can be linked to one's reluctance or willingness to move. Flow is a measure of muscular tension. A movement that indulges in *Flow* results in decreasing muscular tension and reveals the mover's sense of "pleasure in the unrestricted freedom of fluency" (Lamb, Laban, & Lawrence, 2011, p. 227), and is said to be *Free*. A reluctance to move in a continuous manner results in increasing muscular tension and is interpreted as a contending approach towards *Flow*, and is said to be *Bound*. It can be easy to confuse *Bound Flow* with *Strong Weight* or *Sustained Time*, but *Bound Flow* can occur regardless of the approach to *Weight* or *Time*. However, a person moving in *Free Flow* will require time to "gain the necessary control over the flow in order to stop" (Lamb et al., 2011, p. 227).

3.1.2.2. Weight

Weight is an *Effort* factor that continues to be the subject of debate (Lamb et al., 2011, p. 220). It can be seen as relating to the subject's sense of presence in the world and the impact they make upon it. It has also been linked to the notion of exertion and activating one's physical strength; indeed, Laban's original term for this factor was "Force" (Lamb et al., 2011, p. 220). A yielding attitude towards *Weight* results in *Light Weight*, a quality that can be seen as relaxed or indulgent. Smoothing out a piece of lace, sprinkling confectioner's sugar on a pastry, and patting a small child's head are all examples of gestures performed with *Light Weight*. A contending approach towards *Weight* results in *Strong Weight* and can appear vigorous or 'effortful' (in the popular sense of the word); the movement might be seen as one that suggests struggle. Digging

through dense clay-like soil, beating a thick carpet, and uncorking a wine bottle exemplify the use of *Strong Weight*.

3.1.2.3. Time

Time is an *Effort* factor related to the subject's sense of urgency and is characterized in part by the "presence or absence of rapidity" (Lamb et al., 2011, p. 225). A yielding attitude towards *Time* results in *Sustained Time*. Movement performed with a *Sustained* quality can be variously interpreted as leisurely or patient. Stroking a pet, squeezing a stress ball, and stretching a piece of elastic fabric exemplify *Sustained* movement. A contending attitude towards *Time* results in *Quick* movement. Shaking flour through a sieve, swimming to avoid an attacking shark, and cracking a leather whip all demonstrate *Quick Time*.

3.1.2.4. Space

Space Effort is an *Effort* factor related to the subject's attention to the surrounding environment, and the directedness of their interaction with it. An indulgent attitude towards *Space Effort* results in what Laban and Lawrence variously call *Indirect* or *Flexible Space Effort*. Scanning a room for friend and weaving through moving traffic are examples of *Indirect Space Effort*. On the other hand, a contending, *Direct* approach towards space is observed in movement in which care appears to be taken in the way the movement expands and extends into space, "as if [the mover] had an aversion against the manifold extensions of space" (Lamb et al., 2011, p. 226). Running towards a long-lost relative and threading a needle are examples of *Direct Space Effort*.

The four *Effort* factors are seen thus as distinct from each other. Indeed, they represent orthogonal axes of what can be thought of as a 4-dimensional Euclidean-space of possibilities that represents movement quality, though they are not often described as such in the LMA literature. Nevertheless, human-computer interaction (HCI) and robotics research (Bouchard & Badler, 2007; Chi, Costa, Zhao, & Badler, 2000; Rett & Dias, 2007; Zhao, 2001) treats them as such in an attempt to make them computationally tractable.

Effort analysis can be brought to bear on the analysis of illusion styles. For instance, liquid relies on a consistent use of *Free Flow*. In contrast, tutting techniques can be performed anywhere along the range of *Flow Effort* possibilities, although in order to 'hit' hand and finger shapes effectively, dancers need to make careful, strategic use of *Bound Flow*. I discuss these and apply more detailed *Effort*-related analysis in Chapter 4.

3.1.3. Shape

Many of the examples listed in the previous section on *Effort* involve the mover relating to some aspect of the world that is external to them. Analysis grounded on the LMA *Shape* category describes the body's relationship with itself and with the environment. In applying *Shape* analysis, a movement analyst might ask questions such as, "What forms does the body make?" or, "Is the shape changing in relation to self or in relation to the environment?" (Hackney, 2004, p. 221). Shape analysis is relevant even when the body is not moving, at which point the body can be seen as taking on one of several *Basic Shapes*: *linear/elongated*, *wall-like*, *round*, *spiral*, or *tetrahedral*.

3.1.3.1. Modes of Shape Change

However, when the body is moving, the analysis can shift towards describing the *Mode of Shape Change*. When the relationship is primarily self-directed, the shaping action is said to represent *Shape Flow*. Subtle shifts in the form of the torso that can appear 'amoebic' can count as *Shape Flow* particularly if the movement focuses the attention of the mover inwards. An intentional relationship to the immediate environment is manifested in *Directional Movement* or in *Carving*. *Directional Movement* is goal-oriented, and is demonstrated by such gestures as reaching out to touch a nearby object. *Carving* movement is initiated with the intent to mould the body around an aspect of the environment (as in hugging another person) or to mould some aspect of the environment. For instance, several techniques in liquid digitz mime a shape close to the dancer's body. It demonstrates a "co-creative relationship" with the environment

(Hackney, 2004, p. 36). In Chapter 4, I describe in greater detail how *Carving* is the cornerstone of what I call as *spatial tangibilization.*

3.1.4. Space

In *Choreutics* (1966) , Laban and Ullman distinguish between “space in general” and “the space within the reach of the body” (p. 10). They define the latter as the *kinesphere*, which can be understood as the volume around our body that circumscribes our ‘personal space’. Movement can be analyzed in terms of location in the kinesphere: movements can occur very close the dancer (*Near Space*), “about elbow distance away” (*Mid Space*), or “as far as the mover can reach” (*Far Space*) (Hackney, 2004, p. 223).

Laban and Ullman describe locations embedded in the kinesphere, which they call *directions*:

> The basic elements of orientation in space are the three *dimensions*: length, breadth and depth. Each *dimension* has two *directions*. With reference to the [3 dimensional]human body … height has the two *directions* up and down; breadth has the two directions left and right; depth has the two directions forward and backward. The centre of gravity of the upright body is approximately the dividing pont between the two directions of each dimension. Thus this point becomes… the *centre* of our kinesphere. (Laban & Ullmann, 1966, p. 11)

In the preceding passage, nine *directions* (up, down, left, right, forward, backward, centre) were described. Laban describes twenty-seven distinct *directions* in total, each of which he assigned a symbol (Figure 3.1).

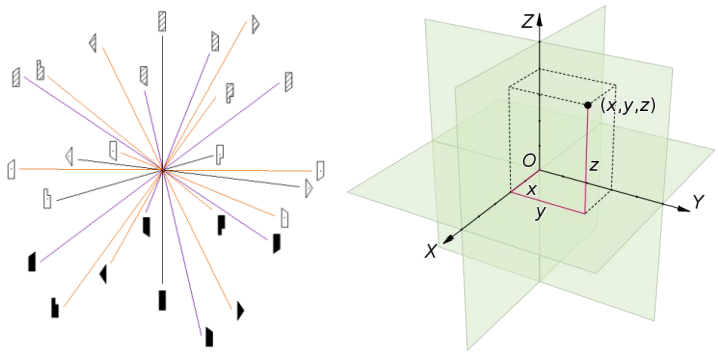


Figure 3.1 Side by side comparison of the 27 directions and the Cartesian coordinate system.

Image of the 27 directions from "26 Directions with symbols" by Wikipedia user Sansan 70, http://en.wikipedia.org/wiki/File:26_Directions_with_symbols.png. Copyright 2012 by image author. Image licensed under a Creative Commons CC0 1.0 Universal Public Domain Dedication. Image of the Cartesian coordinate system is from "Illustration of the Cartesian coordinate system for 3D", by Jorge Stolfi, http://commons.wikimedia.org/wiki/File:Coord_system_CA_0.svg. Copyright 2009 by image author. Image is in the public domain.

Laban and Ullman's conception of *directions* in the kinesphere evokes the Cartesian coordinate geometry of Euclidean space, where an object's location in space is often given as a group of three numbers in the form *(x, y, z)*, as shown in Figure 3.1.[37] While this similarity is not surprising, few codified dance forms use this 'conceptual quantization' of space at this level of granularity as part of its technique. [38] Ballet is one of them, while Merce Cunningham pushed this approach to working with the *directions* in choreographically novel ways. What has been absent in the academic literature is a

[37] For a historical treatment of the development of the Cartesian coordinate system, see Boyer and Merzbach (2010), who point out that while "Descartes' analytic geometry... are now so often associated with the use of coordinates", Descartes himself "did not lay down a coordinate frame to locate points… nor were his coordinates thought of as number [groups]" (Boyer & Merzbach, 2010, pp. 345–346).

[38] Quantization is the process where a phenomenon characterized by continuous (analaog) values is described using discrete measurements. It is the foundation of all digital information.

description of urban dance practices which explore space with similar depth, which finger tutters do using the `tutting grid`, which is described in Chapter 4.

What is interesting with illusion styles that rely extensively on movements of the fingers and the hands is that the notion of the kinesphere may need to be extended and adapted to adequately analyze the movements, particularly with digitz and and finger tutting. In particular, it may be productive to think of complementary, 'mini' kinespheres surrounding each hand. This was suggested by one informant, Houdoken, during a remarkable conversation I had with him (Houdoken, personal communication, August 3, 2012). Unaware of the details of LMA, he nevertheless described concepts *precisely* identical to those of the kinesphere and the 27 directions, but specifying them with reference to his hands and fingers. Furthermore, he described his experiments with minute, 'amoebic' movements of the fingers in which the fingers relate to themselves as if turning their awareness onto themselves, much the way *Shape Flow* movement is understood to operate.

The notion of the fingers possessing awareness is not so radical considering the heightened sensitivity and movement facility in the individual phalanges that underground illusion-based dancers can possess. It is also worth taking into account that under the influence of the drug ketamine, one informant (who spoke on the condition of anonymity) reported that their kinesthetic awareness becomes radically localized, causing them to focus on a limited number of body parts at a time, particularly the hands.

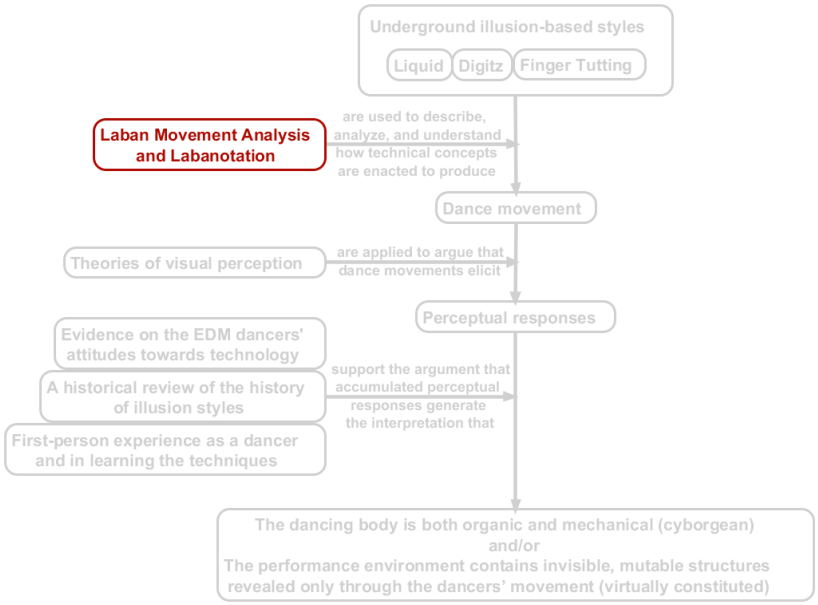
3.1.5. The four categories in practice

The categories of Body, Effort, Shape, and Space comprise the analytical framework of LMA. Each category assumes a level of significance which can vary in part on the intent and internal experiences of the mover. An example of how the different categories can emerge given the 'same' movement is in the execution of a gesture called a *wave*. In an interview I conducted with dancer Albert Hwang, he explained the difference for him between performing a wave in the style of liquid and in the style of popping:

> When I'm doing a wave with liquid, it's like I'm pushing an object through [my body]. But when I'm popping, it's like I'm voguing.[39] It's like I'm hitting poses. *It's a different feeling*. (A. Hwang, personal communication, October 21, 2011; emphasis added)

In this example, Hwang experiences waving-as-liquid more as a phenomenon within the category of *Body*, whereas waving-as-popping is evident to him as a phenomenon that emerges out of an attention to *Shape*.

3.2. Labanotation



[39] Voguing is a gestural style of dance that originated in the clubs of Harlem in the 1960s. It involves 'striking poses'.

One other concept—*holds*—from Laban's body of work is relevant to the analysis of underground illusion-based styles. *Holds* are a feature of his system of movement notation, which I describe in this section.

Systems for notating dance have existed since the 15th century, but tended to be specific to a style of dance and was not generalizable to any style. One of Laban's major contributions was to devise a universal system of movement notation in the 1920s that could be extended to not just to all dance styles but to any type of human movement (Laban & Lange, 2011). Originally called Kinetography, the system is now known as Labanotation. While Labanotation is not a formal system subsumed within LMA, it can capture in a detailed and symbolic manner descriptions of movement as analyzed using the category of *Body*. For instance, the system can be used to make granular distinctions between body landmarks. When notating activity involving the left index finger, for example, a notator can differentiate between its "inner", "outer", and "thumb-side" surfaces.

The anatomical specificity of Labanotation is one of its many features that allow the system to be extensible to a wide variety of movement phenomena. Another advantage of Labanotation over other movement notation systems is its ability to describe movement with respect to different 3-dimensional Euclidean reference systems, which in Labanotation language is known as *crosses of axes* (Hutchinson, 1945, p. 627). Ann Hutchinson Guest gives the example of the confusion that can arise when the direction 'up' is interpreted by individuals posturally oriented in different ways (Hutchinson, 1945, p. 414).[40] If a person is standing up, they would point to the ceiling. If they were lying down, they have two options: pointing to the ceiling or pointing towards the direction of their head. In the *cross of the body axes*, 'up' is established by the

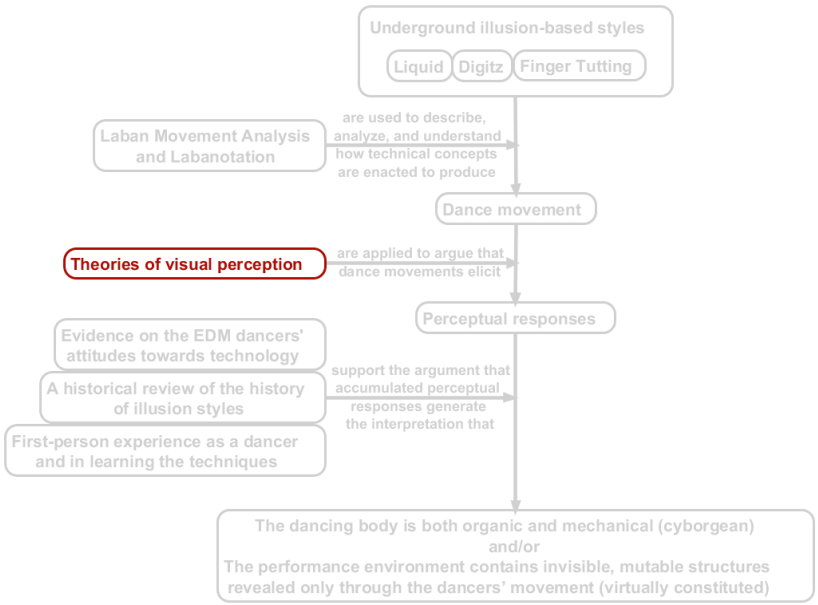
[40] Ann Hutchinson Guest's (1945) handbook is the seminal reference on Labanotation. Guest coined the term 'Labanotation' and established the Dance Notation Bureau in New York (Rudolf von Laban & Lange, 2011), a non-profit organization which maintains a library of dance scores and advances dance notation as a method for describing and choreography.

orientation of the torso and is thus interpreted as ‘towards the direction of the head’. In the *constant cross of axes*, ‘up’ is established by the physical orientation of the room in which the movement is performed. In the *standard cross of axes*, ‘up’ is established by the direction of gravity and is thus always interpreted as parallel to and away from the downward pull of gravity. In this example, the direction of ‘up’ would be identical when understood from both the *constant cross of axes* and the *standard cross of axes*.

3.2.1. Holds

While Labanotation could be used to describe any of the movement techniques in liquid, digitz, and finger tutting, the technique of analyzing movement with respect to various reference systems is applicable to the concept of a `fixed point`, since the `fixed point` is directly mappable to what is termed in Labanotation as a *hold*. Much of the virtuosity in these styles relies on precise execution of such *holds*, as described in Chapter 4.

3.3. Perceptual Principles



Research in the field of perceptual psychology has produced rich, descriptive results that have critically contributed to numerous fields of study, including cognition (Reisberg, 2009), social psychology (Bruce, Green, & Georgeson, 2003, and design (Lidwell, Butler, & Holden, 2003; Ware, 2004). One crucial finding is that humans are highly sensitive to motion-based visual cues, such as flicker and direction of motion. Unlike sensory responses to other visual cues, sensitivity to motion is consistent across the visual field and even increases in the periphery (Findlay & Gilchrist, 2003). Experiments using point-light displays suggest that humans can infer information from sparse motion information. I revisit these findings in Chapter 5, in which I discuss their possible application to a style of dance known as gloving.

Two theories from perceptual psychology relevant to this study are the Gestalt principles of perception and structure from motion. I describe them in this section and apply them in Chapter 4 to analyze how liquid, digitz, and finger tutting movements are perceived by audiences.

