

FIELD CUTS: ENCOUNTER 6

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ABSTRACT

This thesis provides documentation of the creation and development of *Field Cuts: Encounter 6*, an electrically/electronically mediated movement performance for three dancers that explores the ability of performers to influence and interrupt each other at a distance through electrical stimulation. Constructed as a partially improvised open work, *Encounter 6* relies on digitally controlled conditions that connect the movement of each performer to the stimulation received by others. Created in collaboration with sound artist and programmer Kelly Michael Fox, as well as dancers Meghan Anderson, Jacob Regan, and Haley Day, *Field Cuts: Encounter 6* was performed at the Experimental Media and Performing Arts Center Studio 2 in Troy, NY on March 10, 2016.

1. Introduction

This thesis documents the theoretical underpinnings and development of *Field Cuts: Encounter 6*, a multimedia movement performance which explores performers' influence on each other at a distance, physical interruption, and the effects of each on the unfolding of an open work. Building upon previous performances and works that I have created under the title *Field Cuts*, *Field Cuts: Encounter 6* acts as a further exploration of improvisation, repetition, memory, disruption, and potentials through the construction and navigation of open compositional structures and the usage of custom built electronic hardware. Key to the underlying concept of this project is the idea that at any given moment in time, there are many potential actions or movements which can be taken, with only a fraction of them ever being actualized. By creating new means of connecting to and between individuals, I hope to challenge the performer to think about his or her movement in new ways, recognizing potentials which may have previously been hidden.

In order to develop the basis for this line of questioning, I've turned to a number of scholars and writers from dance, choreography, and performance backgrounds in order to develop my ideas related to communication between bodies in movement and performance, and the nature of our perception. Additionally, a number of scholars writing about multimedia performance environments, including the strengths and weaknesses of digital systems, have pushed me to question the relationships between technology and performer, as well as the need for focus on human-to-human interaction. Building upon this line of thinking and previous iterations of the project, I discuss the creation of the choreographic and compositional material and structure, as well as the development and role of the audio and video components in the work.

Section 2 puts forth the theoretical underpinnings of *Field Cuts: Encounter 6*. In 2.1, I begin by discussing the difference between the actual and the virtual, as well as the perceptual gap first investigated by neurologist Benjamin Libet. In 2.2, repetition is discussed as a revisiting of a site of potentials, open to subtle alterations and changes. Immediately following, 2.3 discusses ideas of inter-performer communication at the semi- and unconscious levels through entrainment, as well as the concept of "open work" as described by Umberto Eco in his 1989 text, *The Open Work*.

Next, in section 3, I describe the relationship between technology and the body in performance as it connects to *Field Cuts: Encounter 6*, starting in 3.1 with recent frustrations about ideas of technology as an inherently positive extension of the body. The limitations of digital systems when constructing live performances with human performers is explored in 3.2, followed by concepts of technological prosthesis and symbiosis (3.3), and ideas of shared physicality and split agency (3.4)—both between performers and between technology and performers—connecting back to the concepts first examined in 2.1 and 2.3. One of the primary technological features of *Field Cuts: Encounter 6* is the use of electrical stimulation to interrupt and provide felt feedback to the performers. In section 3.5, a brief discussion of the method of creating the electrical stimulation is followed by a short overview of other artists and performers working with similar technology.

Starting with my past interactive video projection works—beginning with *Accumulation* in 2014—and continuing through the previous iteration of the *Field Cuts* project, section 4 is an overview of my relevant past work. This section outlines my path and thinking, with descriptions of the successes and failures of each project. *Study: Unsustainable // Qualities* (4.1) is my first piece that focused heavily on concepts of repetition and memory (previously written about in 2.2), as well as my growing awareness of the limitations of digital systems in live performance (3.1). The *Field Cuts* project is largely a reaction to these shortcomings, and has led to my growing interest in other methods of performer-to-performer connection and communication, namely, electrical stimulation. Sections 4.2 through 4.6 provide detailed descriptions of each iteration of the *Field Cuts* series, including the development of the hardware, concept, and compositional material leading to *Encounter 6*.

The thesis performance, *Field Cuts: Encounter 6*, is written about in depth in section 6, with subsections about the hardware (6.1), the choreographic (6.2) and compositional (6.3) elements, and the creation of the sound (6.4) and video projection (6.5) systems. Finally, 6.5 details the performance process.

Finally, section 7 poses a number of questions for future investigation and offers a reflection on the performance and development of *Field Cuts: Encounter 6*.

2. Movement and Performance: Actualizing the Virtual

2.1 The Actual and the Virtual, Smeared Reality

In the 1970s, neurologist Benjamin Libet carried out a number of experiments that showed that there exists a delay (of approximately 500 milliseconds) between the “onset of brain activity and conscious awareness of the event.”¹ This period of mind-lag has several interesting qualities. First, the mind covers it up, effectively “backdating” consciousness to make the individual believe that awareness and impulse occurred simultaneously.² Additionally, it is possible to alter or intercept the original impulse by applying a different stimulus during the 500 millisecond gap, meaning that one stimulus can change the effects or outcome of another before either have entered into conscious awareness. This results in what Brian Massumi refers to as a “thirdness,”³ which he describes as “a supplemental effect not reducible to the two stimuli’s respective durations considered separately. [...] To put it bluntly, you get a relational time-smudge.”⁴ Out of this time-smudge comes an experience of reality that is, in fact, an infinite web of feedback between moments and moments in between. As Massumi writes, “... only a very few of the teeming swan actually make it to awareness. [...] In other words, the bulk of discrete perceptions and cognitions remain virtual.”⁵

The virtual in this context is the opposite of the actual, it “is that which has potential rather than actual existence,”⁶ “a kind of problematic complex, the knot of tendencies of forces that accompanies a situation, event, object, or entity, and which invokes a process of resolution: actualization.”⁷ The virtual is different from the possible, which can be brought forth now and exists in “a state of limbo,”⁸ awaiting realization. The virtual is a more latent, hidden potential, which coexists with reality as it

¹ Brian Massumi, *Parables for the Virtual* (Durham: Duke University Press Books, 2002), 195.

² Ibid.

³ Ibid., 196.

⁴ Ibid.

⁵ Ibid.

⁶ Pierre Levy, *Becoming Virtual: Reality in the Digital Age* (New York: Plenum Trade, 1998), 23.

⁷ Ibid., 24.

⁸ Ibid.

is at the current time. “The tree is virtually present in the seed.”⁹ The seed has the potential to develop into the tree, but the exact shape and form of the tree is unknown, both to us and to the seed. Potential is “a situating of the virtual: its remaining immanent to each and every actual conjunction in a serial unfolding...”¹⁰

It is in the virtual, the potential, the possible, and the gaps between moments, and how these relate to our movement and movement with each other, that I am most interested. Brian Massumi writes, “We will have to give the gaps between things, and from one moment to the next, their virtual due. It is in those gaps that the ‘reality’ of the situation is to be found. If we gloss over them, we are missing the thinking-feeling of what really happens.”¹¹

As the web of feedback in awareness builds in complexity, each moment of experience being created out of stimuli received in the last 500 milliseconds—the “time-smudge” mentioned above—we are left unable to reduce any experience to a specific event of stimulus. “A body does not coincide with the discretely cognizable point of its here and now (remember the Libet lag). It coincides with the twisted continuity of its variations, registered in an endless Doppler loop.”¹² One way to think about the body, then, is as a topology, a continuous transformation¹³ out of which an infinite number of snapshots or positions or arrangements could emerge,¹⁴ but which itself cannot be reduced down to each moment, “cannot be separated from its duration.”¹⁵ As a continuous transformation, what matters about the body and movement is not what position it is in, not “the displacement itself,”¹⁶ but rather, “movement is the qualitative multiplicity that folds, bends, extends the body-becoming toward a potential future that

⁹ Ibid., 23.

¹⁰ Massumi, *Parables for the Virtual*, 141.

¹¹ Brian Massumi, “The Thinking-Feeling of What Happens: A Semblance of a Conversation,” *Inflexions* 1.1 (2008): 26.

¹² Massumi, *Parables for the Virtual*, 200-201.

¹³ Ibid., 134.

¹⁴ Ibid., 184.

¹⁵ Ibid., 185.

¹⁶ Erin Manning, *Relationescapes: Movement, Art, Philosophy* (Cambridge: The MIT Press, 2012), 17.

will always remain not-yet.”¹⁷ “To choreograph is to hold incipency to measure.”¹⁸ Any physical position of an individual is the result of movement, a snapshot of the continuous topological transformation of the body.¹⁹

Incipient actions are possible actions,²⁰ actions which have not yet been actualized, but are available to an individual in a given moment. Erin Manning uses the term “preacceleration”²¹ when talking about moving through these possibilities, defining it as “a movement of the not-yet that composes the more-than-one that is my body.”²² Preaccelerated movement has no beginning and no end, but emerges from the reality smear.²³ Bodies in movement can play with this space (this gap), be aware of it, and feel it. These openings are openings of possibilities, out of which only a single actualized reality will be created, but which can be stretched, pulled, teased, and returned to. “Dance is the art of equilibrium giving way to disequilibrium. It is in the hiatus of equilibrium that time and space intervene, that the dance dances through the dancer.”²⁴

The “dancer danced,” the body being propelled or moved, is an interpretation of the awareness of this smudging of perception and reality discussed above: while one still has control over his or her body and choices, we are constantly unfolding in a way that carries us to new places, offers new possibilities for action—“the momentum of any dance move is a created force that in turn animates the body in movement.”²⁵

Brian Massumi offers a compelling analogy, borrowing language from the American philosopher William James, which connects well when thinking about bodies in movement and, specifically, dance. He writes:

A thing felt is fringed by an expanding thought-pool of potential that shades off in all directions. It’s like a drop in the pool of life making ripples that expand infinitely around. William James spoke in those

¹⁷ Ibid.

¹⁸ Ibid.

¹⁹ Massumi, *Parables for the Virtual*, 180.

²⁰ Ibid., 91.

²¹ Manning, *Relationescapes: Movement, Art, Philosophy*, 15.

²² Ibid.

²³ Ibid.

²⁴ Susan Kozel, *Closer: Performance, Technologies, Phenomenology* (Cambridge: The MIT Press, 2008), 39.

²⁵ Ibid., 38.

terms. He said experience comes in ‘drops.’ [...] When in the course of everyday life we march habitually and half-consciously from one drop of life to the next, we don’t attend to the ripples. We see *through* the semblance to the next, not letting it appear with all its force.²⁶

In these ripples of our experience and between bodies, we can affect at a distance, in these gaps of perception and awareness.²⁷

2.2 Repetition/Memory

For Erika Fischer-Lichte, repetition is a “reenactment” or “reexperiencing,” resulting in putting forth meaning which has already been practiced or established.²⁸ In the context of this paper and thinking about movement and dance, however, repetition could better be described as a reexamination of the possible and potential which has not yet been brought forth or actualized.²⁹ While the physical reality may be similar, repetition is not merely a repetition of movement, or a repeated performance, but a repetition should be thought of as a repetition of the “virtual potential that is translated into an actual movement.”³⁰ Therefore, the important physical qualities of a repetition should be the differences between iterations, the differences in what is actualized by revisiting a virtual potential,³¹ the “potential of what is not-yet.”³² While, in a given moment, only one potential can be actualized, the other potentials continue to exist, “preserving the future in the present,”³³ what Manning calls the “future anterior: the will-not-yet-have-happened.”³⁴

When we experience a repetition, either through action or observation, we automatically compare it to previous similar experiences, also experiencing the repetition as it is and as a variation on all of the other repetitions previously experienced.

²⁶ Massumi, “The Thinking-Feeling of What Happens,” 11.

²⁷ Joy, Jenn. *The Choreographic* (Cambridge: The MIT Press, 2014), 1.

²⁸ Erika Fischer-Lichte, *The Transformative Power of Performance: A New Aesthetics* (New York: Routledge, 2008), 28.

²⁹ Manning, *Relationescapes: Movement, Art, Philosophy*, 26.

³⁰ *Ibid.*, 25.

³¹ *Ibid.*

³² *Ibid.*, 26.

³³ *Ibid.*, 24.

³⁴ *Ibid.*

For Massumi, this “likeness” presents the event, occurrence, or object “as a variation on itself. You perceive what it’s like because in your life there have been other appearances ‘like’ this one, and you implicitly anticipate more will come. The likeness is the invisible sign of a continuing.”³⁵

Writing from a phenomenological perspective, Susan Kozel identifies the “pre-reflective” as an experiential state where “we can loosen our rationalist structures of meaning sufficiently to permit qualities that are associated with the pre-rational, such as ambiguity of meaning, fluidity of existential and conceptual structures, scope for entirely new thought, perceptions, including contradictions, reversals of meaning, or paradoxes.”³⁶ However, for Massumi, the phenomenological “pre-reflective” is a “closed loop”³⁷ which relies heavily on repetition and past experiences in order to bring forth new ones. Similar to the pre-reflective, although coming from the perspective of synaesthetic experience, Massumi describes “biograms” as “lived diagrams based on already lived experience, revived to orient further experience.”³⁸ Biograms as lived by synaesthetes are literally mappings of past experience which are built out of sensory input, without the guidance of the individual. They exist in the mind, but can appear to be “occupying the otherwise empty and dimensionless plane between the eyes and objects in the world.”³⁹ While both can be thought of as similarly useful in understanding reality, the key difference between the phenomenological “pre-reflective” and Massumi’s “biograms” lies in differences in agency: while the “pre-reflective” is coming out of our consciousness, or potentially our semiconsciousness, the “biogram” seems to exist as an extra-sensory system which abides by its own rules, only opening itself to observation by the synaesthete who is experiencing it.

³⁵ Massumi, “The Thinking-Feeling of What Happens,” 10.

³⁶ Kozel, *Closer: Performance, Technologies, Phenomenology*, 19.

³⁷ Massumi, *Parables for the Virtual*, 191.

³⁸ *Ibid.*, 187.

³⁹ *Ibid.*

2.3 Improvisation and Communication

We are not monads, coexisting as unconnected entities, but rather, we “live in worlds of shared and overlapping experience.”⁴⁰ The transmission of information and meaning between bodies happens on a conscious and unconscious level, with perceptions and stimuli contributing to our awareness of what is possible at any given moment. Kozel offers a compelling analogy between our connections to each other and connective tissue, writing,

...connective tissue is an embodied way of understanding not only the pre-reflective within us but also the means of communication within one body and between bodies. Those patterns of tension communicate physicality and affect, pain and peace, distortion and degeneration. They hold memory over time. Unpredictable, reshapeable, multilayer, affecting brain and body functioning, connective tissue is a fundamentally dynamic material and network.⁴¹

Key to this understanding of interpersonal relation is the fact that these connections are virtual, not causal or prescriptive; there are gaps in relations which allow for multiple possible interactions.⁴² This sort of virtual relation, open to possibility and interpretation, is an example of “transduction,” as defined by the philosopher Gilbert Simondon and elaborated upon by Massumi.⁴³ Bodies and individuals existing in this networked interaction “continuously and reciprocally influence each other’s planning states,”⁴⁴ moving the relation between them.⁴⁵ Manning writes about this space, the experience of the gaps between moments as felt by groups of people moving together, as the “interval,” “The more we connect to this becoming-movement, the more palpable the interval becomes. We begin to feel the relation.”⁴⁶

⁴⁰ Kozel, *Closer: Performance, Technologies, Phenomenology*, 24.

⁴¹ *Ibid.*, 30.

⁴² Massumi, “The Thinking-Feeling of What Happens,” 2.

⁴³ *Ibid.*

⁴⁴ Tomie Hahn and J. Scott Jordan, “Anticipation and Embodied Knowledge: Observations of Enculturating Bodies,” *Journal of Cognitive Education and Psychology* 13 (2014): 273.

⁴⁵ Manning, *Relationescapes: Movement, Art, Philosophy*, 30.

⁴⁶ *Ibid.*

2.3.1 Entrainment

Entrainment is closely related to this interconnectedness that occurs between individuals who are moving with each other, becoming “contingently coupled, prospectively, at the levels of action, perception, and thought, simultaneously.”⁴⁷ This same sensation is described by Manning as a curve, “A curve within a curve within a curve. As we move together, this curving can be felt. But only when we move the relation.”⁴⁸ For Manning, the curve isn’t the result of some movement, but the heart of the movement itself. It is the transmission of information between individuals on an unspoken level, it enters our perception in the feedback loop that exists in our consciousness (the 500 millisecond gap discussed in 2.1), and has the ability to alter our awareness of what is possible at any given moment. The curve is the location of meaning in movement, “a contraction into elasticity that moves the relation. The body-elastic is pure plastic rhythm, the body of the between where the movement is on the verge, quasi-actual, almost virtual, hanging, pulsing, spiraling.”⁴⁹ As two or more individuals open up the space between them, allowing themselves to both guide and follow each other, it is the interval between them that widens. Any movement is the result or the side effect of this connection, but it is the interval itself that is the site of meaning and intensity in movement. “To remain in the elasticity for as long as possible is the goal—but remaining on the edge of virtuality is a challenging task. Sometimes we linger.”⁵⁰

2.3.2 Open Work

“Open work,” in the context of this thesis, describes a compositional or performance system wherein some portion of the structural elements of the work are left up to the performer to decide at the time of performance, as he or she is in the act of performing. Umberto Eco, in the opening chapter of his 1989 book, *The Open Work*, writes, “they offer themselves not as finite works which prescribe specific repetition along given structural coordinates but as ‘open’ works, which are brought to their conclusion by the

⁴⁷ Hahn and Jordan, “Anticipation and Embodied Knowledge: Observations of Enculturating Bodies,” 279.