3.3.1. Gestalt principles

The Gestalt principles of perceptual organization are a set of laws that explain how humans construct interpretations of visual phenomena. The principles represent the collected findings of Gestalt psychologists primarily working in the first half of the 20th century, notably Max Wertheimer (1938), Wolfgang Köhler (1929), and Kurt Koffka (1935). “The whole is greater than the sum of the parts” is perhaps the most popular précis of what the Gestalt principles embody. They explain visual interpretations that could not be accounted for by structuralist, bottom-up accounts of perception prevalent at the time the principles were advanced (Bruce, Green, & Georgeson, 2003). Although the neurophysiological mechanisms that underlie the Gestalt principles of perception “have not withstood test of time”, the Gestalt principles continue to provide consistent, experimentally verifiable explanations of how visual information is organized perceptually (Ware, 2004, p. 203). Bruce, Green, and Georgeson (2003, pp. 123–127) enumerate the Gestalt principles as follows:

- **Proximity**: Visual elements that are close to each other are perceived as related.
- **Similarity**: Elements that appear similar are grouped together.
- **Common Fate**: Visual elements that move in a similar way are perceived as related.
- **Good Continuation**: Other things being equal, there is a perceptual preference to interpret boundaries as smooth and continuous rather than abruptly changing and discontinuous.
- **Closure**: If several “geometrically possible perceptual organizations” (p. 125) of an image is possible, there is a preference to choose an interpretation where figures are ‘closed’ rather than ‘open’.
- **Figure and Ground**: Other things being equal, the smaller of two superimposed closed areas will be interpreted as being the foreground while the larger area is interpreted as the background.

The first three principles—Proximity, Similarity, and Common Fate—are simple to state and understand. The others can be clarified through examples. In Figure 3.2, the principle of Good Continuation explains why the image on the left (a) is interpreted to be made of two smooth curves (b) instead of two shapes that feature abrupt changes in direction (c).

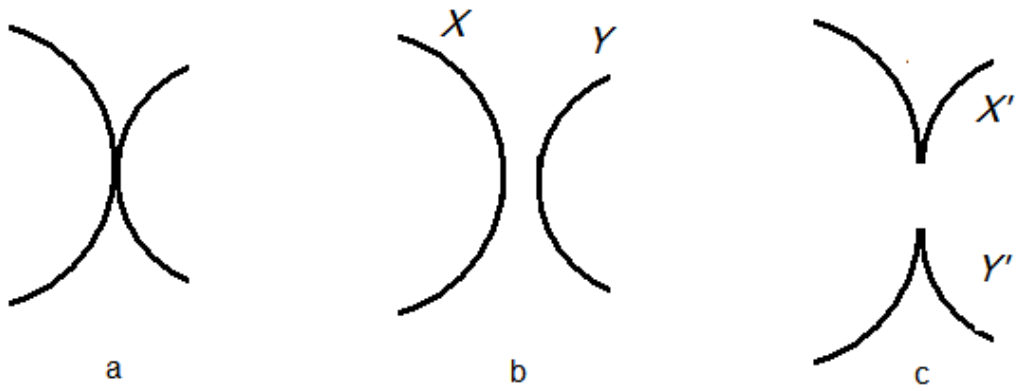


Figure 3.2 ***A demonstration of the principle of Good Continuation. The image on the left is interpreted as the junction of two smooth curves, not of two discontinuous shapes.***

Figure 3.3 demonstrates how the principle of Closure leads us to interpret the image on the left (a) as the superposition of two rectangles (b), not a rectangle and a non-closed angular curve (c).

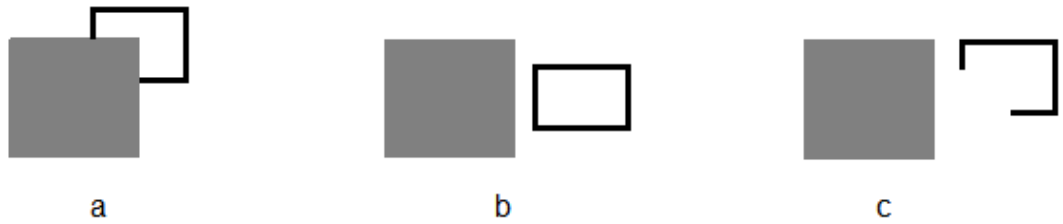


Figure 3.3 ***A demonstration of the principle of Closure. The image on the left is interpreted as two rectangles, not a rectangle and a broken figure.***

The principle of Figure and Ground explains why the image in Figure 3.4 is more likely to be interpreted as a dark grey cross with lighter grey rectangle in the background, instead of four light grey squares arranged on top of a dark grey rectangle.

Figure 3.4 ***A demonstration of the principle of Figure and Ground. The image is interpreted as a dark grey cross on a lighter grey background, not as four light grey rectangles positioned on a darker grey background.***

In addition to these principles, another principle, the **Law of Prägnanz**, was seen by the Gestalt psychologists as a fundamental principle underlying all other Gestalt laws. It predicts a preference for interpreting complex or ambiguous images as simple or complete (Bruce et al., 2003; Lidwell et al., 2003).[41] Koffka (1935, p. 138) summarizes the law as follows: "Of several geometrically possible organisations that one will actually occur which possesses the best, simplest, and most stable shape."

While all the principles can be brought to bear upon the study of dance movement, Common Fate can be directly applied to the study of motion perception. The strength of the perceived relation due to Common Fate depends on the similarity between motion factors such as velocity, phase, and contour (Bartram & Ware, 2002; Limoges, Ware, & Knight, 1989; Ware & Limoges, 1994). On the other hand, the Law of Prägnanz provides a highly generalizable account for both static and moving visual phenomena. Chapter 4 demonstrates how the Gestalt principles can explain the expressive power of the three illusion styles studied in this research.

3.3.2. Structure from motion

In Chapter 4, I advance a conjecture related to the interpretation of human motion called temporary gestural simplification, which relies not only on kinesthetic

[41] The seminal work for the Gestalt principles as a whole is Wertheimer (Wertheimer, 1938).

empathy (described in Chapter 1) but also on a perceptual principle known as structure from motion.

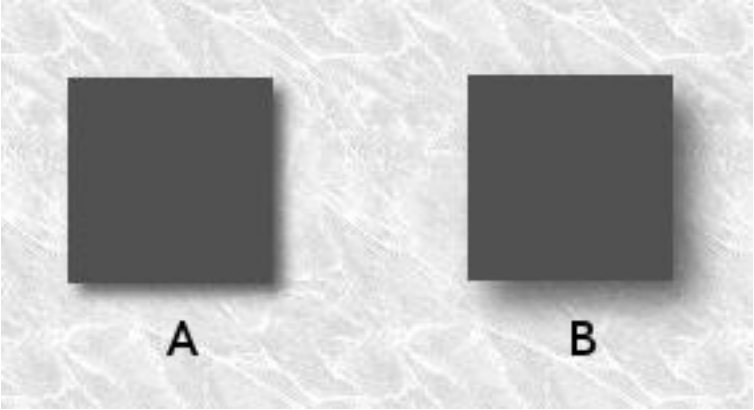


Figure 3.5 3D from cast shadows: Object A is seen as closer to the marbled surface than object B is.

Figure 3.6 Occlusion: Object D is seen as closer to the viewer than object C is.

3.3.2.1. 3D structure from motion

The term 'structure from motion' has been used to define different but related perceptual phenomena (Webb & Aggarwal, 1981). For instance, structure from motion is used to describe how motion cues can be used to infer the 3-dimentional properties of an object. It is one of several *pictorial cues* that include *shape from shading*, *cast shadows,* and *occlusion*, each of which can imply underlying 3-dimensional structures (Bruce et al., 2003). These pictorial cues are crucial for conveying the spatial relationships (such as depth of scene and relative distances between objects) in cartooning and animation (Webster, 2005). For instance, Figure 3.5 illustrates how

object A is perceived to be further away from the checkered surface than object B because of the differences in the shadows cast between A and B. In Figure 3.6, object C is perceived to lie on top of object D because both C and D are interpreted as closed figures (as predicted by Gestalt laws), and thus D is occluding C.

While structure from motion is the most relevant of these perceptual cues to temporary gestural simplification, the inference of spatial relationships through cast shadows and occlusion can be brought to bear on the study of an underground style of dance called gloving, in which gloves lit at the fingertips are donned by dancers performing in the dark. I touch on these ideas briefly in Chapter 5, where I sketch an argument of how principles of perception might be used not only to understand the aesthetic efficacy of a craft but also to illustrate how perceptual principles delineate dance styles and can be leveraged to create hybrid dance styles.[42]

3.3.2.1.1. The rigidity assumption

Structure from motion proceeds from what Ullman (1979) calls the *rigidity assumption*, which he states as follows: “Any elements undergoing a two-dimensional transformation which has a unique interpretation as a rigid body moving in space should be interpreted as such” (p. 146). For instance, consider the experimental setup shown in Figure 3.7 first described by Ullman. Two nested transparent cylinders are covered in dots. Light passes through both cylinders and the dots cast shadows on a screen. When the cylinders are stationary, an observer looking at the screen cannot discern a pattern to the dots. When the cylinders rotate, however, the observer can infer that the dots form the contours of two distinct cylindrical shapes because of the rigidity assumption.

[42] It is interesting to note that Johansson’s study, and all other studies of motion involving point light displays, can have a direct impact on the study of gloving. Such an investigation is left for future research.

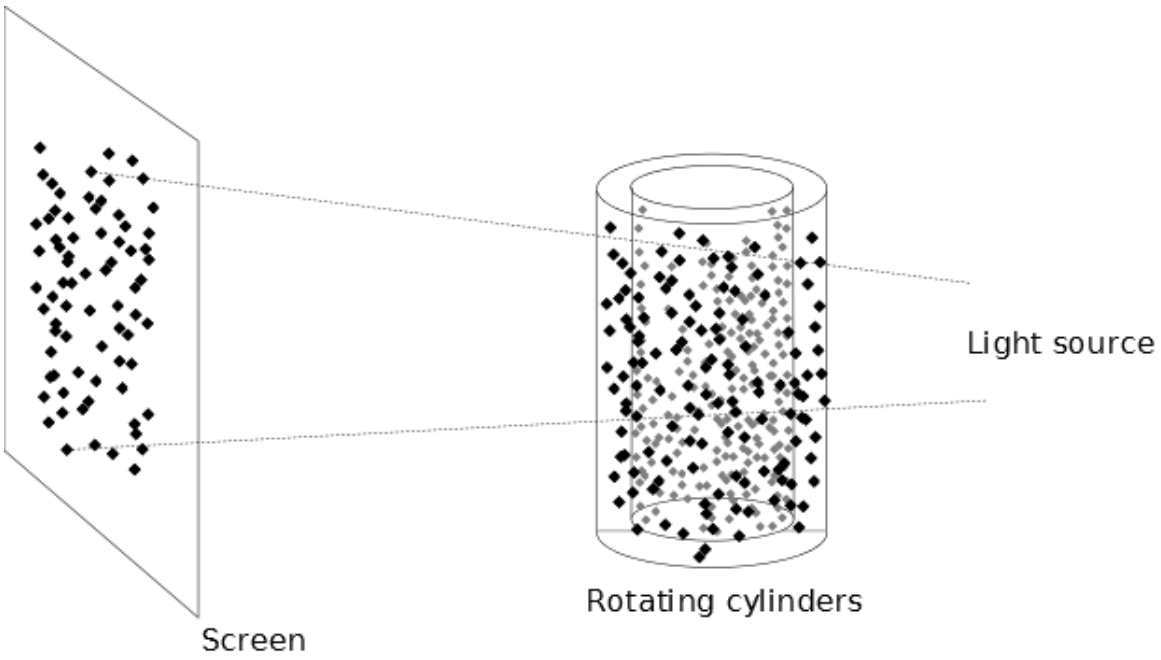


Figure 3.7 Reconstructing shape from motion the rigidity assumption.

Adapted from "Visual perception: physiology, psychology, & ecology" by Bruce, Green, and Georgeson, 2003, p. 255. Copyright 2003 by Psychology Press.

3.3.2.2. Biological structures from motion

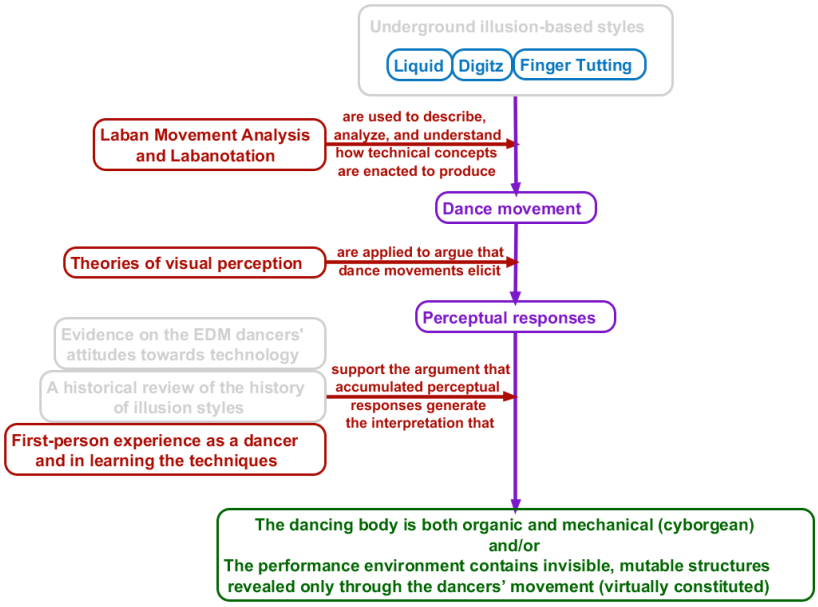
While motion can be used to infer the static structural properties of an object, Johansson (1973) established that sparse moving point-light displays can create the impression of "biological motion" such as walking and running. Kozlowski and Cutting (1977) showed such point-light displays can even reveal the sex of the mover. The illusioning mode of rejointing, proposed in Chapter 4, can be thought of as an inversion to this principle, where the motion of biological figures (i.e., hands and fingers) are interpreted as mechanical motion.

3.4. Summary

In this chapter, I provide an overview of the literature to analyze both the performance of EDM and to analyze audience reception. I provided a brief overview of concepts from Laban Movement Analysis and Labanotation in order to provide a

framework for analyzing the performance of EDM dancers, illustrating both with examples taken from everyday life as well as selected aspects of underground illusion-based styles. While LMA and Labanotation both provide movement-centric analytic descriptions of performance with the emphasis on the properties of the human body, I argue in Chapter 4 that it is equally useful to treat movement aspects of underground illusion-based styles as processes that generate abstract shapes and motions that are amenable to analysis using theories developed in the field of perceptual psychology. In order to provide a basis to analyze audience reception, I adapt and apply theories of visual perception, particularly Gestalt laws of perceptual organization and the perception of structure from motion. These theories are used in Chapter 4 to arrive at generalizing concepts that can describe what the 'illusions' in underground illusion-based styles entail.

4. Performing and Viewing Illusion Styles



In Chapter 2, I gave an account of the history of EDM dance styles, paying particular attention to the way digital technologies, electronic aesthetics, and the notion of the cy`borg have played a role in defining and expanding the urban dance community's identities and technical practices. In Chapter 3, that is brought to bear in analyzing these styles.

In Chapter 4, I demonstrate how technological themes permeate the movement aesthetics and the phenomenal experience of the dancers by bringing the concepts from these two previous chapters to address the main questions of this study: What differentiates liquid, digitz, and finger tutting from each other? What are the perceptual mechanisms behind the illusions? What different illusions do these styles generate?

Members of the urban dance community have pursued similar lines of questioning in discussion forums (EDM Dance Facebook Group members, 2011c; floasisdotnet, n.d.-a, n.d.-b), wikis (Wikipedia contributors, 2012; Yejoon, 2010, n.d.-a, n.d.-b, n.d.-c), websites (Dark Matter Squad, n.d.-g, n.d.-h), online video tutorials, and during face-to-face gatherings both large (such as Axiom) or small. For instance, the following excerpt from the opening narration in the section on the liquid style, taken from the All Access video, illustrates how dancers link principles of *Body* to the audience's perception of an illusion of `flow`:

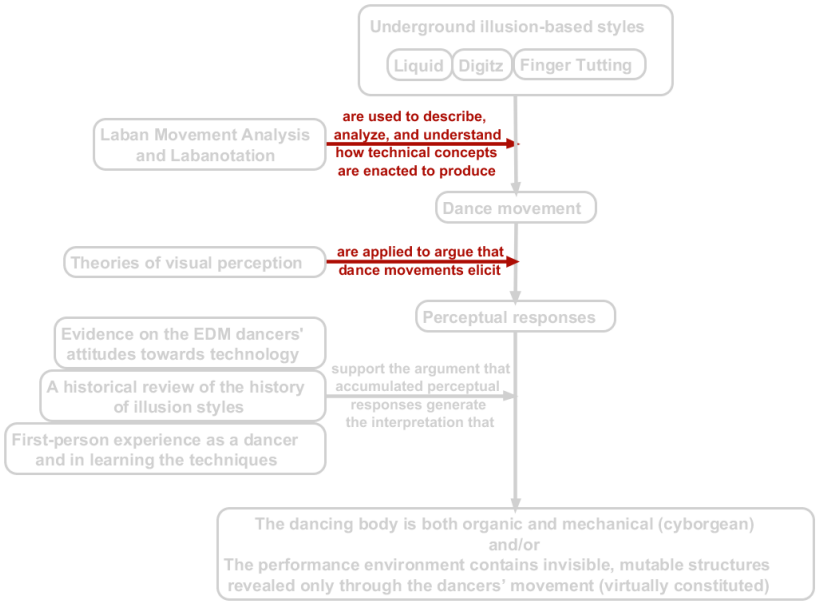
> One of the most common mistakes beginning liquid dancers make is in their elbow placement. Many liquid dancers have their elbows tucked firmly in their sides, which not only limits their ability to move about, but also tends to give off a very sloppy and [meek] illusion. This can be avoided by simply relaxing your shoulders and raising your elbows away from your sides.
>
> Speed control is also important in enhancing the illusion further, and is especially useful when dancing to a flat, 4/4 beat, like the beats most commonly found in techno, trance, or house music. By keeping your speed constant, you in essence move exactly the same distance between base hits. When done correctly, this causes a rhythmic effect and greatly enhances the illusion. You must, of course, be wary of changes in the music, both in tempo and in tone to maintain the illusion.
>
> Hand distancing can also play a major role in your individual style. Theoretically, your arm span is the absolute furthest you can go. However, one must remember that the further apart you spread your hands, the more difficult it is to maintain illusion. (Dark Matter Squad, 2001)

Embedded in this narration is a sophisticated understanding of both the technical facility of the human body for movement and of visual perceptual processes. For instance, the recommendation to keep the hands close together "to maintain the illusion" is predicated on the understanding that while the Gestalt Principle of Common Fate allows the viewer to interpret hands moving in a repeating and synchronized way as related, the 'allowable' distance of the hands from each other is determined by the amplitude of the movement. The larger the hand movement, the more likely it is that Common Fate will continue to be applicable as the hands move further away from each other.