⁴⁸ Manning, *Relationescapes: Movement, Art, Philosophy*, 32.

⁴⁹ *Ibid.*, 35.

⁵⁰ *Ibid.*, 37.

performer at the same time as he experiences them on an aesthetic plane.”⁵¹ Further, open works promote the ability of the performer to actively negotiate the overarching structure of the piece – the aspects of the work that are created prior to the performance by the “composer”—through conscious or unconscious decisions⁵²—“with the aim of enabling non-linearity, increasing performer interpretation and presenting elements of surprise.”⁵³ Individual occurrences in performance are no longer necessarily premeditated or clearly the result of a prescribed cause-and-effect relationship, but rather, the performers have at their disposal any number of possibilities at a given moment, and a complex network of interactions can surface between performers and their surroundings – other performers, audience members, chance happenings, etc.

While performance of this type leaves much to the decision and interpretation of the performers, they are entered into with some degree of understanding as to the nature of appropriate actions that can be taken throughout. This permits for a great deal of spontaneity, while ensuring that the overall work benefits from a cohesion that is the result of each performer’s language, background, and training – the potential actions that each performer can imagine at any moment as possible. Eco describes this as a “mutability which is always deployed within the specific limits of a given taste, or of predetermined formal tendencies.”⁵⁴

Building off of Massumi’s writing about the actual and the virtual, there are at any given moment a number of possibilities imagined by each performer which are not actualized. “But even these will have left their trace. In that moment of interruptive commotion, there’s a productive indecision. There’s a constructive suspense. Potentials resonate and interfere, and this modulates what actually eventuates. Even what doesn’t happen has a modulatory effect.”⁵⁵ The open nature of such work means that each

⁵¹ Umberto Eco, *The Open Work* (Cambridge: Harvard University Press, 1989), 2-3.

⁵² *Ibid.*, 4.

⁵³ Thor Magnusson, “Algorithms as Scores: Coding Live Music,” *Leonardo Music Journal*, 21 (2011): 21.

⁵⁴ Eco, *The Open Work*, 19-20.

⁵⁵ Brian Massumi and Joel McKim, “Of Microperception and Micropolitics: An Interview with Brian Massumi, 15 August 2008,” *Inflexions*, 3 (2009): 5.

performance will be unique in its unfolding, never fully exhausting the composition, but rather, only offering one explanation of it.⁵⁶

⁵⁶ Eco, *The Open Work*, 15.

3. Technology and the Body

3.1 Extension of the Body

Since the mid 1990s, when computer technology started to become powerful enough to enable real-time graphics rendering, computer graphics environments have become more and more common in mixed-media performance.⁵⁷ Theater and dance performances which incorporate some type of interactive video environment⁵⁸ have become relatively commonplace, from early experimentations by groups like Troika Ranch, Chunky Move, and others to more recent ventures into the medium by artists such as Adrien M / Claire B, rAndom International, Rudalfo Quintas and Tiago Dionísio, and many others. There seems to be a common attitude towards these setups and works that the technology is an extension of the body, the multimedia responding and reacting to physical movement through space via mapping of information about the movement to variables in the software. This assumption that technology extends the body and that this is an inherently positive thing has left me, and many others, with a number of questions about the performers' relation to the audio/video system. Johannes Birringer comments that as these multimedia environments become more pervasive and complex, "the remediations of bodies in the terrain of digital information grow more complex, for the body is no longer its own site of performance."⁵⁹ While the interplay between physical bodies in space, the tools and mechanisms that capture or sample data about performer's movements, and the way this data is manipulated to control media could be seen, in its own light, as choreography—data choreography⁶⁰—questions about who is actually in control in these situations are raised. Birringer writes:

The questions extend to: who is interacting with whom? With what?
Performers with other performers using the interface or performers with

⁵⁷ Chris Salter, *Entangled: Technology and the Transformation of Performance* (Cambridge: The MIT Press, 2010), 173.

⁵⁸ Johannes Birringer, *Performance, Technology and Science* (New York: PAJ Publications, 2008), 121.

⁵⁹ *Ibid.*, 103.

⁶⁰ Kozel, *Closer: Performance, Technologies, Phenomenology*, 274.

the interface or performers with performers within an interface which organizes its total output via the actions of the performers?⁶¹

Chris Salter wonders if the performer has been “dematerialized by the electronic fog of the increasingly realistic digital image,” if the multimedia has “sufficiently overwhelmed the human body so that the screen itself now becomes the new site and body of performance?”⁶² Even more to the point, when totally immersed in projected imagery and sound, how does the interactive system affect the experience of the performer?⁶³ These are all important questions to be asking, with seemingly few artists addressing them directly or working to find new answers.

3.2 Limitations of the Digital

A number of strategies have been attempted in order to connect the living, breathing performer to interactive media, through wearable sensors which gather information about orientation, heart rate, etc., through the use of cameras that monitor the performance area, allowing for the extraction of positional data through the use of computer vision software, and a number of other sensing technologies. In order to bridge the gap between input and output data, mapping has been the most common strategy, it seems, although not without controversy. Mapping is most simply the connection of input variables to output variables, permitting real-time response and interaction.⁶⁴ Mapping strategies excel when one thinks of the interactive system as an instrument (musical instrument) to be played or performed: movement or manipulation produces instantaneous response. What does it mean for the dancer to be treated as a musical performer? Is controlling a system in this direct way the same as performing in an environment that reacts naturally and freely? At times producing responses that are unpredictable and surprising? Troika Ranch founder Mark Coniglio “suggest(s) that live performance work must ‘delve beyond direct mapping and the metaphor of a musical instrument; to building systems that could better sense qualities of movement; to

⁶¹ Birringer, *Performance, Technology and Science*, 35.

⁶² Salter, *Entangled: Technology and the Transformation of Performance*, 164.

⁶³ Andrew Johnston, “Conversational Interaction in Interactive Dance Works,” *Leonardo*, 48 (2015): 296.

⁶⁴ Salter, *Entangled: Technology and the Transformation of Performance*, 208.

represent something of the ‘gestalt’ of movement.”⁶⁵ All too often, the performance becomes less about the bodies in movement and more about the performer’s ability to move in a predefined way that will interact with the computer system in a way it recognizes to allow it to extract data that can be used for the purposes it has been programmed for. “The experience of the dance performance is directly related to the limits of the system. The body movement is reduced to bits. [...] Attention is distracted from the subtleties of pure plastic rhythm. What stands out is actualized displacement in the service of the software.”⁶⁶ Additionally, most mapping strategies themselves are never exposed to the audience or observer, only a “manifestation of mapping [...] enters the field of perception.”⁶⁷ There remain questions as to the ability of the audience to accurately understand the nature of the interaction and behavior between performer and system.⁶⁸

Finally, the cost-prohibitive nature of producing performances with elaborate technical requirements—possibly requiring one or more high-powered projectors, lighting, sound system, computers, cameras, sensors, etc.—as well as the time consuming nature of integrating all of these components and developing the software necessary results in a disproportionate amount of time spent on technical needs compared to other artistic considerations.⁶⁹

One of the most simply identifiable qualities of moving bodies is their physical presence. While the site of movement may be in the spaces between experiences and moments, bodies cannot be separated from their physicality. When working with digital technologies, one of the qualities so obvious that it seems to go largely unaddressed is the general lack of any physicality: video environments produce visible boundaries, but not boundaries that push back, that create obstacles; audio environments could potentially create experienced barriers, but again, these are not the same as touch. When two people move together, they can reach out and touch, they can lift each other, they can push, pull, throw each other. Atau Tanaka comments that the “situation is

⁶⁵ Manning, *Relationescapes: Movement, Art, Philosophy*, 61.

⁶⁶ *Ibid.*, 63.

⁶⁷ Birringer, *Performance, Technology and Science*, 146.

⁶⁸ *Ibid.*

⁶⁹ *Ibid.*

symptomatic of virtual reality systems where the lack of resistance in the virtual space can be more disorienting than the accuracy of the display system.”⁷⁰ Andrew Johnston comments that contact improvisation⁷¹ can be a “compelling metaphor for interactive system designers. While the physicality of current systems is very limited, mainly due to the lack of haptic communication from the computer to the performer, it is a tantalizing concept to work towards.”⁷²

At the heart of the problem with the construction and implementation of these kinds of large-scale interactive audio/video environments is the difficulty in extracting meaningful data about movement or dance to be used to control or drive the media. Connecting to my previous discussion, if “the displacement itself—the movement from a to b—is not what is essential about movement,”⁷³ then it would seem that we should be striving to find ways to extract information not about physical movement, but about the site of meaning in movement, the gaps between—the interval and the curve, as per Manning—the intent and communication between bodies. Unfortunately, digital technology is not able to reach into the virtual.⁷⁴ Any misunderstanding which equates “the digital with the virtual confuses the really apparitional with the artificial. It reduces it to a simulation. This forgets intensity, brackets potential, and in that same sweeping gesture bypasses the move through sensation, the actual envelopment of the virtual.”⁷⁵ If these digital systems are only regarding physical displacement as control data, their creators fail to appreciate that the logic of movement “does not only move forward in a

⁷⁰ Atau Tanaka, “Intention, Effort, and Restraint: The EMG in Musical Performance,” *Leonardo*, 48 (2015): 299.

⁷¹ Contact improvisation is a common practice amongst dancers for exploring movement. Contact improvisation was first developed by Steve Paxton in the early 1970s. Generally, it involves two or more individuals who move together while keeping at least one point of physical contact between them. Commonly, neither performer assumes the role of leader or follower, but instead a shared responsibility exists during these explorations of group movement.

⁷² Johnston, “Conversational Interaction in Interactive Dance Works,” 297.

⁷³ Manning, *Relationescapes: Movement, Art, Philosophy*, 17.

⁷⁴ *Ibid.*, 72.

⁷⁵ Massumi, *Parables for the Virtual*, 137-138.

single direction [...] The logic of movement need not be linear or unidirectional; nor does it need to be expressed numerically.”⁷⁶

In order to address the limitations of digital systems, Manning suggests that we stop trying to conform movement and bodies to the technical systems we have at our disposal, and instead reexamine the nature of the movement itself.⁷⁷ how do we as performers extract meaning from performance? How do we as observers extract meaning from performance? What are the qualities, whether seen, heard, or felt that stretch our perception and offer new insight? Where is the preacceleration?⁷⁸ How might we make use of technology to create new transformational experiences on the parts of the performers and the observers? “Transformation entails a shift in affective tone such that the participating spectator feels the performance, responding to it through an emphasis as much on its duration—its capacity to create experiential space-times—as through its content—its micromovements in the making.”⁷⁹ There must be aspects of performance that offer a multitude of potentials and possibilities: just as two bodies in motion are navigating a complex virtual web of potential at every moment, negotiating and reacting to every movement and non-movement, so should technologies offer similar experiences. “For technogenesis to occur, what must be sought is a way to foreground the effects of unknowability that are virtually present in all movement. The incipency of movement’s emergence must be tapped.”⁸⁰ Any connection to the virtual cannot be reached through digital technologies, “it is not contained in the code,”⁸¹ but must be accessed through analog processes. “The analog impulse from one medium to another is [...] a transduction”⁸² as per Simondon, discussed above.

⁷⁶ Nicolás Salazar Sutil, *Motion and Representation: The Language of Human Movement* (Cambridge: The MIT Press, 2015), 102.

⁷⁷ Manning, *Relationescapes: Movement, Art, Philosophy*, 62.

⁷⁸ *Ibid.*

⁷⁹ *Ibid.*, 64.

⁸⁰ *Ibid.*, 65.

⁸¹ Massumi, *Parables for the Virtual*, 142.

⁸² *Ibid.*, 135.

3.3 Prosthesis and Symbiosis

Prostheses are generally considered to be utilitarian, operating to fill some need or requirement, usually as a substitute for some other failed or lacking tool or capability. Prosthetic limbs replace lost or damaged limbs. Glasses aid vision. Dental prosthetics replace lost teeth. Most applications of technology in movement and performance could be regarded as prosthetic to the performers, especially when looking at technologies making use of one-to-one mapping techniques as discussed above. These prosthetics don't necessarily fill some previously present ability to perform a task, but they do operate in a similar manner to tools in general. They operate under the direction of the user, at the user's wishes, "the prosthesis is the sensible concept of a preset system of possibility."⁸³ When used in performance settings, prostheses generally require that the human body be treated as a fixed thing, a "stable body,"⁸⁴ "something already defined."⁸⁵ Under these conditions, Manning writes that "new ecologies of experience are rarely created,"⁸⁶ instead extending or recreating other previously experienced or defined tasks or events.

On the way towards symbiosis, there is a middle ground, which could be called "mutual prosthesis,"⁸⁷ which implies a certain level of reciprocity between human and technology, although, in my understanding without the formation of a new composite entity.

Symbiosis assumes a shared experience; both the body and the technology contribute something new and offer their identity in the creation of a new entity. "With the inauguration of these new absolutes, the chimera ceases to be chimerical; it surrenders its uncanny place between the human and technology and instead becomes a new supersensible."⁸⁸ For the Australian performance artist, Stelarc, "What is important is the body as an object, not a subject—not being a particular someone but rather

⁸³ Ibid., 126.

⁸⁴ Manning, *Relationescapes: Movement, Art, Philosophy*, 64.

⁸⁵ Massumi, *Parables for the Virtual*, 116.

⁸⁶ Manning, *Relationescapes: Movement, Art, Philosophy*, 64.

⁸⁷ Massumi, *Parables for the Virtual*, 116.

⁸⁸ Howard Caygill, "Stelarc and the Chimera: Kant's Critique of Prosthetic Judgment," *Art Journal*, 56 (1997): 5.

becoming something else.”⁸⁹ In much of his work involving the use of digital technology, Stelarc “speculates on the potential for the complete technological reorganization of the human body, a development that entails the redefinition of the limits of human physiology,” treating the body as “an object for redesign.”⁹⁰ Anthropologist Jane Goodall writes about Stelarc’s work and his striving towards developing a new sense of prosthesis and symbiosis with technology, beginning with his incorporations of complex feedback loops between human and machine in which our ability to discern who (or what) is in control is increasingly difficult,⁹¹ where “action is indistinguishable from manipulation.”⁹²

In symbiotic arrangements, the dichotomy of subject versus object ceases to exist, instead collapsing inward to create a new entity or being that is the result of all individuals, devices, objects involved.⁹³ And while Stelarc did say that “technology pacifies the body,”⁹⁴ symbiosis is not about the control or domination of one over the other, but a shared agency or even the emergence of a new combined agency and autonomy.

3.4 Shared Agency and Split Physicality

In a symbiotic system, there is no single leader nor single follower, no master and no slave. The human is “subsumed. [...] There is no center or periphery, only nodes. The human is fractalized.”⁹⁵ Much like bodies moving together in space, sharing a coupled sense of possibility and potential, in a symbiotic system, “intelligence and agency are extruded into the system itself.”⁹⁶ These sorts of technical systems or ideas of our relationship to technology challenge our sense of bodily self. The self is no longer

⁸⁹ Massumi, *Parables for the Virtual*, 99.

⁹⁰ Caygill, “Stelarc and the Chimera: Kant’s Critique of Prosthetic Judgment,” 3.

⁹¹ Jane Goodall, “The Will to Evolve,” in *Stelarc: The Monograph*, ed. Marquard Smith (Cambridge: The MIT Press, 2005), 10-11.

⁹² *Ibid.*, 13.

⁹³ Fischer-Lichte, *The Transformative Power of Performance: A New Aesthetics*, 25.

⁹⁴ Stelarc, “Prosthetics, Robotics and Remote Existence: Postevolutionary Strategies,” 3.

⁹⁵ Massumi, *Parables for the Virtual*, 131.

⁹⁶ Goodall, “The Will to Evolve,” 13.

contained in the body, the entity of the self and the other come closer, eventually merging. Massumi, referencing Simondon's use of the term dephasing, writes,

In dephasing, the body, along with its objects, dissolves into a field of mutual transformation where what in extension are separate phases enter into direct contact. That field is defined less by the already established structure of the objects and organs involved than by the intervals that normally separate them, making them structurally distinct. [...] What the overall transformation is toward, aside from the question of what particular inventions, needs, and utilities might eventually follow from it, is the integration of the human body and will into an expanding *network* to such an extent that the very definition of the body (and the human) might change.⁹⁷

3.5 Electric Augmentation

Towards explorations of prosthesis, symbiosis, shared agency, and split physicality, a number of artists in recent years have experimented with applying electrical stimulation to muscles and nerves as a way of giving up or sharing bodily autonomy with other individuals and machines. Most commonly used in these performances are TENS (transcutaneous electrical nerve stimulation) units, based on a method first developed by Guillaume Benjamin Armand Duchenne de Boulogne in the late 1800s.⁹⁸ TENS units were developed in response to the difficulty in working with “electropuncture,” where needles are placed into the skin and electrical current is applied. When used correctly, TENS devices operate through the placement of electrodes onto the skin; voltage can then be calibrated and electrical current can be sent through the muscle or muscle groups. Today, these devices are commonly used in therapeutic settings for effective pain relief. In performance art, these devices are used by a number of artists, including Stelarc, Arthur Elsenaar, Georg Hobmeier, Peter Coppin, and Daito Manabe, frequently as examinations of the relation of the body and individual to systems of control, shared agency, and with technology.