The communities' insights provide crucial evidence I use in this chapter's analysis. The goal of this chapter is unpack to some of this knowledge by examining the expressive treatment of the body and space in these liquid, digitz, and finger tutting. The refined skill by which a dancer creates and mobilizes the body in space is fundamental to dance itself. Modern dancer Hanya Holm talks of dancers' ability "to address the space" while Judith Mackrell speaks to the dancer's capacity to "charge the air" by "enhanc[ing] the space immediately around himself through communicating a thought-out three-dimensionality" (Preston-Dunlop, 1995, pp. 296, 297).

In this chapter, I enumerate dance techniques as they have been articulated within the digital cultural archives of the urban dance community. I apply theoretical approaches from, and the descriptive language of, Laban Movement Analysis, Labanotation, and perceptual psychology (presented in Chapter 3) to the three underground illusion-based styles. I rely on my movement expertise and experience in the field and in the studio—as I describe in Chapter 1—to apply these approaches in a sound way. I describe three dance illusioning approaches that dancers of liquid, digitz, and finger tutting employ in their expressive treatment of the body and of space: *spatial tangibilization*, *rejointing,* and *spatial quantization*.

4.1. The utility of structuralist descriptions of movement to analyzing expressivity and virtuosity



Before proceeding with the main task of this chapter, it is necessary to address the question of the utility of structuralist approaches to understanding movement in assessing expressivity. After all, the dancing body is an organic and social entity whose actions are apprehended through multiple layers of interpretation that rely on personal, social, and cultural contexts (From, 1960; Moore & Yamamoto, 2012). Consider a gesture of the hand in which the fingers are fully extended, the palm is oriented parallel to the frontal plane of the body, the surface of the palm is facing anteriorly, and the movement primarily involves a periodic, rotational displacement between fifteen to sixty degrees from the shoulder socket but can also involve periodic abduction/adduction of the wrist joint. This low-level description of the gesture, while accurate, provides little insight on the intent of the mover and on how the movement can be understood by a viewer embedded in a particular social or cultural context. If a movement analyst were watching a particular person perform this gesture, they might also observe that the movement was enacted with an energetic quality and that it seems to extend from the

mover into the environment. However, it is through integrating these observations with received cultural knowledge and with the additional observation that the mover's attention is directed at another person, that the casual observer comes to the conclusion that the mover is waving goodbye.

These point touches on a thread of discussion in all dance communities, including that of the community of underground illusion-based dance: What constitutes a good dancer? Is it someone who can perform the 'cleanest' and clearest tuts or who can most precisely use of *Successive Sequencing* and *Free Flow Effort* to create the illusion of `flow`? Is it someone who can—to revisit Plainwhite Tom's comment from Chapter 2—"express their emotions" in their dancing? Perhaps these two notions are not as opposing as they might seem. For instance, they might be reconciled under another concept that is also frequently discussed in the urban dance community: the notion of musicality.

My aim, however, is not to resolve this particular problem but merely to suggest that one way to understand the aesthetics of illusion styles is in their efficacy in creating illusions. And in order to do so, it is productive to treat movement aspects of illusion style dance as abstract motion. As I argued in Chapter 2, some EDM dancers conceptualize their movement precisely as abstractions of shapes and forms in space. I also suggested that the type of clothing that some dancers wear can result in concealing the human form, further localizing the attention of the observer on the performer's hands and fingers. This is taken to an extreme in gloving, where the tips of the finger (which are lit by LED lights) are where the viewers' attention is primarily directed. Finally, the scope of visual analysis in this chapter is gestural and localized to the fingers, hands, and arms—the phalanges, forearm, and upper arm can be very roughly modeled as 3d rigid cylinders, unlike the torso which can change volume and shape.

In summary, a structuralist interpretation of movement is not sufficient to adequately define 'good dancing', but it is necessary in order to provide a more complete interpretation.

It bears mentioning that one area of inquiry relevant to this research looks at how *affective* qualities such as *interaction* (attracting/rejecting), *urgency* (relaxed/urgent), *intensity* (calm/exciting), *dominance* (reassurance/threat), and *valence* (positive/negative) could be interpreted from the motion of abstract forms. Bartram & Nakatani (2010) have shown that these affective qualities can be mapped to *motion parameters* applied to individual point light sources while Lockyer, Bartram, & Riecke (2011) have shown that this also is true for *motion textures* (i.e., groups of point light sources). Animation parameters for motion textures included *texture shape* (linear, radial), *speed* (slow/fast), *curvature* (straight, wavy, or angular), and *direction* (upper right, upper left, down left, down right for linear motion, and inward or outward for radial motion) (Lockyer et al., 2011). The results demonstrated correlations between animation parameters and affective qualities—that is, from the abstract to the human. My research exemplifies an inverse line of questioning: how can the human be used to evoke the abstract? I propose that principles of perception can be used to convincingly explain some of the aesthetic principles behind illusion styles.

4.2. Temporary Gestural Simplification: A speculative application of the Law of Prägnanz to gestural movement

In this section, I describe a speculative, embodied application—in the form of a conjecture—of the Law of Prägnanz to human gestural movement. I arrived at this application after countless hours watching EDM dance videos, reading through discussion forum threads, exchanging emails with informants, interviewing dancers, learning illusion style techniques, and reviewing the literature on vision research. This proposal brings together theories of sensory perception and how they interact with embodied cultural knowledge.

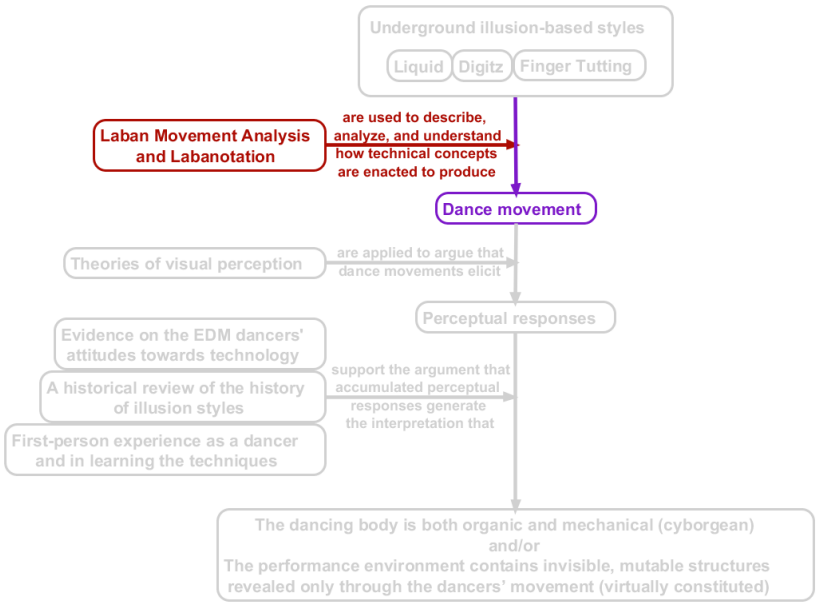
This conjecture, which I call *temporary gestural simplification*, repurposes the Law of Prägnanz to apply to viewing and understanding human movement. Unlike the Law of Prägnanz and other Gestalt principles, temporary gestural simplification would be

far less permanent and more prone to “instructional bias” (Ware, 2004). The conjecture can be stated as follows:

> When gestural movement is observed in which the underlying mechanics of the gesture is ambiguous (i.e., multiple interpretations are possible), all other things being equal, there is a *momentary* perceptual preference to choose an interpretation which requires the least sophisticated mechanics of the body.

I propose that temporary gestural simplification is the fundamental perceptual principle that underscores all three dance illusioning modes of spatial tangibilization, rejointing, and spatial quantization. I further propose that this principle relies on kinesthetic empathy (see Chapter 1), which allows me to educe from watching a movement what neurophysiological processes would be required in my own body were I to perform that movement. *As a result, the viewer experiences an embodied/cognitive dissonance: while the shapes and trajectories formed by the dancing body are often visually geometrically and kinetically elegant or ‘simple’, kinaesthetic empathy and embodied knowledge also ‘tells’ the viewer that the movement is extremely difficult to perform*. In the sections to follow, I further expound on and apply this conjectured principle to illustrate its explanatory power by linking perceptual and cognitive principles to explain the visual power of the movement techniques, with Laban Movement Analysis to illustrate the sophistication required to perform the movement.

4.3. Performing, perceiving, and reading illusion styles



In this section, I detail selected movement techniques from liquid, digitz, and finger tutting. The list of techniques is meant to be representative, not definitive, as new techniques are actively being developed, described, and shared within the community. In the case of liquid and digitz, I rely primarily on the text from the Dark Matter Squad site, which in turn is based on content from the All Access video. I do so in part because these sources, uniquely and extensively document dance concepts, categorize techniques by placing them in relation to each other within a conceptual framework, and are publicly available. I was not able to locate any similarly rigorous and organized theorization for finger tutting, such as a detailed exploration of the `tutting grid`. According to Kai, "complete information on the tutting grid doesn't yet exist on the net" but such work is ongoing (EDM Dance Facebook Group members, 2012d).

I describe three dance illusioning models—*spatial tangibilization*, *rejointing*, and *spatial quantization*—and argue that the effective application of each to liquid, digitz, and finger tutting, respectively, is a cornerstone in understanding the efficacy of each style. Each dance illusioning technique is explained by example.

4.3.1. Liquid, Digitz, and Spatial Tangibilization

In this section, I discuss liquid and digitz concurrently not only because their techniques overlap, but also both rely extensively on a dance illusioning principle I call *spatial tangibilization*.

4.3.1.1. Spatial Tangibilization

To a dancer, space need not be a vacuum through which the body simply moves. "Empty" space can be usefully thought of as a medium that has physical properties.[43] Space can be imagined as being thick as honey, grainy as sand, or unrelenting as steel. Choreographer Dana Gingras has likened space to an elastic medium that is deformed according to the number, relative spacing, and speed of the bodies that occupy it (Gingras, personal communication, March 2007), much in the same way that physics describes space-time as a field that is deformed by massive objects. One of choreographer William Forsythe's improvisational techniques, *volume avoidance*, calls for dancers to temporarily imbue the space with the physical properties of a well-defined solid (for instance, a cylinder) around which dancers must improvise while strictly respecting the physical properties of the solid (Forsythe, 2000). The imaginative power and refined bodily skill of trained dancers allows them to regard space itself as tangible and expose this tangibility to the viewing audience through their movement. The performance of spatial tangibilization can be thought of as an embodied application of visuospatial thinking, in which a mental image is informed and "manipulated in a principled manner" (Mayer, 2005). On the other hand, I propose the perception of tangibilized space is achieved through a specific application of temporary gestural simplification based on a variation of the cognitive principle of structure-from-motion: *when body parts move in a manner which can be most simply explained if it is assumed that they are interacting with a solid object in space, that solid object interpreted as real*.

[43] "Empty space does not exist," write Laban and Ullman (1966, p. 3).

Talking about liquid, Dark Matter Squad member Jared Hupp has remarked that "space around you needs to be seen as a substance, pliable and having resistance and physics … you have to believe that, in my opinion, or you are just imitating movement" (J. Hupp, personal communication, July 10, 2012). That the percept of space being tangible is foundational to Hupp's own dance practice lends weight to the notion that dance illusioning is foundational to liquid. Hupp further links the tangibility of space with the flow, which to him designates "the ability to present the perception of a pliable, physical space both internally and externally in a way that gives shape, form and feeling to space otherwise perceived as empty to the viewer" (J. Hupp, personal communication, July 10, 2012). I call this dance-based, tangible treatment of space *spatial tangibilization*.

4.3.1.2. Liquid techniques

Table 4.1 reproduces descriptions of liquid techniques, taken from verbatim with permission from the Dark Matter Squad site or transcribed from the All Access video. In the video, each description is accompanied by a demonstration.

Table 4.1. Liquid Techniques

Liquid techniques	Description
Flow	To move or run smoothly with unbroken continuity as in a manner characteristic of a fluid. The first and most important concept in liquid dancing is mastering your own personal flow. Correct flow is accomplished through one of two ways, with either your dominant hand leading the other along a predetermined path, or with your dominant hand pushing the other along a predetermined path. For those of you who are ambidextrous, this does not apply. However, ambidextrous or not, it is still important that you learn to properly control your flow when it is moving in either direction.
Rail	To range in a line. In order to give the illusion substance it sometimes helps to run the illusion along rails. This is accomplished through the use of imaginary paths along which you flow can travel. These paths or rails can vary from the simple to the complex depending on your own personal skill, taste and imagination. Whatever type of rail you choose, make sure not to deviate from the shape too much or you will lose the illusion. It also helps to connect these rails in a repeating or looping pattern in order to create a rhythmic effect.

Contour	To make or shape the outline of a figure, shape, body or mass. To contour is to make your liquid run the shape of the object. The objects themselves can range from imaginary geometric shapes to actual physical objects and on the most commonly used object the human body. In some respect, contours are very similar to the concept in waving known as tracing, the major difference being that tracing always involves the human body and requires a wave to take place on the point of effect. Contours, however, do not require you to wave the body part you are contouring, as the contour is the wave itself.
Build	To develop or give form to, according to a plan or process; to create. Using builds is very similar to the act of miming. It involves using liquid to move imaginary objects about in space. The shape of the objects you are manipulating is only limited by your imagination. When using builds, it is important to consider exactly how that object would behave. Imagine how it would look if you actually held it in your hands.
Split	Having been divided or separated. A break or a split is used to give liquid more dimension by slighting maligning your hands along a vertical plane you will find your liquid will become much more versatile. Now your liquid can pass in places that were once impossible but be careful to maintain the illusion of the flow especially when one hand passes over the other.
Folds	A technique found in digital liquid that is meant to trace the structure of a 2-dimensional plane in 3-dimensional space. The 'fold' is the act at which the hands turn to show both sides of the plane OR move from one plane to the next. This movement emulates folding an imaginary piece of paper through tracing the linear lines within each plane. Similar to the Liquid Lights style of rails, this style of liquid was developed by Prime & Relic in 2000, and is now widely used in digitz and finger tutting.

Flow styles	
Hand flow	The starting point for liquid dance: Like a wave in the ocean it starts small and grows greater and greater. So is true with Liquid flow; it starts out in the hands and works its way outward to the body. Attention to detail put into the hand flow will define a liquid dancer and be pivotal in showing their unique style. Exceptional liquid dancers can create the illusion of having no bones in the hands and keep a steady flow indefinitely with no unintentional stops, stutters or breaks.
Body flow	Body Flow is a term used to describe the relationship your body has with the liquid you are performing, the space around you and how the flow you are producing in your hands and arms push and pull to manipulate body movement
Speed control	Speed is important in liquid, the flow must always be kept in a constant steady speed to create and keep the illusion. Speed changes can also occur, but should be done in concert with the music's tempo or sounds.

Liquid styles	
Hand flow Liquid	This style developed in the north east of the United States and was spread westward by party people traveling from mostly NYC. This style is identifiable by its long flowing movements and intricate patterns. Possessing some of the oldest traceable roots in history, this style is the closest to be being the "parent" style for all other forms of liquid. As the dance spread it morphed and mutated to fit the demographic of the musical and social tastes where it was being practiced.
Gloved Liquid	This style developed when party people discovered white gloves in blacklights glow very brightly. This style relies more on speed then technique. The hands are moved to create "trails" in the blacklights that give a "liquid" effect. This style is very fast and is mostly practiced on the west coast of the United States and Canada. The use of the hands is predominant in this style and has many similar appearances to the early Hand Flow styles.
Orbital Liquid	This developed in the Midwest of the United States in towns like Chicago, Detroit and Milwaukee. The style itself starts out in the chest and the illusion is kept by manipulating an imaginary ball in the center chest. This style is very unique and very few people can do it well.
Digital Liquid	Digital Liquid was created organically by the practitioners of Liquid and Digitz. They started combining the flow of liquid with the intricate finger movements and patterns of Digitz. LPEric coined the term "Digital Liquid" in late 2003 during a discussion on the old reflective message board. The technique Folds has also been incorporated into this style of liquid.
Light Source Liquid	This style uses various light sources from glowsticks, maglights, flashlights, photons etc to create intricate trails. In this style the Liquid is external to the body and the flow is reliant on the trail which the light leaves behind as it is moving.

Note: Descriptions of these techniques are reprinted from *www.darkmattersquad.com* with permission, or transcribed from the Liquid Pop Collective All Access Liquid & Digitz Tutorial video. Copyright 2001 by the Dark Matter Squad. Licensed under a Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License.

4.3.1.2.1. Flow

Liquid technique emphasizes the cultivation of flow, which can either be treated as a verb ("to move or run smoothly with unbroken continuity as in a manner characteristic of a fluid") or as a noun (Dark Matter Squad, n.d.-h). Thus, there is a clear connection between liquid flow and *Free Flow Effort*. All subsequent techniques rest on the ability to "properly control flow" (Dark Matter Squad, n.d.-h).