⁹⁷ Massumi, *Parables for the Virtual*, 120.

⁹⁸ Arthur Elsenaar and Remko Scha, “Electric Body Manipulation as Performance Art: A Historical Perspective,” *Leonardo Music Journal*, 12 (2002): 23.

In the next section, I will discuss my past work, which includes the creation of interactive video projection for a number of dance performances, as well as the beginning of the *Field Cuts* series.

4. Past Work

Of some significance, insofar as it has provided the impetus for my current line of questions and thinking related to my work and technology in performance generally, are a number of my earlier works in interactive video for dance performance.

Beginning with *Accumulation*, a solo dance performance created and performed in collaboration with Anna Kroll at Bennington College in spring of 2014, my work focused primarily on the design and programming of large-scale interactive video projections as environments for dance performance. *Accumulation* was approximately ten minutes in length, with Kroll as the solo performer, and included several different projected “scenes” or “environments” through which the body could move and interact.

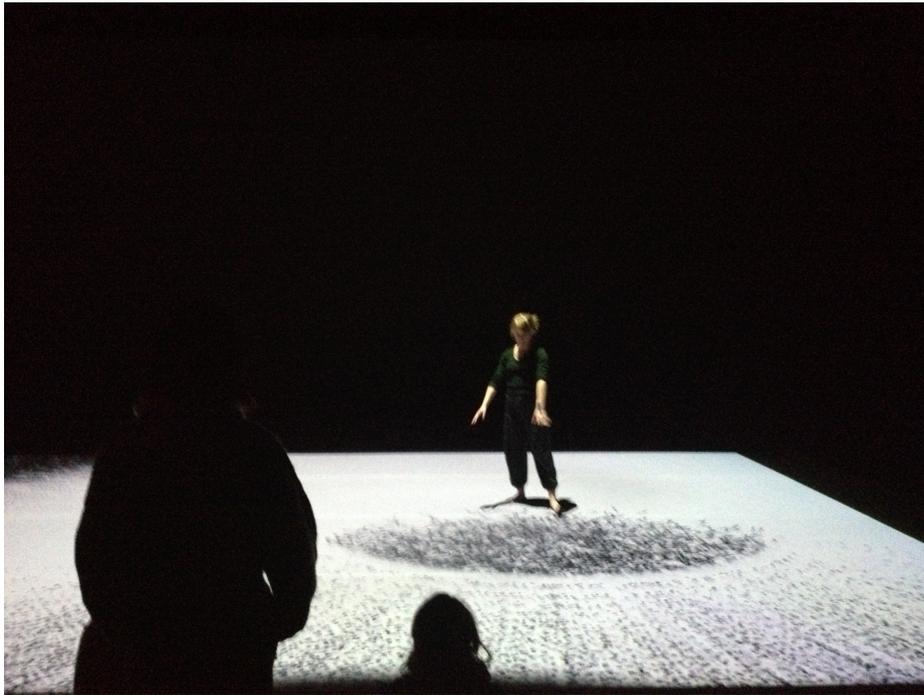


Figure 4.1: *Accumulation* (Bennington College, 2014)

While the performances of this work were generally satisfying in process and outcome, it was my first experience with the amount of time and energy required in order to successfully produce work of this kind and scale. Many hours were devoted to initial testing and setup of the hardware, followed by many more hours devoted to the

creation of the software necessary to generate the desired visual environments. At the end of the development process, I was left feeling that a disproportionately small amount of time was spent addressing the performance itself, regarding the structure of the work as a whole and the performer's relationship to the video projection. This left me wanting for more, and at this point, I believed that by continuing to create similar works, I would develop a more efficient workflow, which would, in turn, allow me to address what



Figure 4.2: *They Fell* (ICA/Boston, 2015)

I felt were the shortcomings of *Accumulation* and my role in its creation.

They Fell is a similar interactive video/dance performance which was created in collaboration with the Boston-based company, Urbanity Dance, choreographer and company director Betsi Graves, and musician and composer Ryan Edwards. This roughly 27-minute piece included seven dancers⁹⁹ and a cyclical movement format, developing and altering each repetition as performers exited the piece at the end of each movement. This piece used a setup similar to my previous work on *Accumulation*, although here all software was programmed in openFrameworks, a C++ creative coding package.

⁹⁹ Brian Washburn, Jacob Regan, Meghan Anderson, Haley Day, Jamie Lovell, Jorge Delgado, and Melanie Diarbekirian

While this piece was a great success, culminating in two sold out performances at ICA/Boston in February of 2015, I began to feel frustrated with my role in this kind of work. Specifically, I felt stuck on the sidelines controlling a piece of software with the goal of recreating the same performance every time, with little room for improvisation and communication – a passive role. This frustration, coupled with the difficulty of collecting, installing, and calibrating the necessary hardware for the piece (camera, projector, mirror, lighting, extensive cabling, etc.), led me to further question the efficiency and value of the work and of my position in relation to it.

During the development of *They Fell*, I was actively involved in conversations with the choreographer and composer about the direction of the piece, defining the structural and conceptual components of the narrative and composition, but still felt that my energy was focused disproportionately getting the computer system and software to work. While during the creation of *Accumulation* I may have felt that my frustration was partially due to my newness to working on a project creating interactive video or the arrangement with my collaborator, here I felt that I was, again, being distracted from the creation of the work while dealing with numerous programming issues, bugs, hardware difficulties, etc.

At this point, I began looking for new avenues of creating work, not necessarily so focused on the development of new programs for video for each performance, as a way to redirect my focus back onto concepts and ideas I value in performance, and trying to redirect my energy and resituate myself in my own process of creating.

4.1 Study: Unsustainable // Qualities

During the spring of 2015, I made the active decision to take a step back from programming and designing interactive systems in order to reexamine bodies in movement and performance itself, searching for the source of value and meaning in performance, and looking for new ways to create open compositional structures which would encourage improvisation and communication amongst all performers, not just the dancers, but also others: sound designers, musicians, media artists, programmers, etc.

This search led me to create *Study: Unsustainable // Qualities*, a study of repetitive movement, flow, memory, and fatigue in performance over long durations, and counterpoint between distantly connected (or unconnected) performers.

For this piece, I worked with four professional dancers from the Boston, MA area, all members of Urbanity Dance, with whom I have collaborated previously on *They Fell*: Meghan Anderson, Jacob Regan, Alex Davis, and Betsi Graves. Each dancer was asked to create a short movement sequence that they would be comfortable performing repeatedly for one hour. No instructions or directives were given as to the content of the movement beyond this. Anderson, Regan, and Davis each created sequences that were approximately 15-20 seconds in length which could be considered quite dancerly, although each with very different content. Graves's sequence was approximately 90 seconds in length and, compared to the others, was very minimal, involving long periods of relatively little movement—either sitting or standing. Each performer was filmed by themselves, performing their movement sequence on a loop for the period of one hour. They were not aware of how much time had elapsed during their performances, only being told to stop after the hour had been completed. Each performer's movement changed, to a greater or lesser degree, as they became fatigued, their memory of the movement changed and evolved, and as they slipped into and out of periods of flow.