The hands are a primary locus of flow. Though capable of fewer degrees of motion as a whole than the hands are, the spine is another locus of liquid flow and often

is used to “pass” the `flow` from the upper body to the lower body, or laterally from one side of the body to another.[44] Liquid is specifically characterized by the consistent use of *Successive Sequencing*. In Chapter 2, I alluded to the fact that the `flow` (through the use of *Successive Sequencing*) does not always transfer to the lower body, which instead sometimes serves as a stable base for the movements of the torso and the arms. In cases like this, stability-mobility, coupled with homologous patterning, assumes importance.

Indeed, all three underground illusion-based styles are primarily characterized by Body (C. Prophet, personal communication, June 18, 2012). This observation is consistent with the language that the dancers use in describing their craft. For instance, consider the following advice that one liquid dancer offers to another in a discussion forum post from the EDM Dancers Facebook group:

> The part from 40 seconds on is great, but the first half is a little sloppy. Three suggestions: 1) Your liquid will flow smoother if you practice keeping your hands closer together; only let your hands get that far apart when you want to put the wave in slow motion or make it swell. 2) Practice isolating the movements of your limbs and torso while keeping your shoulders horizontal with the ground, like you do at 40-45. 3) Focus your footwork to complement or emphasize what you're doing with your hands and upper body. For example, if you're tracing from left to right, slide your right leg from right to left with the toes pointing in. Syncing contrasting motions like that gives the illusion that the `flow` of your hands is pulling your entire body along. (EDM Dance Facebook Group members, 2011h)

Later in this chapter, I describe my attempts to learn a move called ‘boxing’, in which I demonstrate the significance of the use of Body in tutting.

`Flow` is supported by the consistent use of *Free Flow Effort*. Attention to *Effort Time* in liquid is located anywhere in the spectrum between *Sudden* and *Sustained* but

[44] See, for example, videos by gfunkedup (2008) and floasisdotnet (2010b).

tends to remain there. Indeed, 'pure' `flow` involves few (if any) fluctuations in the use of *Effort*, unless techniques from other dance styles are blended in. For instance, a `dimestop` is a technique from popping which results in a movement coming to a sudden halt. In order to create a clean and visually arresting `dimestop`, the mover *Body* must also utilize *Sudden* use of *Bound Flow Effort*, supported by the *Body* principle of *Breath*, since "breathing technique can help a lot with making stops more sharp" (Floasis contributors, 2011b). [45]

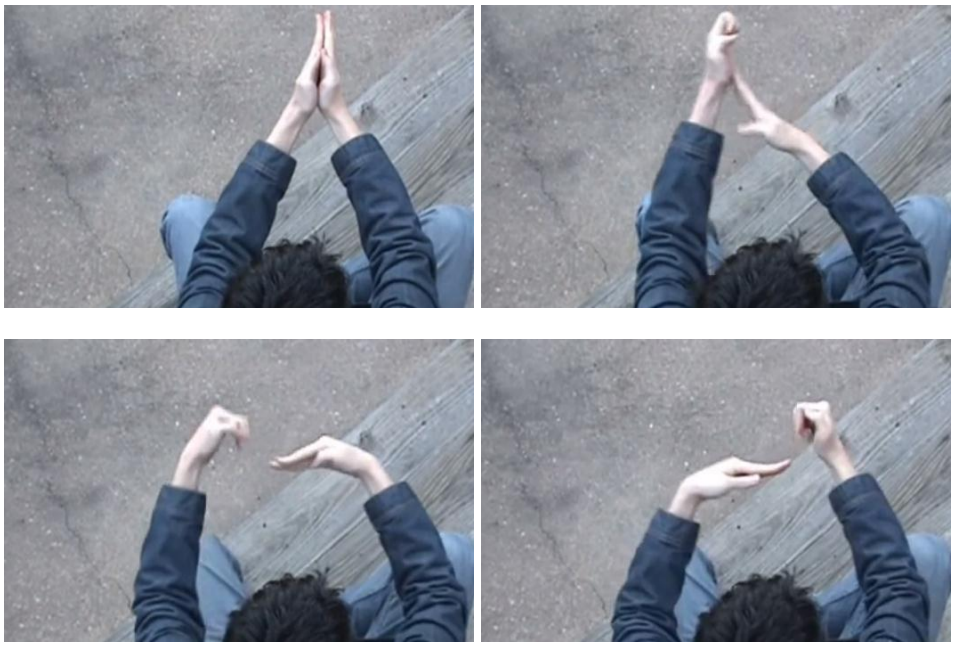


Figure 4.1. Still captures of a dancer demonstrating hand flow.

From "Floasis Handflow Breakdown", by Yejoon K. Accessed on 12 June 2012 from http://www.youtube.com/watch?v=XxO1Py3r8n0. Copyright 2007 by floasisdotnet. Reprinted with permission.

[45] See also the Floasis discussion forum post on movement isolations (plainwhitetom, birdage, Relic, houdoken, & Falsify, 2011).

With respect to kinesphere of the dancer, most of the movement happens in *Near Space*, sometimes in *Mid Space*, and only rarely (if at all) in *Far Space*. One explanation for this is that `flow` illusions become harder to perceive when the hands are far apart from each other or from the torso (Dark Matter Squad, n.d.-h). In the introduction to this chapter, I argued that this is because the Gestalt Principle of Common Fate allows the viewer to interpret hands moving in a repeating and synchronized way as related but only if the distance between the hands falls within a certain limit set by the amplitude of the movement.

4.3.1.2.2. Hand flow

While `flow` is the foundational concept in liquid, the `hand flow` (demonstrated in Figure 4.1) is the foundational movement technique in liquid:

> Hand flow ... starts out in the hands and works its way outward to the body. Attention to detail put into the "hand flow" will define a liquid dancer and be pivotal in showing their unique style. Exceptional liquid dancers can create the illusion of having no bones in the hands and keep a steady flow indefinitely with no unintentional stops, stutters or breaks. (Dark Matter Squad, n.d.-h)

As with many liquid techniques, `hand flow` requires *Successive Sequencing* of limbs. Starting from one (lateral) side the body, the dancer must sequence movement from the shoulder joint, then to the elbow, then to the wrist, then to the metacarpophalangeal joints, then to the interphalangeal joints. The sequence is then reversed on the other side of the body. While this sequence describes the order in which the `flow` may be seen to follow, the entire body (particularly the arm and the upper torso) is mobilized to support *Successive Sequencing*, since all the structures of the body are connected. However, effective *Successive Sequencing* is not sufficient to convey the illusion of `flow`. The movement must be done in a smooth and even manner, and at a speed fast enough to create the illusion.

4.3.1.2.3. Contours, rails, builds, and folds

`Contours` and `rails` are *Carving* techniques that mobilize `flow` and controlled application of Stability/Mobility for spatial tangibilization. Like Forsythe's volume avoidance, both create the illusion that a dancer's hands are outlining an object in space. Figure 4.2 illustrates `contouring`. A `rail` can be considered a specific instance of `contouring`. The object to be contoured consists of flat surfaces:

> [A rail is] to range in a line. In order to give the illusion substance it sometimes helps to run the illusion along rails. This is accomplished through the use of imaginary paths along which you flow can travel… Whatever type of rail you choose, make sure not to deviate from the shape too much or you will lose the illusion. It also helps to connect these rails in a repeating or looping pattern in order to create a rhythmic effect. (Dark Matter Squad, n.d.-h)

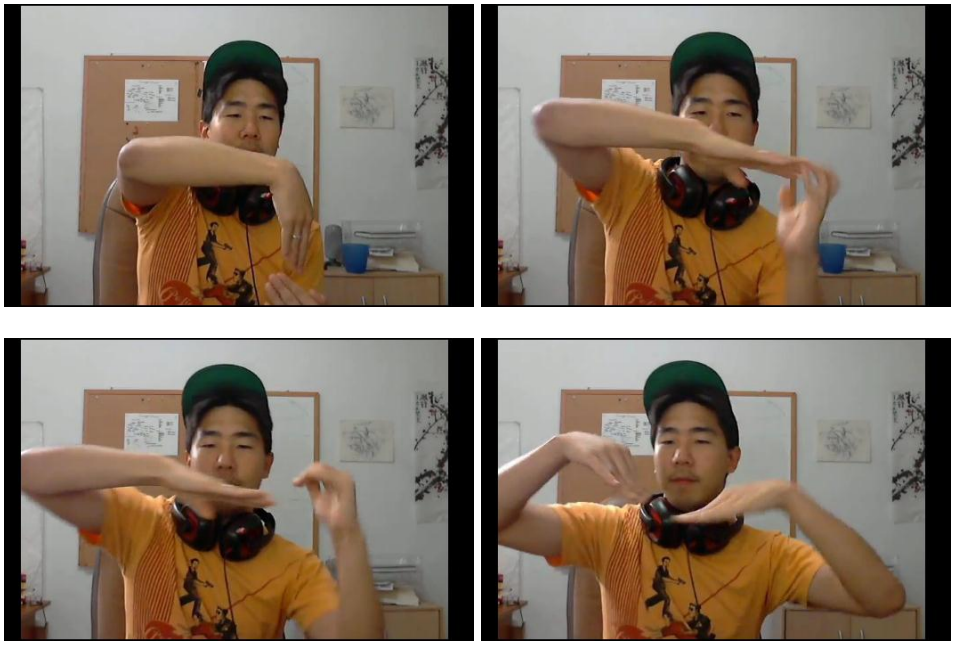


Figure 4.2 Still captures of a dancer illustrating contouring

From "How to Dance Liquid: Rails", by Albert Hwang [phedhex], 2012. Accessed on 12 June 2012 from http://www.youtube.com/watch?v=Wwxwc_2vDKQ . Copyright 2012 by Albert Hwang.

As with other liquid techniques, speed is an important factor in the successful performance of `contours` and `rails` because a lower bound exists for the movement speed, below which the viewer cannot perceive the virtual object being `contoured`. This can be thought of as similar, though not identical, to how a lower bound exists for the number of frames per second that is required to project a sequence of still images, in order to create the perception of smooth motion.

`Builds` and `folds` are two other liquid techniques that also rely on spatial tangibilization. While `builds` are described in sufficient detail in Table 4.1, a `fold` needs more explanation. Lucas Johnson describes how he and the dancers he had collaborated with in the past combined liquid and digitz to form `digital liquid`, of which `folds` "are a type or style" (L. Johnson, personal communication, June 12, 2012). A `fold` tangibilizes a complex structure in Cartesian space that is the result of "a two dimensional rail" which is shifted on along the cardinal axes as the dancer performs the fold (L. Johnson, personal communication, June 12, 2012). Figure 4.3 is a rendering of the object resulting from these geometric operations.

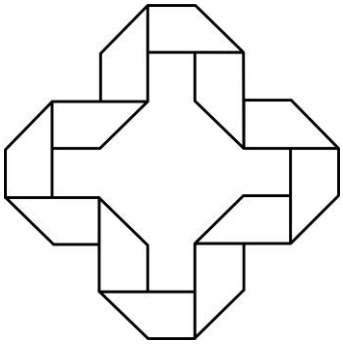


Figure 4.3. The imaginary shape mimed in a fold

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4.3.1.3. Digitz techniques

Table 4.2 reproduces descriptions of digitz techniques, taken verbatim with permission from the Dark Matter Squad site or transcribed from the All Access video. As in Table 4.1, each description is accompanied by a demonstration in the video.

Table 4.2. Digitz techniques

Techniques	Description
Finger Waves	The creation of a fluid flow from one side of the hand to the other through the use of the fingers.
Rolls	A perfectly repeated rounded wave where the last part of the roll triggers the first origin of the roll. In all phases of the roll the pinkie and first finger remain at opposite sides of the diameter created by the roll.
Remotes	Using one hand to manipulate or control the other.
Hides	This technique entails any form that entails making any finger and/or hand disappear and reappear, or any other move that holds a "magic" presence to it.
Contours	Much like in Liquid contours include following along the outline of a[n] object be it imaginary or real.
Syncs	To create the appearance in which some form of synchronicity is achieved between each hand's fingers. This can be achieved on any axis or angle while remaining stationary or in motion.
Contortions	This technique involves bending a wave so that it appears to be pinched at its central axis and the structuring it back into another wave.
Mirrors	The act of creating perfect symmetry between two hands. Mirrors can flow in any direction use any for or any style just as long as each hand matches as if they were a mirror image of each other.
Axis Shifts	Taking any digit technique and the[n] shifting the hands opposite along a vertical or horizontal axis. A pause in flow occurs where hand [r]eorientation is achieved utilizing robotic straight lines and fixed-point rotations. Flow is then resumed in the new hand configuration.[46]
Fixed 45s	A linear fingerwave technique where a single iteration consists of pulling a line in the fingertips 90 degrees through a fixed point achieved by approaching and exiting the fixed point at mirrored 45 degree angles. Fixed 45s can be used to create square waves, triangle waves and sawtooth waves
Fixed Point Concept	Uses the Mime technique of fixed point ('pointe fixe') while applying any type of digitz concept. It is the act of using a stationary point within your environment to apply how all other objects interact with that point.

[46] Note that the tutorial does not mention shifting along the depth axis. I believe that this is because from a viewer's perspective (assuming the viewer is directly facing the dancer's front), a shift along the depth axis does not result in a visual change that is as dramatic as a shift along the horizontal or vertical axes. This analysis would of course not hold true if the viewer were viewing the dancer from another angle. The point, however, is that the absence of any mention of the depth axis points to dance illusioning.

Tubing	The act of giving the appearance that your hands are holding a tube. While doing so additional concepts are used such as rails and contours to follow predetermined paths. Both rounded shapes and corners can be achieved either by contouring the rounded edges or using a technique called 'hinging' to bend the tube at a joint and change direction. A tube can also be segmented to allow the person to separate the hands from a solid tube and in 3d space to recreate, position, and produce symmetrical relationships of each hand.

Note: Descriptions of these techniques are reprinted from *www.darkmattersquad.com* with permission, or transcribed from the Liquid Pop Collective All Access Liquid & Digitz Tutorial video. Copyright 2001 by the Dark Matter Squad. Licensed under a Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License.

Figure 4.4 Still captures of a dancer performing a finger wave.

From "Liquid Pop Collective Digitz Tutorial", by Dark Matter Squad. Accessed on 12 June 2012 from http://www.youtube.com/watch?v=w0XPJTGaeuM . Copyright 2001 by Liquid Pop Collective. Content licensed under a Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License

4.3.1.3.1. Finger waves and rolls

While there is some overlap between liquid and digitz, liquid tends to treat the hand as an organic whole while digitz tends to showcase fingers individually or in

groups. One basic technique, `finger waves`, involves “the creation of a fluid flow from one side of the hand to the other through the use of the fingers” (Dark Matter Squad, n.d.-g) and requires the dancer to *Successively Sequence* movement. (Figure 4.4).

The `roll` is another fundamental digits technique that applies `flow` to the fingers of one hand (Figure 4.5). It creates a different set of motion trajectories than `finger waves`:

> A Roll [is] a perfectly repeated rounded wave where the last part of the roll triggers the first origin of the roll. In all phases of the roll the pinkie and first finger remain at opposite sides of the diameter created by the roll. (Dark Matter Squad, n.d.-g)

Figure 4.5 Still captures of a dancer performing a roll.

From “Liquid Pop Collective Digitz Tutorial”, by Dark Matter Squad. Accessed on 12 June 2012 from http://www.youtube.com/watch?v=w0XPJTGaeuM . Copyright 2001 by Liquid Pop Collective. Content licensed under a Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Unported License

4.3.1.4. Illusions of causal relationships through Common Fate, Similarity, Figure and Ground, and 'Effort difference' in liquid and digitz

Illusions of causal relationships in illusion-based styles can be created through expert application of the principle of Common Fate. This principle can be seen to apply when two or more fingers extend and flex in a coordinated manner through simultaneously *Simultaneous Sequencing* (`syncs`), creating the illusion that disparate body parts are set into motion by a common cause. Common Fate also explains why two non-touching and non-adjacent body parts (say, the left index finger and the right thumb) are perceived be related to each other as long as they move towards the same direction, at the same velocity—that is, through the use of a *Body Hold*. In executing a `remote`, for example, the left index finger may 'summon' (like a puppeteer) the right index finger, creating an illusion of causal relationship. I suggest, however, that the interpretation of which finger or limb follows which depends on the relative orientation of the limbs. If one limb is seen as pointing at another (i.e., functioning as a 'demonstrative', as described in earlier in this chapter), then the pointing limb is interpreted as the commanding limb. If neither can be interpreted as demonstrative or both can be interpreted as equally demonstrative, then the larger of the two limbs is seen as the commanding limb. This can be seen as an embodied and movement-based application of the Gestalt principle of Figure and Ground. If the limbs are physically equal in all respects, if one limb moves with more contending *Effort* than the other, it is seen as the commanding limb.

Common Fate also underlies `mirroring`, where the palms face each other and the fingers move in a mirroring fashion. `Mirrors` also mobilize our perceptual preference for ascribing relationships between symmetrical forms, as predicted by the Gestalt principle of Similarity.

One particularly interesting example where Common Fate can be seen to apply is when two body parts that are not identical to each other are placed in an arbitrary relationship to each other in space and are rotated simultaneously (another example of *Simultaneous Sequencing*). For instance, say, one hand closed in a fist except for the index finger, which is extended; the other hand's three middle fingers are at right angles

to the palm while the pinky is fully extended. Neither of the extended fingers is pointing towards the opposite hand. (See Figure 4.6.) Now imagine the forearm rotating at the elbow so that both hands end up rotating as well. A relationship can be perceived, regardless if the forearms rotate in opposite directions or in the same direction.

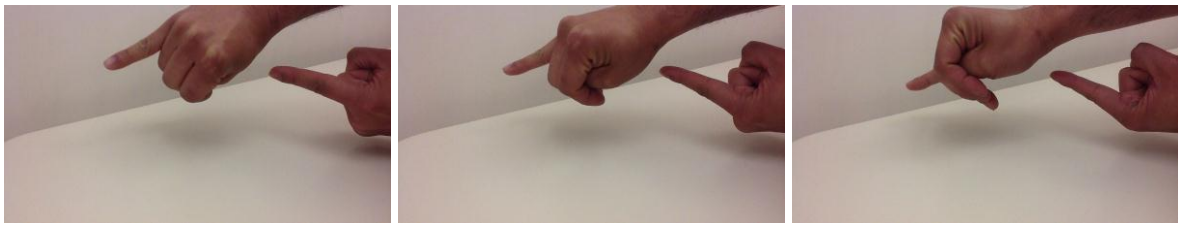

Figure 4.6 A gestural example of Common Fate

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The perceived relationship becomes even stronger if the forearms are collinear. If the forearms rotate in identical directions (say, medially), the illusion of a single, larger, closed-loop limb (instead of two limbs that terminate at fingertips) can be seen. However, if the forearms rotate in opposite directions, it evokes some kind of mechanism, such as a lock and key, or two gear shafts connected by an unseen number of gears. This perceived lock-and-key relationship, in fact, appears in some tutting videos.

4.3.1.5. Temporary gestural simplification, spatial tangibilization, and performing a rail

Consider how the temporary gestural simplification conjecture might be used to apply why the `rail` illusion works. The conjecture states that "when gestural movement is observed in which the underlying mechanics of the gesture is ambiguous (i.e., multiple interpretations are possible), all other things being equal, there is a momentary perceptual preference to choose an interpretation which requires the least sophisticated mechanics of the body." There are at least two possible interpretations:

Interpretation 1: There is no box in the space. In this case, the dancer would need to follow a sequence of actions:

1. The dancer starts by miming the side of the box with one arm and the top of the box with the other. The dancer must exercise an attention to *Body* and keep the parts in correct relationship to each other in order to mime 90-degree angles accurately. The arm on top of the box has to be parallel to the ground (or, more precisely, perpendicular to the direction of gravity, in case the floor is not level.) Moreover, the fingers, palms, and forearm need to be aligned well so that they appear as collinear as possible.
2. When the arms start moving, the fingers of the arm miming the side of the box needs to *Sequence Successively* in a timed manner with the support of *Free Flow Effort*, so that the corner of the box appears sharp. The upper arm, elbow joint, and forearm that had been miming the top of the box now need to move in a coordinated fashion to mime the other corner as best as they can.
3. When both arms are the top of the box, the dancer must again align the two arms at the tips of the fingers so that they appear as collinear as possible.
4. The movement as a whole need to be done quickly enough so that the illusion is perceptible. And they do it repeatedly, in time with the music.

In other words, this is not an easy movement to execute. I suspect that somewhere down the perceptual processing pipeline, my brain/body realizes this. So for a brief instance, my brain/body settles for a more reasonable explanation:

Interpretation 2: There *is* a box in the space. The arms—magically joined at the finger tips—are simply being pulled up, around, and down the box. My 'eyes tell me' that there is no box, and that there is nothing keeping the dancers fingers tied together; but my 'body tells me' that the presence of the box would provide the most 'sensible' explanation from an embodied perspective. At least for a moment. *I propose that this moment of embodied/cognitive dissonance is what makes the movement compelling,* and that the strategic ordering and accumulation of such moments through choreography/improvisation explains (at least in part) the efficacy of the movement aesthetics of all illusion-based styles. To what extent this dissonance is important in performing (how difficult is it to create such dissonances?) and in viewing (do more frequent dissonant experiences create a more satisfying or compelling viewing experience?) remains unclear and is the subject of future research.

4.3.1.6. Temporary gestural simplification, Spatial tangibilization, and performing a finger wave

At the start of a `finger wave`, the first finger moves a certain distance in space and at a particular velocity before it returns to its original position with respect to the hand. Before it completes this cycle, the adjacent finger will move through a similar distance in space at a similar velocity before returning to its original position, and so on. One possible interpretation a viewer might make is that a finger is "carried along" by the previously moving finger, or that a finger "receives the energy" of the previously moving finger, in a manner that recalls the types of causal illusions that experimental psychologist Albert Michotte (1963) has proposed.[47] Another possible interpretation is that a small virtual object (such as a virtual marble) is passing through the hands and causing the fingers to lift in response in order to allow the object to pass through. I propose that at heightened speeds, temporary gestural simplification 'kicks in' and leads the viewer to believe that the cause of the movement is not the volitional movement of the dancer but the existence of a virtual object interacting with the dancer's hands. The illusion is even more pronounced when the movement is performed quickly and in a repeated manner.

One approach to the successful execution of a closed-fist finger wave is to imagine a small object (such as a marble) passing through the fists, and the fingers lifting in response to it. In my experience rehearsing the finger wave with this imagery in mind, I found the movement easier to execute than when "thinking muscularly", since imagery allows the neuromuscular system to create the appropriate connections (Hackney, 2004, p. 238). The performance of finger waves is facilitated by what

[47] Michotte (1963) conducted close to a hundred different experiments on how a moving object A can be seen to cause the movement of another object B. These experiments involved human subjects viewing geometric shapes that were created by an apparatus that incorporated light projectors. The speed of the objects ranged from as slow as 3 centimetres a second to as fast as 130 centimetres per second. Michotte distinguished between different kinds of causal relationship, such as *triggering*, *launching*, *entraining, traction*, the *relay effect*, and the *transport effect*.

Hackney describes as *kinetic chains*, in which muscle sequencing occurs as a result of a pre-established "neuromuscular plan" (Hackney, 2004, p. 238). Because `finger waves` are similar to drumming one's fingers against a hard surface, a gesture that many people perform, some of the muscular pathways required to perform a finger wave is likely to already have been established. (This is not the case for `rolls`, which are far more 'unnatural', that is, less habitual for most people).

Nevertheless, the precise execution of a `finger wave` takes significant attention to the *Body* convey. For most people, it is not easy to extend the third finger and, particularly, the fourth finger of the hand while the other fingers are completely flexed. It requires significant practice to further develop the neuromuscular patterning to develop the movement independence of the third and fourth fingers from the movement of the adjacent fingers.[48] The `half-finger wave` (Tiny1Love, 2010) is even more challenging: it requires the fingers to fold halfway, at the second set of interphalangeal joints. To get a sense of the skill required to execute a `half-finger wave`, imagine forming your hand in the shape of the letter "e" in American Sign Language, one finger at a time in sequence. While it is possible to do this slowly, speed is required to convey the illusion effectively.

An extended discussion of how the conjecture of temporary gestural simplification can be applied to each technique listed in Tables 4.01 and 4.02 is beyond the scope of this chapter and is left for future research reports. However, I suggest that similar arguments can be drawn up for each technique.

[48] Movement independence of the third and fourth fingers is a well-known challenge for pianists, who practice keyboard exercises developed by master piano teachers such as Charles-Louis Hanon (1986) and Carl Czerny (1969) in order to develop it.

4.3.1.7. Concluding remarks on liquid, digitz, and spatial tangibilization

Table 4.2 indicates that digitz makes use of `contours` to spatially tangibilize virtual objects, just as liquid does. However, as mentioned in Chapter 3, digitz shapes tend to have a higher 'resolution' (to borrow a term from digital signal processing and imaging) than in 'pure' liquid, since the fingers can be more deliberately positioned and be used to specifying fine details in the illusory shapes.

As I discuss in Chapter 2, praxis in urban dance communities—like in most sites of discourse—is distributed and contested. Liquid dancers have cited as mime as a practice related to or influencing liquid. Several discussion forum threads archived on the Floasis site discuss miming (Floasis contributors, 2009b, 2010c, 2011c; LiquidWave32, 2009). The extent to which mime is believed to be foundational to liquid is contested, as one dancer explains:

> I believe the idea of "flow" is directly rooted in mime. In my research and development into the foundations of Liquid, I've come to find that the underlying motivation behind "flow" is very simple: manipulation of space. Space can be manipulated in so many ways, and it's all flow. However, again, not everyone believes that space is directly connected to Liquid dancing. Some consider Liquid a framing dance... That is to say, instead of manipulating space, people simply wish to frame its existence. I think that's how Liquid (like Tutting) was performed in its early stages in the 90's but advanced practitioners of the 2000's had changed the game. ({I6}, personal communication, February 2, 2012)

This dancer's observations suggests that much as Hwang experiences a `wave` differently depending on whether he performs it in the style of liquid or as popping (a performance-oriented choice), the phenomenal experience of `flow` depends on its ontology—that is, what a dancer believes `flow` to be and in which ways they interact with it. If we take the view (as respondent {I6} does) that all of liquid can be understood in terms of the manipulation of space, then all movement techniques in liquid can be understood simply as different variations of spatial tangibilization.

Setting aside—at least for the purposes of extending the line of argument in this chapter—the theory of liquid being entirely based on spatial tangibilization, I suggest

while some liquid and digitz techniques (`contours`, `rails`, `folds`, `tubes`, and `Fixed 45s`) rely on spatial tangibilization, other liquid and digitz techniques (such as `hand flow` and `splits`) rely on another dance illusioning modes I call *rejointing*, on which finger tutting also relies. Finger tutting also makes use of another dance illusioning principle, *spatial quantization*. I describe both these illusioning modes in the next section.

4.3.2. Finger Tutting, Spatial Quantization, and Rejointing

Tutting terminologies are continuously under development and few resources available to the online public lay out tutting concepts (EDM Dance Facebook Group members, 2012d). However, two concepts are frequently mentioned in discussion forums and online videos: the `tutting grid` and the `fixed point`.

4.3.2.1. The tutting grid

The `tutting grid` denotes a subdivision of space into a two-dimensional grid or three-dimensional lattice of imaginary points which dancers use as guides for aligning their arms, hands, fingers, and phalanges. Other body sections (such as the shoulder girdle area) may be used as well. To accommodate the varying sizes of the limbs, the grid has been conceptualized as "scaleable" (Kai, personal communication, October 15, 2011). The concept of a tutting grid structures space in way that evokes Cartesian coordinate geometry in Euclidean space.[49] Kai discusses an extension of the tutting grid that he is developing under the term 'Spatial Frameworks' in one of his online video tutorials:

> Think of [the grid system] as dots in space and also dots on your body. They're kind of dots in space that you align your body against. The basic

[49] An in-depth treatment of coordinate geometry is provided by Coxeter (1969). Foley's classic textbook on computer graphics includes a discussion of coordinate geometry of 3D Euclidean space and its use in fundamental computer graphics concepts such as viewports and cameras.

dots (or points as I call them), are … on your wrist… on your elbow… on your shoulder… on your opposing shoulder… on your opposing elbow… and on your opposing wrist. (floasisdotnet, 2011a)

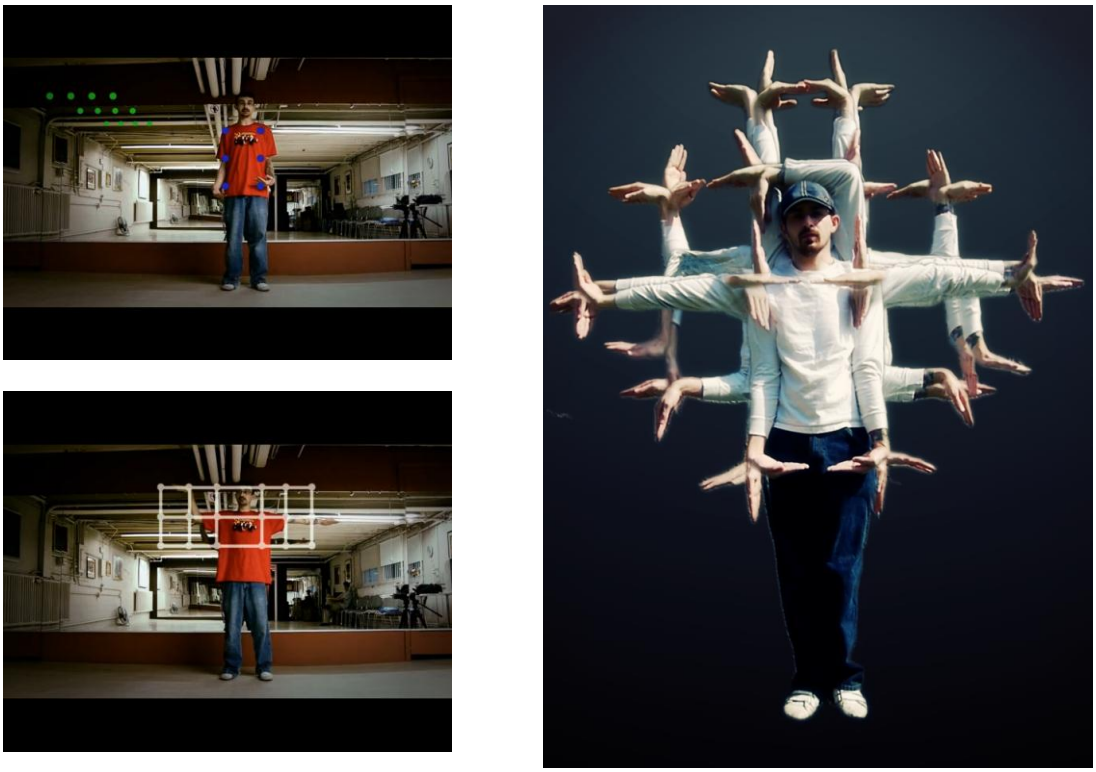

Figure 4.6. Visual representations of a spatial grid. The images on the left are still captures from Kai's tutorial on straight line grids.

From "Kai - F.N Archives #1 - Straight Line Grids", by floasisdotnet, 2011. Accessed on 2012 June 12 from http://www.youtube.com/watch?v=6CLitXIJeeg. Copyright 2011 by floasisdotnet. Reprinted with permission. The image on the right is provided by the image author. Reprinted here with permission.

4.3.2.2. The tutting grid and spatial quantization

The tutting grid is an example of *spatial quantization* for dance. Laban and Ullman's (1966) notion of *directions* is another example of spatial quantization. What is unique about the tutting grid is in its use of landmarks of the body to determine what would be its equivalent of *directions*. Figure 4.6 illustrates these ideas. The top left image shows blue dots that represent locations on the body, while the green dots

represent imaginary locations in space that can be used for aligning body parts. The image on the right suggests that the grid can be used to create shapes at a number of different scales. In fact, it suggests that the grid is *fractal*,[50] another feature that differentiates it from Laban and Ullman's *directions*. Spatial quantization is a form of technology. Consider, for instance, the Western system of subdividing a circle into 360 equal angular units (Hutchins, 1995). Moreover, the subdivision of space into discrete points is fundamental to contemporary digital technologies. For instance, raster screens (which represent images using a discrete number of pixels) have now completely supplanted vector screens, which drew images through a combination of points and (analog) lines (Wolf, 2002).

A subtle but critical distinction needs to be made about how the *directions* are analytically used in LMA and how the points of the tutting grid are used. In LMA, the *directions* indicate where the movement is going—a concept known as a *Spatial Pull*—and not the endpoint of the movement. On the other hand, the points of the tutting grid are very much seen as delimiters of the movement.

Figure 4.7 are still captures from a video of a dancer performing finger tuts. Note how three out of the four frames show right angle shapes, while two of the frames show the positioning of the limbs along a `tutting grid`.

[50] A fractal form is one that exhibits self-similarity along multiple scales. While the earliest known fractal form, the Koch snowflake, has been known since the early the 20th century (Pickover, 2009), Benoit Mandelbroit (1982) popularized fractals by making the case that natural forms are largely fractal in nature.

Figure 4.7 Still captures of a dancer performing tuts

From "Epic finger tutting combo (Nathaniel)", by YouTube user nathaniel439. Accessed on 12 June 2012 http://www.youtube.com/watch?v=pgEBgxNcsXE. Copyright 2011 by nathaniel439. Content licensed under a Creative Commons Attribution 3.0 Unported License.

4.3.2.3. The fixed point concept

The `fixed point` is "a stationary point within [the dancers'] environment…All other objects interact with that point." (Dark Matter Squad, 2011a). Video tutorials posted by tutters place an emphasis on the `fixed point` (Igrewupafukinscrewup, 2012; thaSMIZofESV, 2010). Dancer Tiny Love—a prominent dancer in the urban dance community—goes so far as to emphasize that "absolutely everything we do is related to fix point", underscoring the fundamental importance of this concept (EDM Dance Facebook Group members, 2012c).

Although most finger tutters seem to agree on the basic definition of a `fixed point` as a stationary point in space, further distinctions could theoretically be made. The movement possibilities afforded by attaching a joint (e.g., the elbow) to a `fixed point` are different from the movement possibilities afforded by attaching a limb (e.g.,

the palm) or a distal landmark of the body (e.g., the fingertip). In Chapter 3, I mention that the concept of a hold from Labanotation is directly mappable to the concept of the `fixed point`. Ann Hutchinson Guest identifies three types of holds—*body holds*, *space holds,* and *spot holds*:

> When a limb is to retain a previously established direction in the room even though the rest of the body turns away from it… this retention in space [is called a] '*space hold*'…
>
> [During a *body hold*] the relation of a minor part of the body to a more major part may be retained while the limb as a whole is moved in space…
>
> A *spot hold* is stronger than a *space hold*: when using a *space hold*, a performer can travel around while one part of the body maintains a relationship to a room direction, whereas with a *spot hold* he is tied down to a particular spot. (Hutchinson, 1945, pp. 137, 245, 449–450)

I shared the quote from Hutchinson Guest on the EDM Dance Facebook group list along with a short comment about how *holds* can be mapped to the `fixed point concept`. The quote received a number of 'likes' from the community, including key members of the group such as Tiny Love, suggesting that this mapping has resonance within the theoretical framework of the dancers. While holds can be used across illusion styles—for instance, *body holds* are used in the robot style whenever the lower and upper arms are held at a right angle—body holds and spot holds are particularly important in finger tutting and digitz.