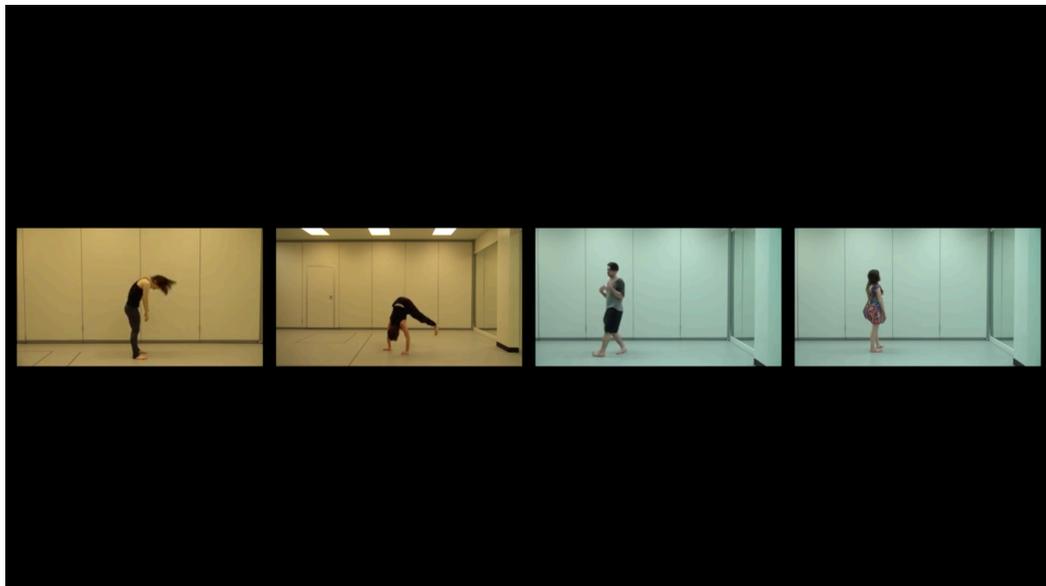


Figure 4.3: Still from *Study: Unsustainable // Qualities*

Regan's and Davis's movements changed the most drastically over the hour. Regan's sequence involved a handstand, which began to shift subtly very soon after beginning, as his shoulder started to fatigue. At one point during the piece, Davis suffered from a cough and chose to modify that iteration of his sequence by sitting, facing away from the camera, for a period of nearly two minutes.

In contrast, both Anderson and Graves were able to prevent drastic alterations to their movements over the course of the hour due to the controlled nature of their sequences.

The output of this project was a four-channel video installation—the video of each dancer's performance being its own channel—which presented the performers side-by-side. The performers seem to fall into and out of synchronization and alignment with each other. The audio from each performance was mixed down into a single stereo presentation, with each being panned to correspond to the relative position of the dancer in the video piece.

This piece was presented as part of the Arts Graduate Show at RPI in spring of 2015 and subsequently in October 2015 as part of the Miami New Media Art Festival.

Coming out of this work, and looking back on it now, there are several ideas and concepts that have carried forward into more recent projects. First, the role of repetition, of performers carrying out the same movement or task many times, allowing the viewer to notice minute differences which come about as a result of the imprecision of the mode of performance (bodily movement), fatigue, and evolving sense of embodiment as each position and movement, each moment, is revisited. Secondly, the importance of counterpoint—either composed/designed or the result of chance moments of alignment—became apparent. Having studied to be a composer, with a particular interest in counterpoint, I find myself returning to and continually fascinated by these serendipitous moments in performance, where performers seem to momentarily align, either in a parallel coming-together or in moments of clear opposition. While each of the four performers in this piece created their own movements, and each performed for a camera as a solo, when viewed side-by-side there are clear moments of alignment, where the piece no longer seems to be a collection of four solos, but of duos, trios, or even a quartet.

4.2 Field Cuts: Encounter 1

Immediately following the exhibition of *Study: Unsustainable // Qualities*, I began working on a new project, called *Field Cuts*. This project focuses on the use of felt feedback, generated by transcutaneous electrical nerve stimulator (TENS) units connected to a wirelessly controllable microprocessor, to interrupt movement and thought processes of performers.

Initial development of the hard and software began in mid-May 2015. After early testing using an Arduino UNO to trigger a mechanical relay – gating the electrical signal from the TENS units—I switched to using the Particle (formerly Spark) Core. The Particle Core is a relatively inexpensive microprocessor with built in wifi capabilities, chosen here for its flexibility, low cost, and small size.



Figure 4.4: Initial prototyping and testing

Soon after building the initial prototype, I began working on developing a way to use this hardware in a performance setting. *Field Cuts* is an exploration of shared agency in movement through the usage of this equipment. The name of the project come from a lay-term for a medical condition wherein the patient suffers from loss of part of his or

her visual field, more correctly called “anopsia” or “anopia.” While the performer in this work is not suffering from loss of visual field, he or she does experience the loss of full bodily autonomy, as part of the body is activated by a source from without, whether driven by a computer algorithm or by a user behind a controller.



Figure 4.5: Regan performing *Field Cuts: Encounter 1*

Field Cuts: Encounter 1 is an improvised movement performance involving a performer who is moving in response to being triggered by another performer at a distance. All controls are direct: the interface involved four keys on a keyboard which, when held, activated one of four corresponding trigger points on the body. The mover was directed to move only in response to this stimulation, attempting to not elaborate very much, and tending to come to rest when no triggers were active.

Performances for camera were attempted in collaboration and Meghan Anderson and Jacob Regan, with each performance being roughly 27 minutes in length. I consider this piece a successful initial exploration of the use of electrical stimulation in performance. By allowing the performer to freely interpret the received impulses, we were able to focus on the physical effects of the impulses, as well as the performers’ own responses, without attempting to set limitations on movement or behavior in reaction to any received stimuli.

Entering into this project, I initially conceived of the use of this technology as a tool that could relay information, acting as a “score” of sort, providing information to the

performer that could push them to explore new patterns of movement and behavior. However, over the course of developing *Encounter 1*, the focus settled more on reaction/response to the stimuli, and the performance setting developed into one that had much stronger connotations of control and domination, something I was, and continue to be intrigued by, but not necessarily what I believe this project is overtly about.

4.3 Field Cuts: Encounter 2

Echoing the direct control relationship in *Field Cuts: Encounter 1*, *Encounter 2* focuses on a much smaller domain: the manipulation of objects. For this performance, a performer is sitting with a tray of various objects, a blank sheet of paper, a pen, and four bowls or containers. The performer selects an object off of the tray, traces its outline onto the paper, and sorts it into one of the containers. During the performance, the

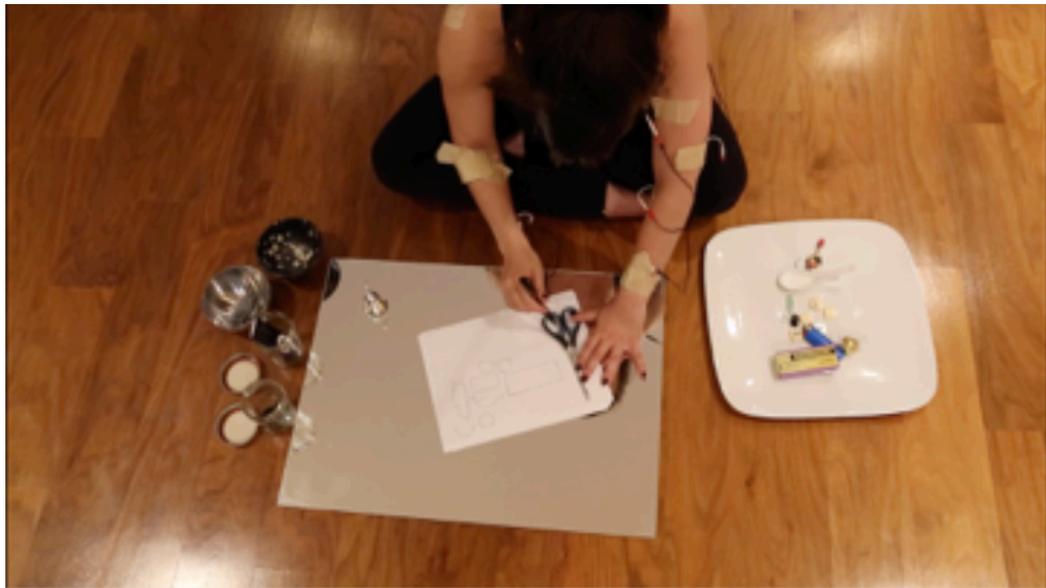


Figure 4.6: Anderson performing *Field Cuts: Encounter 2*

performer manipulating the objects is interrupted by another performer at a control device (here, a laptop).

This performance was carried out for the camera by both myself and by Anderson, alternating roles of manipulating objects and controlling. The performances were approximately 12-15 minutes in length.

While I consider this exploration valuable and ripe for further examination and development, the response of the performer—both myself and Anderson—was heavily

on the side of frustration while attempting to carry out this performance. The combination of attempting to complete a series of seemingly pointless tasks while being constantly interrupted by one's own body through electrical stimulation, while interesting in and of itself, was not, at the time, the direction I intended to carry this project.

Looking back on the footage of this iteration of *Field Cuts* now, though, it's clear that the smaller scale and manipulation of objects is an avenue that deserves a closer look and further development in the future, either as a solo or group performance.