Drawing from Laban's rigorous taxonomy of body parts in Labanotation, I propose a taxonomy of fixed points organized around the various uses of the fixed point concept in EDM dance styles, including a classification of fixed points by the type of hold they represent. By making these distinctions, I would not be so bold as to state that finger tutters would or should take these as fundamental principles of tutting. However,

perhaps dancers from the community could leverage some part of this taxonomy in their own movement-based research. This taxonomy is presented as Appendix A.

Figure 4.8 shows still captures from a video of me rehearsing a move called 'boxing'.[51] The move primarily uses the `fixed point` concept. I practiced this move to gain an experiential understanding for what it would demand of my body. In attempting to learn this move, I discovered on an experiential level the sophisticated degree of *Body*-centered skill required to successfully execute a move based on the `fixed point`.

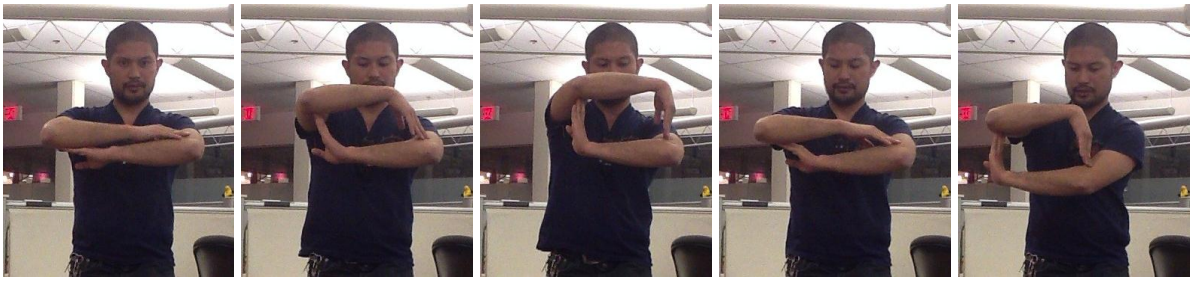

Figure 4.8. The author doing the best he can to execute a box. It was not as easy as I thought it would be.

Copyright 2012 by the author.

To prepare, one forearm rests on top of the other. To initiate the movement, I learned that I have to flex one wrist and extend the other wrist at the same speed, while keeping my palms and fingers stable and aligned. Because the range of motion of my wrist for flexing and for extending are not equal,[52] I learned that I have to actively concentrate on extending my wrist to so that it bends at an angle congruent to the flexion

[51] While boxing is not strictly a finger tutting move but one from 'regular' tutting, the argument presented in this section can be applied to finger tutting techniques.

[52] Indeed, several posts on the EDM Dance Facebook group and the archives of the Floasis.net forum are about developing the wrist's ability to move into extension.

of my other wrist. Because the move requires the use of two *spot holds*, I learned that in order to stabilize one arm as the other arm moves, I needed to allow the scapular region on side of the body to be free to move and to stabilize my upper chest on the other side of the body. A sophisticated use of the principle of stability/mobility was crucial.

4.3.2.4. The fixed point point concept and rejointing

In short, performing a box for the first time required my neuromuscular system to be activated in a way that was foreign to me. As with all expert movement practices, I discovered that with training—or "drilling", as dancers such as Jared Hupp describes it (Hupp, 2012)—the movements become increasingly easy. Nevertheless, in my initial attempt to learn how to box, I discovered that I needed to reconceptualise the way my body was internally connected in order to perform the movement *with ease*. I needed to edit my model of my own body and overwrite it with a new one. In this new model, I had no metacarpopholangeal and interphalangeal joints; my wrists had equal mobility in both flexion and extension; and an articulating joint connected my fingertips to the crook of elbow. I describe this process as *rejointing.*

I realized as well what a skilled performance of the move would look like to a viewer. A successful execution of a box leverages the viewer's tendency—informed by the principle of Common Fate as well as the rigidity assumption—to infer that my hands are governed by a single underlying mechanism. Applying the temporary gestural simplification conjecture, it might be possible that the bio-mechanical complexity required to execute a box leads the user to the more 'sensible' (and short-lived) explanation to the user is that there *must be* a physical connection between my fingertips and the crook of my elbow, like a hitherto undiscovered joint. And my hands *must be* monolithic, fingerless limbs, much like boat paddles.

4.3.3. Synthesis: From Performance to Perception to Reception

In this chapter, I described using concepts from LMA and Labanotation how techniques from liquid, digitz, and finger tutting might be experienced and performed by a dancer. I mapped these dance techniques to three general dance illusioning modes: spatial tangibilization, rejointing, and spatial quantization. I argued how the performed

movement might be perceived by a viewer using concepts adapted from the Gestalt principles of perception. Table 4.3 summarizes the discussion thus far in this chapter in the form of proposed mappings that trace how the skilled performance of dance technique translates into (a) the enactment of dance illusioning modes and (b) perceptual principles that support those dance illusioning modes. While the table does not address every underground illusion-based dance technique mentioned in this chapter, it includes additional findings not described in the previous sections, but which can nevertheless be derived using the line of argumentation I have demonstrated.

Table 4.3. Proposed Mappings from Dance Techniques to Illusioning modes

Dance technique	Selected LMA Principles and Labanotation concepts supporting the execution of the dance technique	Dance illusioning modes enacted
`Rails`	*Shape Change through Carving; Sequential Sequencing; Free Flow Effort*	Spatial Tangibilization; Rejointing
`Contours`	*Shape Change through Carving; Sequential Sequencing; Free Flow Effort*	Spatial Tangibilization; Rejointing
`Folds`	*Shape Change through Carving; Sequential Sequencing; Free Flow Effort*	Spatial Tangibilization; Rejointing
`Hand flow`	*Sequential Sequencing; Body Connectedness; Free Flow Effort; Indirect Space Effort*	Rejointing
`Fixed 45s`	*Successive Sequencing; Stability/Mobility*	Spatial Tangibilization; Spatial Quantization
`Finger waves`	*Successive Sequencing; Body Connectedness*	Spatial Tangibilization
`Boxing`	*Simultaneous Sequencing; Stability/Mobility*	Rejointing
Movements based on the `fixed point`	*Stability/Mobility; Holds*	Rejointing
Movements based on the `tutting grid`	*Stability/Mobility; Holds*	Spatial Quantization

I further propose that the three dance illusioning modes of spatial tangibilization, rejointing, and spatial quantization might be mapped to two receptive readings that the audience might make in watching underground illusion-based styles. In the course of performing, the dancer moves through various techniques and moves that conveys the illusion that their body is rejointable and reconfigurable. I am tricked into endowing dancers' bodies with new physical properties, such as joints where there are none, or an absence of joints where they actually exist. Temporary gestural simplification assembles, disassembles, and reassembles my mental models of the dancer's anatomy, keeping me in a perpetual state of cognitive dissonance and wonder. The dancer approaches what Clark (1995) has described as "artificial life entities", possessing "bodies capable of reconfiguring themselves into more permutations than we could ever conjure up" (p. 130). Thus, one receptive reading that the viewer might make is *that the underground illusion-based dancing body is simultaneously organic and technological—that is, cyborgian*.

In addition, spatial tangibilization creates illusions of objects in the performance environment where none exist, while spatial quantization suggests the presence of lines, planes, and points in space—invisible but substantial—that delimits the range of the movement of the body. Thus, another receptive reading that the viewer might make is that *the performance environment is virtually constituted in that it contains invisible, mutable objects and structures that are revealed only through movement of the dancer*. Table 4.4 illustrates these concepts in the form of a mapping.

Table 4.4. Proposed Mapping from Illusioning Modes to a Receptive Reading of the Audience

Dance illusioning principle enacted	Receptive Reading of the Audience
Rejointing	The body is cyborgian (simultaneously organic and technological)
Spatial Tangibilization	The performance environment is virtually constituted (contains invisible, mutable objects and structures)
Spatial Quantization	

I emphasize these mappings are tentative and speculative. They are not necessarily generalizable—however, they might be. I articulate these mappings

because accurately represent how I've come to understand the efficacy and expressive power of underground illusions-based dance styles. I advance that if these mappings have resonance to the reader, they might consider advancing this area of research by pursuing the research trajectories that described in Chapter 5. In the spirit of community-building and deepening the scholarly discourse on urban dance and movement research, I would also invite the reader to visit the companion website for this research (www.archive.org/details/Illusioning), through which we can exchange critical insights on the questions pursued in this study.

4.4. Summary

In this chapter, I analyzed selected underground illusion-styles dance techniques using theoretical approaches Laban Movement Analysis, Labanotation, and perceptual psychology. Situating my subjectivity as part of the analytical process, I proposed approaches to applying these theories to explain the efficacy and aesthetics of these dance styles, and arrived at a set of mappings linking performance, perception, and reception, justifying my interpretation of the illusion-based dancing body as simultaneously organic and technological, and the performance environment as virtually constituted and revealed only through dance.

5. Conclusions

In this chapter, I describe two proposals: one for the EDM dance community and one for the human-computer interaction research community. These proposals represent the contributions of this research, which I review and summarize. I describe the limitations of this research and outline directions for future study. I conclude by articulating a vision—founded on a concern for the continued evolution of human and social welfare—on the value of treating dance “as” technology.

5.1. Two proposals

Citing Reason and Bradbury (2008) in Chapter 1, I characterized the central activity of participatory and action research as the contribution both to action and to inquiry. To this end, the analyses developed in the previous chapters has aimed to support the development of praxis in urban dance communities as much as it has contributed to scholarly studies in dance and in technology.

In this section, I further advance both goals by presenting two proposals—one directed at the EDM dance community, the other directed at the HCI research community. In the first proposal, I describe how analyses based on principles of visual perception can address open questions around gloving, an EDM dance style, and apply such analyses to the design of a glove that might bridge a practice-based gap between gloving and tutting. Building on the ideas by dancer Albert Hwang (2011b), the second proposal argues that underground illusion-based dancers are rich potential sources of movement knowledge that could be used in the design and evaluation of new technologies.

Where my glovers at!

Like · Comment · Unfollow Post · September 13, 2011 at 9:02pm via mobile

2 people like this.

nvite them!
September 13, 2011 at 9:03pm · Like

hey umm can't finger tutting be converted into gloving? i was told by a friend that it could but i wasnt sure =/
September 13, 2011 at 9:03pm · Like

With gloving, its more digitz than fingertuts but finger tuts can be utilized
September 13, 2011 at 9:05pm · Like

oh i will be. yeah its one form used n gloving.
September 13, 2011 at 9:06pm via mobile · Like

ohh nice lol then ill have to look into gloving then, it sounds interesting lol
September 13, 2011 at 9:07pm · Like

yeah mos def man. digits is another form used alot as well.
September 13, 2011 at 9:10pm via mobile · Like

i'd like to know what more is there to gloving besides digits/fingertuts, not trying to be an asshole... i'm just interested and havent found anybody with technical knowledge to explain it. this group could be a good place to educate ppl
September 13, 2011 at 9:40pm · Like · 1

Not really anything i'm that familiar with other than i've seen people do it, visually it appears more handflow and digits oriented than anything though i've seen a few people use finger tuts. I'm sure there are a ton of people on here though with way more knowledge on gloving than I.
September 14, 2011 at 12:13am · Like

its all about hand flow and finger control and yes u can it tutting, finger rols, there are videos for begginer on emazinglights.com give u a good break
September 14, 2011 at 12:27am · Like

it all depends on the glovers style in my opinion.
September 14, 2011 at 1:51am · Like

.... yeah but you just described digitz and finger tutting. what makes Gloving any different than just adding finger tip lights?
September 14, 2011 at 5:05am · Like

Figure 5.1 A Thread on the EDM Dance Facebook Group on What Makes Gloving Unique

Screenshot from the EDM Dance Facebook Group page on September 13, 2011d, at 9:03 am. www.facebook.com/groups/221650201226046

5.1.1. A Glove for Tutting

As many in the urban dance community are aware, gloving is an EDM dance style that shares a similar, though not identical, history with the underground illusion-

based styles studied in this research. Glovers wear LED-tipped cloth gloves and perform in dim or dark spaces.[53] The lights can leave a trail, reminiscent of Pablo Picasso and Gjon Mili's experiments with "luminous sculpture" in the 1950s (A. White, 2001).

Of all the illusion styles, gloving produces perceptual phenomena—point light sources—that have been studied extensively in vision research. For instance, ravers know that gloving is particularly suitable for smoothly varying movement. Indeed, Bartram & Nakatani empirically validated affective responses to various types of point source motions, noting that "faster, angular, jerky motion that [has] … obtuse angular changes" can result in a negative affective response in the viewer (Bartram & Nakatani, 2010).

The dance techniques involved in gloving overlaps with techniques in other EDM dance styles, such as digitz and tutting. On the EDM Dance Facebook group, a conversation grew precisely around two questions: What makes gloving its own dance style that is uniquely differentiated from other styles? And why does it seem that gloving employs more digitz than it does tutting? (See Figure 5.1.)

To the best of my knowledge, the questions remain unanswered. While patterns of personal association between dancers likely played an important role in the affinity between digitz and gloving, I propose that digitz has a stronger affinity with gloving over tutting because of the manner digitz-based movements are visually perceived. While liquid, tutting, and digitz represent the aesthetics of some combination of arm, hand, and finger movement, gloving occupies a niche in the aesthetics of finger-, hand-, and arm-based dances: *the aesthetics of the fingertips*. From a viewer's perspective nothing else other than the fingertips really matter, as urban dancer Liquid Rush discovered during his first experience dancing with gloves:

[53] See, for example, EmazingLights [EmazingLights] (2010) and Tiny Love [Tiny1Love] (2012)

> Without the gloves, you can be doing digits but you can still have the rest of your body complementing or doing things which easily have as much focus, you know? You can be sharing the focus. You can be doing other things with other body parts but still be playing with your fingers.
>
> With the gloves ... what I found was that you're pretty much only watching the trail of the lights. That's your main focus. So you want that trail of lights to dictate everything you do. You can still use the rest of your body but everything works around the light trails.
>
> Some things are really cool. Like I can be doing stuff like this [demonstrates]... Normally I wouldn't do that with digitz. It doesn't look that good... But with the lights it looks really cool. And you can do stuff like you can hide the lights [demonstrates]. Now they're gone... It really opens up a new whole world: bringing the lights in and out of the equation, and then following the trails. (Liquid Rush, personal communication, June 7, 2012)

Digitz is probably used more often finger tutting in gloving because in finger tutting, the shape of the entire fingers and hands are important. The primary value of the fingertips in finger tutting is as visual anchors that indicate where the fingers end because tutting is more positional and shape-based than digitz. To address this, a glove that might be useful would have the entire finger lit, not just at the tips, to show the shapes.

Additionally, in the dark, it is difficult to see movement of a point light if the movement is along the axis formed from the observer's eye to the point light (i.e., if the movement is along what might be considered the depth axis). As discussed in Chapter 3, humans rely on a variety of visual cues to perceive depth, such as shadows and occlusion, which are absent when the perceptual targets are points light sources seen in dim setting. Another innovation of this glove could therefore be some way to map a property of lit portions of the glove (say, brightness) to its distance from the body of the performer to simulate and exaggerate changes along the depth axis.

When I shared this proposal with Jared Hupp and Lucas Johnson, both members of the Dark Matter Squad, it is relevant to note that they were working in fact on similar designs for a glove. The glove would function not just as a novel physical interface but also as a social artefact that represents areas of shared value, particularly between gloved and non-gloved dances.

5.1.2. Illusioning and the HCI community

As I show in Chapter4, underground illusion-based dancers pay sophisticated attention to relationships between the body and the space, treating dance as an object manipulation activity using refined control of the fingers, hands, and arms. I propose that their well-developed attention to the movements of these limbs could be relevant in the development of touch-based and gestural interfaces. The strength of my claims is supported by the technology-centric work of dancers such as Albert Hwang. In addition to being a dancer of liquid and other illusion styles, Hwang is an information artist who has worked on a series of design projects that focus on 3D, including a low-cost volumetric display (Parker, 2009) and the compelling Spatial Computing series of videos (A. Hwang, 2009, 2010, 2012). A post that he had put up on a discussion forum for dancers is worth quoting here in full:

> I just got back from an HCI conference late last night where I was … [selling them on] the merits of liquid and why liquid dancers are going to be the interaction designers of tomorrow.
>
> As a culture, we've pretty much spawned from computers. The dance is borne out of technologically based music, and many of us are in computer related fields. As dance cultures to, liquid dancing is probably the type of dancing that is culturally most related to computer generated space.
>
> What I'm saying is that we inhabit 3d computer space. Not only that, but we've also been here long enough to set up camp and to figure out how to navigate in this weird environment.
>
> We've done a lot of research and found a variety of tools that helped us feel comfortable with it, too: spatial frameworks, conceptual frameworks, social conventions, and a variety of languages (spatial, verbal, kinesthetic) that help us communicate new ideas. (A. [phedhex] Hwang, 2011b)

Hwang's comments suggest that one area of HCI research to which illusion-based dancers might contribute is in the design and evaluation of systems for tangible interaction, an area of inquiry that encompasses themes of tangible manipulation, spatial interaction, embodied facilitation, and expressive representation (Hornecker & Buur, 2006). Such systems include tangible interfaces (Ullmer & Ishii, 2000), mixed reality systems (Hughes, Stapleton, & O'Connor, 2006), and ubiquitous augmented reality

interfaces (Sandor & Klinker, 2006). Furthermore, Hwang's argument, though compelling, omit a crucial aspect of illusion-based dance styles: aesthetics. Indeed, it seems likely that illusion-based dancers could contribute richly to the development of what Djajadinigrat, Matthews, and Stienstra (2007) describe as "tangible aesthetics". An increasingly large body of scholarly work suggests that there are instances when ease of use and efficiency should not be the primary (or indeed the only) considerations in the design of interfaces. Enhancing or facilitating expressivity (Djajadiningrat et al., 2007), pleasure (Schiphorst et al., 2007), movement quality perception (Subyen et al., 2011), somatic awareness (Levisohn & Schiphorst, 2011; Schiphorst, 2008; Schiphorst, 2011), and meaningfulness (Djajadiningrat et al., 2007; Loke et al., 2007) are but a few alternative goals in interface design. Musical instruments, for instance, are interesting precisely because they are difficult to use; musicians are valued for the skill, refined over time, with which they master an instrument with a complex interface (Dobrian & Koppelman, 2006). Even more considerations in *designing for movement* could exist which have not been explored (Loke, 2009).

Research into designing technologies with movement as a central focus is ongoing. Levisohn's (2011) work on *designing for movement experience* leverages movement expertise of dancers and movement analysts. Indeed, dancers of all types, musicians, athletes, mimes, and movement analysts might exemplify what has been called variously as the "expert technical body" (Schiphorst, 2008) and the "moving, experiential body" (Wilde et al., 2011). Movement expertise is contextual and corporeally localized. It is possible but highly improbable to expect that the movement expertise of a concert pianist could make meaningful contributions to designing a pole vault; a pole vaulter would probably be a better choice for this task. But it *would* be reasonable to assume that a concert pianist might provide interesting insights to the design of a gestural language and what could be thought of as an 'aesthetics of the fingertips' for a handheld tablet with a touch interface. The illusion styles that I discussed in this research train for embodied awareness localized primarily in the fingers, palms, back of the hand, wrist, and forearm, and supported by awareness in the arms and upper torso. It might therefore be reasonable to propose that they can lend expertise in the design, evaluation, and use of interfaces that mobilize primarily these

body parts. Moreover, as Hwang essentially argues, because liquid dance often engages with imaginary objects in space, the application of their expertise could be particularly useful in contexts where contact with physical objects is not present (e.g., virtual environments, augmented reality).

The movement expertise of underground illusion-based dancers might prove particularly useful given that an increasingly large number of gestures—or, more accurately, gesture recognition technologies and gestural mappings to system behaviour—are now patented. Intellectual property in dance movement in particular and human movement in general is a salient issue. In 2007, Richard Silver, who is reported to have originated the popular dance known as the "Electric Slide" (Rutledge, 2007), filed a Digital Millennium Copyright Act complaint against authors of YouTube videos who posted videos featuring his choreography because these constituted public performance of his choreography without his consent. Silver eventually agreed to license the steps of the Electric Slide under a Creative Commons License (Electronic Frontier Foundation, 2011). While dance lawsuits are few and far in between, the idea that human movement is patentable is problematic for HCI researchers. For instance, Apple Inc. holds a patent to unlocking a device by performing a predefined gesture on an unlock image (Chaudhri et al., 2011), thus barring the rest of the world from publicly implementing a gesture-based system that could be construed as identical to the patent claim. However, dancers of styles such as liquid, digitz, and finger tutting draw from a tremendously varied movement gestural vocabulary, much like speakers of sign language do, and might provide novel insights on gestural interfaces, particularly since a significant proportion of the population might (as described in Chapter 2) might already work in fields that regularly require them to program, design, or build digital artefacts.

The idea that human movement might be subject to intellectual property laws is also problematic for finger-, hand-, and arm-based styles dancers. In a personal conversation I had with dancer Houdoken, he expressed concern over the idea that movement knowledge and practice can be corralled and owned by individual dancers or, for that matter, by corporations. Reacting to a recent article on the popular site www.io9.com claiming that certain "physical gestures have been patented" by hi-tech

companies (Newitz, 2011), Houdoken remarked, “I'm tempted to make a dance clip using as many of these as possible” (Houdoken, 2012). I share Houdoken’s belief that movement is a locus of innovation, and one that cannot (or should not) be owned. In a presentation that contemporary choreographer Sara Coffin and I made at the 2007 New Forms Festival ArtCamp, we presented a prototype for an online service, ‘Open Source Dance’, where choreographers can license their choreography under a Creative Commons License and ‘register’ choreographic material that influence their work, as a way to highlight to the contemporary dance community the importance of human movement as copyrightable material and to encourage the free and legitimate exchange of movement ideas (Maranan & Coffin, 2007). In an unexpected (and to my mind fortuitous) turn of events, dancers Houdoken and Kai had independently come up with the term “Open Source Dance” in 2010 (Kai, 2012). A few days before this research document was officially submitted, Kai released a video where he described his own vision of what an open source dance framework could mean. I argue that this is indicative of some convergence between different communities of dance praxis around issues of ownership in human movement in general and dance movement in particular.

5.2. Contributions

This study contributes to overlapping research areas in choreology, cultural studies, technology studies, and HCI:

- It uses a novel approach to the study of EDM dance practices through structuralist, movement-centered methods based on Laban Movement Analysis.
- It puts forward the proposal that perceptual and cognitive principles, particularly Gestalt laws of perceptual organization and the spatial cognition principle of ‘structure from motion’, explain and underlie the visual expressive and communicative strength of these styles through the process of dance illusioning.
- It develops a novel approach to explaining the interactions between technology and dance practice through a close reading of ethnographic and archival data in conjunction with structuralist and cognitive approaches for analyzing movement.

- It proposes that illusion-based dance as a community of practice embody movement expertise that is of value for technology design.

5.3. Limitations and future directions

This study draws from a wide range of methodological approaches and themes in order to explore understudied community practices and conceptual linkages. What it achieves in breadth could be strengthened through deeper and more rigorous inquiry in areas described in this research.

5.3.1. Closer phenomenological inquiry

While I applied some studio-based, auto-ethnographic approach to arriving at conclusions and bridging conceptual gaps, this could be conducted with more depth through more rigorous first-person approaches based on the work of phenomenologists such as Merleau-Ponty (1962) and which have found wide application in fields ranging from dance (Sheets-Johnstone, 1980) to experience design (Schiphorst, 2011). Increased engagement with learning as much of the illusion styles as possible and journaling throughout the process might provide richer, 'thicker' descriptions.

5.3.2. Broadened sampling methods

I tentatively described findings about the EDM dance practices based on a web survey I conducted. The low response rate to the survey makes it difficult to draw definite conclusions. Furthermore, because the survey was advertised entirely online and yet is meant in part to establish or refute a connection between the respondents affinity towards technology use, the results may be prone to systematic bias towards technology affinity. The dispersed nature of the illusion styles dance community makes it challenging to collect informant responses that do not bias it towards a particular reading. Ideally, the survey (or some other similar research instrument) could be deployed more widely, for instance, through channels other than the online discussion forums.

As mentioned in the introductory chapter, the opportunity to use online videos as data provides a large sample size for movement observation and allows me to replay and analyze key moments repeatedly. However, a reliance on online videos for movement observation presents challenges, since aspects of live performance qualities can be lost or missed out on when viewed on video. The study would be benefit from in-person observation, such as during the Axiom conference. Unfortunately, the timing of this study did not coincide with the conference dates, and reports from the EDM Dance Facebook group indicate that none of them lived in or near the city that I did. Future study would incorporate more movement analysis applied to live observation.

5.3.3. The relationship of technology to other urban dance styles

The study concentrated on only the three styles of liquid, digitz, and tutting; yet other urban dance forms exist that have clear and intriguing links to technology, such as the illusion styles of *animation* and *strobing*, whose names are derived from cel animation and strobe lights respectively. For instance, YouTube user WHZGUD2 (2011) has uploaded a video of a dancer performing a sequence of movements and then performing them exactly in reverse sequence. While choreographic inversions are present in ballet as well, the movement qualities used in this particular choreography creates a vivid impression that one is watching an analog recording of him being played back in reverse. Precisely how this dancer has managed to achieve this striking effect invites inquiry.

5.3.4. Further reception-based analysis

A broader and more detailed analysis of audience reception is worth pursuing. In particular, additional principles from spatial cognition could be applied to the analysis and could be used to further characterize the various urban dance styles. For instance, the decision whether to perform normal tuts, finger tuts, or digitz can depend on the size

of the movement and the distance of the viewer from the dancer. Liquid Rush (who is mentioned in this chapter) dances not only liquid, digits, and finger tutting but also other styles that incorporate more of the torso (such as *waving*) and the lower body (*shuffling*, *house*, *BBoying*). He uses the scalar differences in movement to effective use:[54]

> Finger tutting, definitely you want to be quite close. 'Normal' tutting you can probably get away with some distance, but as soon as you start compressing everything down to the fingers, that's when you need the focus. ... I'd still do [finger tutting] in a club. What I find I'll do is: say I'm in a circle. I'll do my big moves to get people's attention. Once I see that I everyone's attention is focused then I can bring it down and focus it into the hands. (Liquid Rush, personal communication, June 7, 2012)

Liquid Rush's observation also points to the fact that scale creates boundaries between different styles of dance.

It is widely acknowledged that mental imaging exercises—i.e., rehearsing actions mentally before performing them—facilitate the development of motor skills through neuromuscular patterning (Krasnow, Chatfield, Barr, Jensen, & Dufek, 1997; Morris, Spittle, & Watt, 2005). While these mental imaging exercises involve the visualization of the body and its movement through space, research also suggests that certain mental imaging tasks related to objects external to the body are implicated in the development of motor skills. For instance, results reported by Pietsch and Jansen (2012) suggests that the ability to perform mental rotations (i.e., accurately and quickly rotating images in one's mind) is correlated not only with rotational hand movement but gross motor skills. Dance techniques such as axis shifts and folds appear to be founded on both cognitive and motor abilities for mental rotation. Mental rotation is one of several other tasks related to "spatial ability", which also include spatial perception (accurately identifying the orientation of objects in space with respect to the orientation of one's body

[54] Note how Liquid Rush transforms the *Indirect* attention of the audience in a room to a *Direct* focus on himself through strategizing which style to perform.

despite the presence of distracting perceptual cues) and spatial visualization (performing complex tasks that involve manipulating objects in space in one's mind) (Linn & Petersen, 1985; Richardson, 2006). While this research suggests that spatial abilities of underground illusion-based dancers are highly-developed, it remains an open question to what extent and under which contexts this is true, particularly compared to non-dancers or to dancers of other genres.

Finally, I advanced a principle of perception—temporary gestural simplification—which remains conjectural. It is left for future research to design experimental conditions in which this conjecture may be verified empirically.

5.4. Postscript: Towards (or Back to) Dance as Technology

In the course of this research I have come to understand illusion styles as a rigorously conceptualized, highly sophisticated practice—the technê, to return to a term from previous chapters—that can be used to evoke virtual environments and cyborg bodies. In the case of illusion styles, the cyborg body embeds into itself not technological artifacts but technological tropes and processes. For instance, the idea of a moving with respect to fixed reference points in space is not new, and has been extensively explored in Laban's theories of movement and their subsequent application by choreographers such as Merce Cunningham and William Forsythe. However, to lay out—as the `tutting grid` does—the points in a finely divided grid of nearly-equidistant points suggests a treatment of space that is more similar to pixel grids than Laban's crystalline forms.

The concept is extensible, as dancer Kai shows in a framework he is currently developing. Using a grid similar to the tutting grid, he borrows the techniques and terminologies of the *poi* community to come up with a "modular", "scaleable", and "extensible" concept of movement (floasisdotnet, 2011a, 2011b, 2011c). Poi is a traditional Māori performance art form from New Zealand that involves the use of tethered weights that are swung in geometric spatial patterns (Paringatai, 2004). 'Poi' also refers to the weights and the cord to which they are tethered. Returning to the

distinctions presented in Chapter 1 between material, non-material, and virtual uses of technology in dance, the implements of poi are examples of material extensions of the self. What is notable here is that Kai takes these extensions and folds them back into the 'unencumbered' dancing body. The result is a visually compelling approach to moving the limbs that suggests the mechanics of multi-jointed levers.

One could fold back into the body other extensions of ourselves. For instance, we can reinterpret the various illusion style techniques in the language of computing. Finger waves are sinsuoidal forms. Fixed point tutting involves traversing the pixel grids. Contouring is edge detection and object collision avoidance.

It is in this spirit that I conclude with a sketch for a vision, offered to the members of the communities I am variously affiliated with—HCI researchers, software developers, designers, dance artists, social entrepreneurs, social workers, environmental advocates. In this vision, we consider laying to rest the practice of building computing machines using materials such as plastic and metal that take up ever more resources to produce, and to instead turn inwards, towards the self, and consider the body as a primary and renewable locus of innovation. Returning to Mauss' techniques of the body from Chapter 1, I propose that we in the technology design and technology research communities should privilege research trajectories that revisit ideas articulated by Mauss, as well as other movement philosophers and researchers, which set out to investigate how the intelligent body can be used to supplant the agenda that traditional approaches to information technology has set out. The proof of concept exists: in fact, they've been dancing for at least fifteen years. Through their sheer facility in movement, underground illusion-based dancers can suggest that they are immersed in a world invisible to me but which is nonetheless located in the same Euclidean space as the reality we inhabit.

They make me believe that, however briefly, that they can create and remove joints in their body at will. They can choose to appear organic, mechanical, digital, or triangulated somewhere in between all three states.

They dance through and into different realities. They suggest a future where dance can be regarded as technological innovation. They hint at ways for how we can use our bodies extend into the world without overpowering it. They are technology, embodied, in motion.

The machine is not an it to be animated, worshipped, and dominated. The machine is us, our processes, an aspect of our environment.

Manfred Clynes and Nathan S. Kline, "Cyborgs in Space", *Astronautics,* September 1960, 26-27, 74-75. Quoted in Flichy (Flichy, 2007)

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Appendices

Appendix A.
A Taxonomy of Fixed Point Concepts

Fixed point analysis by body landmark

Fixed point at a joint. This occurs when the fixed point is located at a joint, such as the elbow, which connects the forearm and the upper arm; the wrist (the hand the forearm), the metacarpopholangeal joints (the large knuckes), and the interphalangeal joints (smaller knuckles).

Fixed point at a limb: This occurs when the fixed point is located on the surface area of limb, such as a phalange, a finger, the palm of a hand, the forearm, the upper arm, or the the tip of the shoulder (the acromion process).

Fixed point at an extremity termination: This is a special case of a fixed point at a limb. An extremity termination is a landmark on the body that terminates in a point-like way. Examples of extremity landmarks are the finger tips, the tips of the toes, the tip of the elbow, the acromion process, the top of the head, and the heel. In this analysis, there are two kinds of extremity points: 'joint-based' extremity points, and 'jointless' extremity points. Joint-based extremity points include the elbow tip (associated with the elbow joint) and the shoulder tip (which is associated with a number of joints). Because joint-based extremity points are associated with a joint, an analysis of how they are used as an anchor would fall under analysis of fixed point at a joint. On the other hand, jointless extremity terminations are the most distal points of the body, namely the top of the head, the fingertips, and the tips of the toes. An extremity termination is neither a limb nor a joint, but instead corresponds to the most distal landmark of a limb. It is so distal, in fact, that it converges to (but never arrives at) a 0-dimensional point in Cartesian space. For instance, if one applies a fixed point at the tip of the index finger that is resting on a table, imagine that an infinitesimally small drop of infinitely strong superglue were applied between the fingertip and the table; this results in the finger—and, in fact, the entire body—being able to rotate along all three degrees of freedom without being able to translationally move along the three translational Cartesian axes. In the case of tutting, a point in three dimensional Euclidrean space of performance takes the place of the location of the table to which the finger is attached. This example is an idealized form of the fixed point at an extremity termination.

The use of spot holds and body holds appears to form the foundation of much of tutting and finger tutting and aesthetically differentiates it from other finger-based styles. For instance, the finger connect style is characterized not by the frequent use of spot holds or body holds but—according to dancer Twan—by the frequent use of the digitz technique of remotes to create a series of complex hand shapes that evoke the idea of a series of spatial puzzles, the goal of which is to "find ways to get in [and] find ways to get out" (Love [Tiny1Love], 2011). Another characteristic of finger connect is continuous contact fingertip contact to other parts of the body, notably areas of the hand such as the palms, the phalanges, and the fingertips. See, for example, *Exclusive Ty and Tiny Finger Connect Freestyle* (Love [Tiny1Love], 2010c), which also demonstrates the notable use of remotes.

The principle of constant fingertip connection is reminiscent of the principle of continuous body contact in the dance style of *contact improvisation*, where two dancers strive to maintain continuous physical contact with each other, even if just by the tips of their head or, yes, their fingertips. In fact, an interesting choreography might involve two dancers trained in both contact improvisation and finger connect who alternate between traditional contact improvisation and finger connect!

Fixed point analysis by degrees of movement freedom

A distinction can be made between different kinds of fixed point movements based on degrees of freedom of movement. When a joint or section is placed in a spot hold and it remains invariant both along translational axes and rotational axes, an ‘absolute’ fixed point results. When joint, section, or extremity terminator it adhering to a rotationally-variable fixed point.

Fixed point analysis by number of fixed points

It is possible that the fixed point technique is applied to only one body landmark. For instance, a spot hold could be applied to the point of an index finger, and the dancer could move their entire body around that point; they could kneel, or jump, or move into spine flexion and rotation, or do any other combination of movements without their fingertip ever releasing the spot hold. This represents a movement based around a single fixed point.

Most often, several fixed point techniques are used. For instance, between 0:54 and 1:00 of the video by thaSMIZofESV (2010), the dancer can be interpreted as applying fixed points to three limbs (the hand, the upper arm, and the forearm), to two joints (the wrist and the elbow joints), or to one joint and one limb (the wrist and the upper arm). Like all movement analyses, several different interpretations (which are equivalent on certain levels) are possible for this movement sequence. Which analysis is most valid? The intent of the mover should be taken into account. In this case, thaSMIZofESV clearly states that he intends to apply two joint-based fixed points.