4.4 Field Cuts: Encounter 3

In *Encounter 3*, control of electrical stimulation on the performer's body was relinquished to a computer algorithm. Initial tests were performed on myself and included ten stimulation points spread across two arms (an increase over the previous four stimulation points). For these tests, each channel was triggered by a pattern which was randomly filled according to a density value and played repeatedly. As time goes on, the density and the speed at which each pattern is read decreases. Because each channel is operating independently of every other, a variety of interesting polyrhythmic stimulations come forth.

Following these tests, this algorithmic control was further developed into a short solo performance that was performed at Mobius, a gallery in Cambridge, MA, in October 2015. This performance was programmed by myself, following a similar density pattern control system, and was performed by Meghan Anderson with eight stimulation points attached across her arms. This piece was 60 seconds in duration, beginning with a simple test sequence—triggering each point in turn, followed by several pairings—followed by patterns controlled by a programmed density function.

Anderson's movement for this piece was restricted to bodily response to electrical stimulation. The piece was performed three times as part of an evening of short solo movement performances.

As this was a return to full-movement movement and reaction/response—unlike *Encounter 2*, which required the performer to carry out a series of tasks with objects—we immediately felt more at home in this context. Because the piece was so short (60

seconds), there was not nearly as much time to explore the full potential of this autonomous system, although moving control of the stimulation from a second performer to a computer algorithm had two affects. First, it allowed the performer to disengage, in a way. Stimuli were no longer being triggered by another individual, so the soloist was not subject to any inter-performer communication or affect. Secondly, the



Figure 4.7: Anderson performing *Field Cuts: Encounter 3* (Möbius, Cambridge, MA, 2015)

precision of using a digital system allowed for more interesting rhythmic and timing control over the sent impulses, creating patterns that could be seen to be evolving in certain ways, rhythmically.

4.5 Field Cuts: Encounter 4

Building upon the algorithmic control of the body explored in *Encounter 3*, the fourth iteration of this project added sound synchronized with all triggering and shrunk the focus down to a single hand.

For this piece, my own hand is being triggered at four points in conjunction with rhythmic patterns that are simultaneously activating simple sine wave oscillators of different frequencies. This four and a half minute piece was recorded for camera in October 2015.

Unlike every other piece in this series, this iteration of *Field Cuts* is the only, thus far, that has shrunk the space of the performance down so considerably. While experimenting with various electrode placements on my body, I discovered that it was



Figure 4.8: Still from *Field Cuts: Encounter 4*

possible to activate individual fingers in a variety of ways, each requiring very precise placement of the electrodes.

This brief micro-study allowed me to further explore algorithmic control of electrical stimuli, similar to *Encounter 3*. I believe there is interesting territory to be uncovered in this direction, but *Encounter 4* was moving further away from my initial goal of finding methods to allow performers to connect and communicate between each other in new ways. As a result, this line of investigation was put on hold for the sake of returning to full-body movement and inter-performer communication.

4.6 Field Cuts: Encounter 5

Field Cuts: Encounter 5 marks a return to full bodily movement. For the first time, this work involves more than one moving body. The piece also involves an expansion of the

technical capabilities of the electrical stimulation system. Each dancer is now wearing the following equipment: a battery-powered wrist pack with an accelerometer, a battery-powered pack on the torso with an accelerometer, a four-channel relay unit, and two TENS units. The accelerometers read data about the position and movement of the performer and send it over wifi to the control computer.

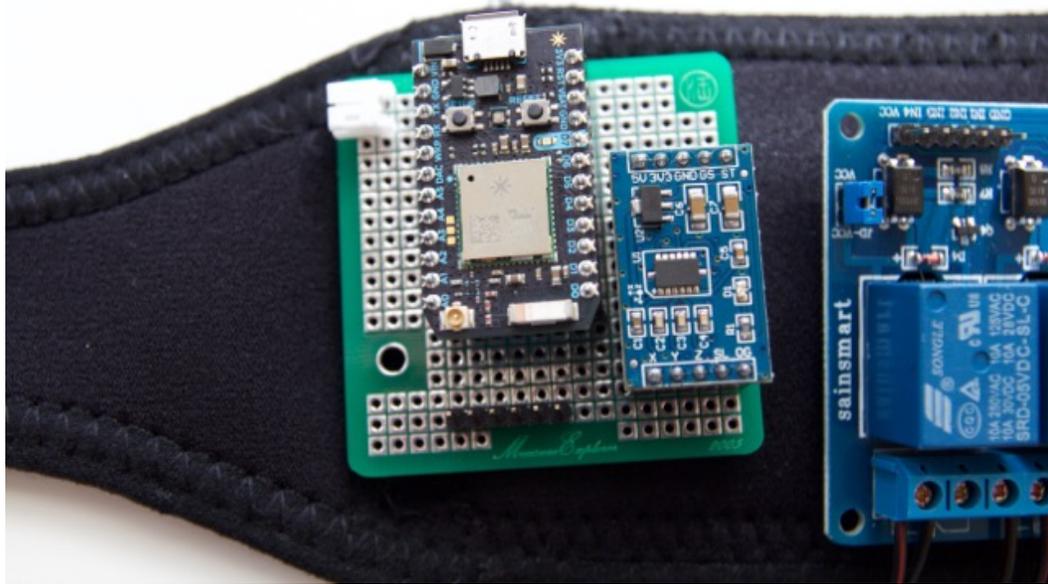


Figure 4.9: Close-up of pack worn in *Field Cuts: Encounter 5*

Through the use of this data, performers can have parameters set that allow them to remotely trigger the bodies of other performers or themselves. I was performing at a laptop, where I am creating these virtual connections between performers.

By setting simple thresholds on either absolute values received from the accelerometers or delta values (the change between each reading), each performer can be assigned a variety of ways to activate the bodies of other performers.

The piece is about how we can influence each other at a distance, relying on the technology to amplify and bring forward these interactions.

Field Cuts: Encounter 5 was performed at the Arts Graduate Show in December 2015. I collaborated again with Meghan Anderson and Jacob Regan. Both Anderson and Regan repeated a movement sequence, approximately two minutes in duration, during

the course of this 20-minute piece. Anderson created the choreographic material under my instructions to have the movement be fairly motivic in content—each performer is executing a unique sequence made up of motives that occur across both performers. As the performance carried on, the multiple sequences wander from their initial alignment, and created new moments of overlap, repetition, and echoing between the performers' movements.



Figure 4.10: Beginning of *Field Cuts: Encounter 5*

The compositional structure for the performance was open, with only a basic sketch laid out ahead of time. Anderson and Regan began by sitting on the floor until being cued to begin. Each performed their 2-minute sequence twice before any further interaction or triggering began, in order to set the stage, introduce the movement material, and give all of us (audience included) a moment to relax into the performance.

Interaction between the hardware and the performers began slowly, with stimulation lasting only for a brief moment with long periods in between each. Over the course of the piece, the period of time separating each electrical impulse decreased as the duration of each impulse increased.

The nature of the interactions between performers also changed. First, a single gesture on the part of Regan triggered both his own body and Anderson's. As time went

on, each performer was more actively influence the other, as more virtual connections between performers were created.

For *Encounter 5*, I also wore a similar hardware pack, with four electrode pairs attached to my arms. As Anderson and Regan received electrical impulses, I too received similar triggers. By monitoring the relative density of each performer’s triggering, my own triggers were activated depending on Anderson’s or Regan’s density. The “fall-off” of both of their thresholds is also delayed, resulting in my impulses being of longer duration, shutting off some period after their triggers are shut off. This thresholding is based on the number of triggers each performer has had activated in the recent past. For example, if three triggers were activated simultaneously on Regan, then I, too, had three



Figure 4.11: Regan in performance of *Field Cuts: Encounter 5*

of my electrode pairs activated. Once his three were shut off, mine would continue to be turned on for a couple seconds. During that period, if Anderson had two of her electrode pairs activated, one of my impulses would shut off, while the other two would remain active. As the conductor or controller of this performance, I must experience all that the other performers are experiencing, although I was standing at a console and not moving across the space.

Sound design for *Encounter 5* was created by Kelly Michael Fox using software written in SuperCollider to be reactive and responsive to messages sent from my computer related to the activation of the TENS units on the bodies of all performers. For

the performance, a four-channel audio system was employed, arranged linearly across the far side of the performance space. This was done in order to be able to spatialize the sound in accordance with the relative position of Anderson, Regan, and myself.

There were two basic components to the sound. First, there were short, percussive, pointillistic sounds that activated every time an impulse began or ended, corresponding to the sound of the mechanical relay units that were controlling the gating of the electrical impulse. The short sounds were panned to correspond to the relative position of each performer. Second, there were sustained, ambient sounds, which faded in in direct relation to the duration that each electrical impulse lasted. These, too, were panned to correspond to the relative position of each performer.