Appendix B.
Consent Form and Survey Instrument

Consent for Adult Participation in a Research Study
Title: fluid flux
Chief Investigator: Diego Maranan
Thesis Co-supervisors: Dr. Thecla Schiphorst, Dr. Lyn Bartram, Simon Fraser University
Investigator Department: School of Interactive Arts and Technology (SIAT), Simon Fraser University, 2400 Central City, Surrey BC V3T 2W1; www.siat.sfu.ca

Hello. My name is Diego Maranan, and this research study is part of thesis that I am doing as part of my MA studies at the School of Interactive Arts and Technology at Simon Fraser University. If you identify as a dancer of EDM dance, I'd love to have you involved in this study. You can learn more about this study on blogs.sfu.ca/people/diegom. Participation is voluntary and you can withdraw at any time.

Because the University and those conducting this research take the ethical conduct of research seriously, everyone who involved in conducting this research wishes to protect your interests, comfort, and safety at all times.

How you can participate:

The first part of the study is this survey, which asks you some questions about technology and about dance (for example, whether you watch online videos or participate in online discussion groups to discuss dance). Your individual responses will be kept confidential and won't be used to identify you personally in the published study.

At the end of the survey, you'll be invited to participate in an online interview where I'll be asking you about your practice as a dancer. I'm also hopeing to exchange ideas with you in more detail around dance, movement, and technology. We can arrange for a time that works best for us. The interview can happen in person or over video chat (e.g., Skype). I'll be asking you to provide me a name that I can use to identify you in my thesis. Our interview will be video recorded but the recording will be kept secure and private (I describe how below).

If I include pictures or video clips in the published study that feature you, I'll first ask your permission to link these pictures or video clips with the identity you have provided me.

Benefits and risks of this study:

This study aims to help build a bigger picture of how creative, embodied practices such as dance are influenced by technology. I'm also hoping that this study can raise the profile of the urban dance community and its members in the various artistic and academic communities that I'm involved with. If you choose to participate in an online interview, I hope to engage in a productive dialogue with you where we can exchange perspectives around the subjects of common interest, as well as connect you to the perspectives of other artists and thinkers in my artistic and scholarly communities, in a way that I hope could be useful for your own professional and artistic practice.

During the course of the interview, you might reveal opinions (for example, opinions about any other members of the dance community) which you many not feel comfortable being attributed to you. If this happens I'll take care extra care in protecting your identity. I'll also be emailing you periodically with drafts of the study to make sure that the published thesis accurately reflects how you want to be represented. There are no other known risks to you.

Information and Privacy: The information from this study will be used to complete a thesis that will be published publicly, including on SFU's institutional repository (summit.sfu.ca). The results from this study will be shared with thesis supervisors, and may appear in one or more journal or conference papers. We will *not* do this unless you explicitly consent to this at a later date. Once thesis has been submitted for publication (Summer 2012), all information will be kept digitally on the University's servers and will be password protected for up to five years, at which time it will be destroyed. Whenever possible, data collected from this study will be managed in accordance with the University's standards on Freedom of Information and Protection of Privacy (www.sfu.ca/archives/foi_index/policies/index.html). The online survey is conducted on a secured and encrypted web server housed in Canada. If you participate in the study from the US, because of the Patriot Act, the confidentiality of your identity cannot be guaranteed. If you agree to be interviewed over Skype, confidentiality cannot be guaranteed as Skype works on a global peer-to-peer architecture and is not considered a confidential medium.

If you want to obtain information about your rights as a participant in research, or about the responsibilities of researchers, or if you have any questions, concerns, or complaints about the way you were treated in this study, please contact thesis co-supervisors, Dr. Thecla Schiphorst ([redacted]) and Dr. Lyn Bartram ([redacted]); or Dr. Hal Weinberg, Director, Office of Research ([redacted]). This study's code is [2012s0352].

You can participate in this study by completing a survey. Personally identifiable information such as first and last name will not be used in the published results to link your answers to the survey. After completing the survey, you can also optionally participate in an interview. You must complete this survey before agreeing to be interviewed. Before the interview, you will be asked to fill out a form (http://blogs.sfu.ca/people/diegom/?page_id=52) where you will provide a publishable name that can be used to attribute answers you give during the interview. You can use your legal name or a pseudonym as you wish. You can change your publishable name at any time before the publication of the study by using a form provided on the research website (http://blogs.sfu.ca/people/diegom/?page_id=225) or by contacting me directly via email. I'll also be consulting with you at various points in the process of this study, and particularly before thesis is published, to make sure that I have cited and identified you in the way you want. Your participation in this study is entirely voluntary. You can at any time withdraw from this study and your data will be destroyed. You can obtain copies of the results of this study once it has been completed by contacting the chief investigator (me).

On the next page, you will be asked to confirm that you agree to participate in the study. By answering "yes" to the question on the next page, you signify that you have read this document which describes the benefits and procedures of this research study, that you are legally considered an adult in your country and state/province of residence, that you understand the procedures to be used in this study, that you have received an adequate opportunity to consider the information in the document, that you voluntarily agree to participate in the study, that know that you have the right to withdraw from the study at any time, and that any complaints about the study may be brought to the research co-supervisors or to the Director of the Office of Research Ethics as described here.

Q1 . Do you agree to participate in this study as described by the document on the previous page? (You can review the document by clicking the "Previous" button below.)

☒ Yes

☒ No

Overview
Again, thank you for agreeing to participate in this study! Over the next several pages, I'll be asking you some questions about digital technology and how they might (if they do) relate to your practice as a dancer and as a member of a community of other dancers. There are 23 questions in this survey which will take around 10-25 minutes to answer.

Q2 . Please enter your contact details. Your contact information will be kept confidential. For your name, you don't need to put down your legal name. Please write down how you would like me to call you when talking or writing to you.

Name :

City :

Province :

Postal Code : *

Country : *

Email : *

WebPage :

Q3 . What year were you born?
*****

Part 1 of 4: Your dance background
The questions in this section ask you about how you started dancing and what styles of dance you know, draw inspiration from, or have influenced your dancing.

Q4 . What dance styles do you primarily know or draw inspiration from? I know this is a limited list, but you can list down more in the next page if you want.

☒ Liquid
☒ Digits
☒ Finger tutting
☒ Gloving
☒ Popping
☒ Locking
☒ Finger connect
☒ Others (you can list them in the next page)
☒ Would rather not say

Q5 . If you checked "others" in the previous page, please indicate which other dance styles you know or draw inspiration from

Q6 . How did you first learn about EDM dance? Please select as many as you feel appropriate

☒ At an event or venue (club, rave, party, other)
☒ At a gathering, conference, or convention for EDM
☒ Through a friend
☒ Online through videos, discussion forums, or websites about dance
☒ Other (you can give details in the next page)
☒ Would rather not say

Q7 . If you checked "others" in the previous page, please feel free to share how you learned about EDM dance

Q8 . How long have you been dancing?

☒ Less than six months

☒ Less than a year

☒ About 1-2 years

☒ About 2-5 years

☒ About 5-8 years

☒ About 8-12 years

☒ More than 12 years

☒ Would rather not say

Q9 . Would you like to share any online links that showcase your dancing (such as a YouTube channels, personal websites, MySpace pages, Facebook artist pages)? These links will be kept confidential and not shared publicly without your express permission.

Part 2 of 4: Dance, digital technology, and online communication
The questions in this section are about the use of digital technology and online

communication in learning from, teaching, or sharing dance techniques with other dancers. This section also briefly talks about the work of certain dancers and choreographers with who have used technology to explore new ways of moving.

Q10 . Have you ever posted online videos of yourself dancing and shared it with other people? (please check all that apply)

☒ No
☒ Yes, and I shared with non-dancer friends
☒ Yes, and I shared with other dancers
☒ Yes, and I shared with the public
☒ Would rather not say

Q11 . Have you ever posted any video tutorials with the main goal of teaching others dance techniques or tips?

☒ Yes

☒ I've posted video of me dancing but not with the particular intent to teach the viewer

☒ I've never posted any videos of me dancing

☒ Would rather not say

Visually annotating and augmenting dance using technology
(This page gives some background for the question on the next page.)

Dance can be visually "annotated" or "augmented" using digital techniques. One example of what I mean is by the American contemporary dance choreographer William Forsythe. In 2000, he made a series of videos under the title "Improvisation Technologies". In these videos, he superimposes lines and shapes using post-production editing to show how ballet dancers could think about the space around them in a way that could help them break out of their habitual patterns of moving. In the first video below, he illustrates his concept of "shearing space". The second video shows a ballet dancer applying a series of his techniques in an improvisation session. (If you can't see the videos, this is the first one and this is the second one). I think of these as examples of using visual annotation as a teaching tool.

Another example is from a video you might have already seen, Samsung's ad for their Galaxy phone that features finger tutting visually augmented by moving figures. (Here's the link if you can see it below.) Another example is from an Australian dance company called Chunky Move. They tracked the movements of dancers in real time and and projected live visuals onto a white floor. (My personal favourite sections is from around 0:42 to 1:10 and from 1:42 to 2:05) (Again, the link if you can't see it below) I think of these as examples of using visual annotation in performance.

Q12 . Which of the videos or choreographers from the previous page are you familiar with?

☒ William Forsythe or the Improvisational Technologies videos
☒ The Samsung Galaxy tutting ad
☒ Chunky Move or the video of their piece, Mortal Engine
☒ Would rather not say

Q13 . Have you come across video tutorials for any of the dance styles that you do which use visual annotation?

☒ Yes

☒ No

☒ Would rather not say

Q14 . Have you ever used digital tools to visually augment your dancing, either for teaching or in performance?

☒ Yes

☒ No

☒ Would rather not say

Q15 . What do you think about using visual annotations as a teaching tool for the dance styles that you do? Do you think they would add something valuable to the dancing?

Part 3 of 4: The dance community
The questions in this section relate to how you communicate with other dancers in your dance community.

Q16 . Which online communication channels do you use to discuss dance-related issues with other dancers?

	Never	Rarely	Sometimes	Frequently	Would rather not say

Email :	☒	☒	☒	☒	☒
Posting online videos (e.g., YouTube) :	☒	☒	☒	☒	☒
Reading and leaving comments on online videos :	☒	☒	☒	☒	☒
Video chat (for example, Skype) :	☒	☒	☒	☒	☒
Discussion forums (e.g., on Dark Matters, Floasis, EDM Dancers Facebook Group, etc.) :	☒	☒	☒	☒	☒
Posting and reading comments, photos, and videos on Facebook or other social networking sites :	☒	☒	☒	☒	☒

Q17 . How often would you say you attend gatherings/conferences/events where you meet other EDM dancers? (These could be small or big, local or national/international.)

☒ I never attend

☒ I sometimes attend

☒ I attend whenever possible

☒ Would rather not say

Q18 . If you discuss dance-related issues with other dancers, how often would you say you communicate with them online compared to communicating with them in person?

☒ I don't discuss dance-related issues with other dancers

☒ I discuss dance-related issues online less than I do in person

☒ I discuss dance-related issues online as often than I do in person

☒ I discuss dance-related issues online more often than I do in person

☒ I only discuss dance-related issues online

☒ I only discuss dance-related issues in person

☒ Would rather not say

Part 4 of 4: You and technology
The questions in this section are about your use of digital technology tools in general and handheld devices outside your practice as a dancer.

Q19 . Do you work in a field that regularly requires you to program, design, or build digital artifacts (for instance, software, websites, plugins, databases, robots, computer hardware)?

☒ Yes

☒ Somewhat

☒ No

☒ Would rather not say

Q20 . Please indicate your familiarity with the following computing-related languages

	None	**Basic**	**Intermediate**	**Advanced**	**Never heard of this language**	**Would rather not say**
Any low-level programming language (e.g., machine code, assembly) :	☒	☒	☒	☒	☒	☒
Any object-oriented programming language (e.g., C++, Java, C#) :	☒	☒	☒	☒	☒	☒
Any scripting language (e.g., Python, Javascript) :	☒	☒	☒	☒	☒	☒
Any structured markup language (HTML, XML) :	☒	☒	☒	☒	☒	☒

Q21 . Which mobile devices do you own or plan on owning in the near future (within the next 6 months)?

☒ A non-smart cellphone
☒ Smart phone with a touch screen
☒ Smart phone without a touchscreen
☒ Tablet
☒ Another mobile device not listed here
☒ Would rather not say

Q22 . Do you know how to play a (traditional) musical instrument, such as a keyboard, string, brass, wind, or percussion instrument?

☒ I don't play any musical instruments
☒ I can play at least one instrument at a basic level
☒ I can play at least one instrument at an intermediate level
☒ I can play at least one instrument at an advanced level
☒ Would rather not say

Q23 . This is the last question! Do you have any comments or questions about this survey?

Appendix C.
Interview Protocol

Part I. Introductory Protocol

To be read by the interviewer:

Thank you very much for completing the survey and for agreeing to be interviewed. When you took the survey, you signed a document which states that: (1) all information will be held confidential, (2) your participation is voluntary and you may stop at any time if you feel uncomfortable, and (3) I don't intend to inflict any harm!

To facilitate our note-taking, I would like to video record our conversation today. Only researchers on the project will have access to the digital video files which will be eventually destroyed.

In this interview, I will be asking you to share in some detail your experiences in dance: how you practice and learn dance, how you choreograph, how you think of space and your body's relationship to space, and how technology influences (if it does) the way you move.

I've planned this interview to last no longer than one hour. If you'd like more time to discuss, please let me know and I'd be happy to extend our time or find another time that's convenient for you. During this time, I have several questions that i would like to cover. If time begins to run short, it may be necessary to interrupt you in order to push ahead and complete this line of questioning.

Do you have any questions or comments before we proceed?

Part II. Interview Questions

Research question	**Sample interview questions and comments**
How have digital communication and digital data representations influenced the Liquid dancers' movement vocabulary and their attention to space, time, and the body?	You indicated in the survey that some of the dance styles that you know include [liquid, digits, tutting, etc.]? What about [indicated dance styles] do you enjoy? How would you describe [indicated dance styles] to someone who's never seen it? How do you practice? How do you put together a piece of choreography? What is your process like? In the survey, you shared some videos of your dancing. In one of your videos [state video URL] it seemed like [an observation about the use of time, space, and the body] was this your intention? Would you agree? In [genre], there's a lot of attention to movements of the [xxx] but not so much [yyy]. Would you agree? Would you

	say that your attention to [xxx] has changed? Did you have a prior interest in [xxx], for example, did you you use to play musical instruments? One dancer I had interviewed has said that to him, liquid dance is about manipulating space. Do you feel the same? What role do the following play in your dancing: Manipulating space Imagining space as having a tangible form Using lattices/grids and other ways of placing a structure on space? What kinds of spatial structures do you use? Using one part of your body to manipulate another part In one of the YouTube videos that I came across (and then share video URL) it seemed like [an observation about the use of time, space, and the body]. Would you agree? How important is it for your dance to be viewed from a particular angle? How aware you of the difference between the way you're seeing your dance and the way and audience might be seeing it? Do you get lost in the performance and forget how the movement might appear to an audience? Or are you always aware of how you're being viewed? If you were to describe the difference between your body when it's dancing and when it's not dancing, how would you describe it? One of the things that I've been thinking about was how there was a time in the 60s and 70s when our notion of what was high-tech and modern had a hard, angular aesthetic to it. Square, rectangles, triangles, very angular. Now we're seeing a return of organic forms: soft and subtle curves, organic forms... these are now considered more contemporary, more chic. And you can see that in things the design of mobile phones, computers, laptops. I'm wondering whether to a certain extent, you can also say that about say, robot dance from the 70s and dance styles like liquid: they both have a precision and a mechanical logic to them, but in Liquid the resulting aesthetic is fluid, more organic, has less edges. Would you agree? What do you think?
How significant is the use of digital technologies in spreading the practice of Liquid and increasing the number of Liquid dancers?	Have you ever learned any dance techniques or moves from online videos? Have you learned any Liquid techniques from online videos? How important would you say are online venues such as YouTube, discussion forum groups, etc. in the way you

	share/develop/practice your craft? If a novice dancer wanted to learn Liquid, digits, finger-tutting, from the videos, tutorials, wikis, and resources available the resources online, how much success do you think they would have? Where do you perform? Do you post videos of yourself performing?
How significant is the use of digital technologies in facilitating the growth and evolution of the craft? Has "visual annotation" played a significant role in the way the craft is developed and shared?	What do you think of visual annotations? Do you make these? What benefits do you see in using visual annotation in the dance? What do you think of the Samsung tutting video?
Are Liquid dancers consistently technology literate/proficient outside of their practice as dancers?	You indicated in your survey response that you work in a field that regularly requires you to program, design, or build digital artifacts. Could you say more about this?
What insights do liquid practitioners have about the moving body, technology, and aesthetics that could contribute to research in HCI and technology design?	How do you think technology has changed the way humans move? Can you think of examples in your own life which the way you move has been influenced by digital technologies? Check these interfaces out. Some of them are old, some are new, some are experimental. What do you think about these? phedhex had made a post on the floasis forum insight about HCI. What do you think about these?

Part III. Post Interview Comments and/or Observations

Before we end, I wanted to remind you that you can change the name that you would like to be used when I referred to yoru responses in the thesis? If you would like to change this publishable name, you can do it from the research website. You can use your artist name or stage name. You can also use your legal name. You can also choose to remain anonymous and choose a totally different name altogether. It's up to you. You can change that name at any time.

Do you have any questions or comments?

If you have anything you wanted to add the information you've provided for me today, please feel free to send me an email. If you would like to arrange for another interview, please fill out the Interview and idea exchange request form available on http://blogs.sfu.ca/people/diegom/?page_id=52 to indicate your consent to be interviewed again.

Thank you very much for your time!