In addition to these two components, there was a third, less apparently controlled sound element: a delay line echoing the sustained sounds resulting from held impulses. The delay line wasn't active at the beginning of the performance, but gradually faded in over the course of 15 minutes. Each of the sustain sounds passes through a low-pass filter before being sent to the delay system, that then echoes the sound back, while altering its spatialization on the four-channel system. The attempt was to create a more complex texture that reflected the way that each performer influenced others at a distance, and reached beyond his or her own body to affect others.

Field Cuts: Encounter 5 was performed in December 2015 at RPI as part of the Arts Graduate Show. The most common critique was the need to further clarify the interactions between the performers in order to bring the audience in better. While the inclusion of interactive sound in the performance greatly enhanced the sense of the interactions, I believed that the development of lighting controls to further reflect the performers' interactions, and careful compositional programming to clarify which performer is interacting with another, this goal would be met.

Additionally brought into question was whether repeated movement on the parts of Anderson and Regan was appropriate for the piece. While a loosened structure may make some of the interperformer interactions more obvious, or allow them to explore these interactions more freely, it also creates questions of material continuity—each performer has his or her own learned performance and movement style and language. Additionally, the repeated movement cycles still maintain importance for me. It is in the

subtle alterations of each iteration that I find the most meaning and interest. Connecting to section 2.1, each moment contains a number of potential actions and movements that can be explored, although only a single path can be physically realized. If a repetition of a movement is a repetition of the sight of its potentials, then the subtle alterations that occur between iterations are other potentials being actualized.

Perhaps beginning in a similar manner—with set movements—but allowing each performer to alter his or her movement more freely in reaction to impulses, would create a situation that was both somewhat constrained to repeated movement, but also more permitting of the performer's exploration of the space and the interactions between bodies.

5. Field Cuts: Encounter 6

Field Cuts: Encounter 6 is the most recent performance in this ongoing movement project, and can be seen as a continuation or further development of *Encounter 5*. This piece attempts to explore the relationship of the actual and the virtual through interruption and distanced communication between performers, who are able to influence each other through movement, affecting and altering each other's performances.

By expanding the performers' freedom to alter and modify their movements, drawn from a collection of motives, as well as their spatial arrangement, the performers have at their disposal a number of possible actions that can be taken in response to received impulses. A changing environment of interactions and influence potentials between performers, where virtual connections linking individuals at a distance are created and deleted, allows each individual to navigate the structure of the piece in a variety of ways, while often receiving unexpected impulses. These impulses have the effect of bringing the performer's awareness to his or her body and movement, while interrupting and possibly altering the path of the performance.

Encounter 6 made further use of the choreographic motives that were created in the previous performance, while expanding the collection to include more dancerly and athletic movements. These movements, separated into two "motive banks," can be drawn upon when the performer alters his or her sequence.

Encounter 6 involves three performers—Meghan Anderson, Jacob Regan, and Haley Day—and included an expansion of both the choreographic material and the technological component beyond previous iterations. Specifically, this was the first performance in this series to include video projection, and also marked a return to a computer-controlled system, where the software generated a score based on loosely defined rules.

With all impulses being generated based on the movements of the three performers, they were able to influence the progression of the performance, at moments becoming aware of who and how they were affecting others and who was affecting them.

This approximately 35-minute piece was performed at the Experimental Media and Performing Arts Center at RPI on March 10, 2016.¹⁰⁰

5.1 Interface Design

For this performance, the hardware used was the same setup as in *Encounter 5*, comprising of a pack which was worn on the back of each performer that contained a microprocessor, 4-channel relay, and two TENS units, as well as an accelerometer. Additionally, each performer wore a wristband that had a second accelerometer.

5.2 Choreographic Material

The choreographic content of *Encounter 6* builds upon the previous iteration. Where, in *Encounter 5*, each mover was performing a set movement series based on a number of discrete, slow moving motives, here, each mover has at his or her disposal a collection of movement motives—ranging from very pedestrian to more dancierly—from which to draw on throughout the performance.

At the onset of the piece, each of the three movers is performing the same choreography, made up of a short, repeated sequence which includes simple acts such as standing in place, walking, one- and two-arm planks, etc. This type of short cycle, performed repeatedly, remains a fixture throughout this piece. The initial cycle consists of the following motives: stand in place for 10 seconds, walk forward, sit and slide backwards, two-arm plank, slowly stand up, walk backwards to edge, pause, walk around the perimeter and return to starting position.

Movers were instructed to respond to different stimuli in different ways: short impulses (lasting shorter than approximately three seconds) pause the movement of that performer for a brief instant, until the impulse has passed and the performer has recovered, while longer impulses affect the movement that was being performed. Any impulse lasting a minimum of 3-4 seconds is an instruction to the performer to alter a choreographic motive, or to alter his or her spatial orientation. When altering a choreographic motive, the performer has a number of possible movements to choose

¹⁰⁰ Video documentation of the performance can be found at <https://vimeo.com/159868244>. (Accessed April 13, 2016).

from, and essentially replaces the next movement in his or her current sequence with one chosen from the bank of all possible movements.

When initially developing *Encounter 6*, the selection of possible movements was confined to similarly simple, slow moving, nearly pedestrian movements. As time went on though, a second group of movement motives was created, these all being more dancerly and athletic.

During rehearsals, we experimented with a number of strategies to bring together these two groups of movement. First, an attempt was made to relate specific electrodes (stimulation points) to each movement bank. Whenever a performer received an impulse, the location on his or her body would instruct them which motive group to draw from when modifying his or her movement. While the concept seemed simple enough when conducting short tests, when the idea was included in the larger structure of the piece, it became very difficult for the performers to keep track of which location on their bodies related to which group of movements while also keeping track of their approximate place in the larger structure of the work. Second, an attempt was made to simply include instructions about which bank to draw from in the larger structure of the piece, i.e. every third alteration should come from the group B. This strategy worked better, but was too restrictive and eliminated the preferred open structure that allowed the performers a greater degree of freedom. Third, we experimented with a strategy wherein the performer would select a motive from the opposite group of movement as the performer nearest him or her. The performers made their concerns clear; while they could try to pay attention to what each other is doing, they would have difficulty knowing for sure, and difficulty keeping track of which motive grouping each movement came from.

Finally, the decision was made to simply have each performer aware of an approximate balance between the two motive groups, different for each performer. For example, in the first rehearsal where this process was attempted, the following ratios were given to each performer (A:B): Anderson – 45:55; Day – 20:80; Regan – 60:40. In other words, Regan was aware that he should attempt to draw from movement group A approximately 60% of the time and group B the remaining 40% of the time.

This open instruction for each performer allowed them more freedom to choose from all possible movements, while keeping them aware of an ideal balance. This

openness will, hopefully, allow them to make greater modifications to their movement and respond more obviously to their present situation and surroundings. While there was no need to judge a “success” or “failure” of each performer to adhere to these ratios (they are merely suggestions), it allowed each of the performers greater freedom and therefore a greater variety of potential paths to explore based on each of their current position, mindset, and affect.

5.3 Compositional Structure

The compositional structure of the piece, as a whole, was based on a sequence of choreographic and spatial modifications that unfold in relation to the number of long impulses that each performer receives. Because of the undefined and “open” nature of this cueing method, the time period between these changes and the compositional position of each performer in relation to each other is different in every performance.

Every long-held impulse — minimum length of approximately four seconds — acts as a cue in some way, marking a step forward in the overall structure of the piece for the receiving mover. For each such impulse, the receiving performer alters his or her movement sequence by exchanging the next motive for one from the previously discussed movement motive groups.

At the onset of the piece, each performer is confined to one fourth of the total performance space. As each performer receives long impulses, they are cued to move to an adjacent quadrant or to expand the area they are performing in, based a defined progression for the performance. Eventually, each performer can be moving throughout the entire performance area, no longer constrained to a single quadrant.

When performers move to a new quadrant or extend their performance into multiple areas, they have the potential of physically meeting another performer. In these cases, rather than interact directly with the performer, which would lead astray from the designed movement sequences, the performer moves immediately to the next step in his or her sequence of movements.

The conditions that activate impulses on the performers’ bodies are created via a generative score running on a computer off stage. This score has a number of large structural elements defined by the artist, as well as settings which roughly define

probabilities, parameter ranges, which taken together approximate the general flow and unfolding of the piece. When the software is turned on, it uses these defined parameters to generate a more detailed score which has instructions for when to create or delete



Figure 5.1: Development of *Encounter 6* at EMPAC

conditions, when and how to modify parameters, and appropriate limits on impulses for a given section — these are mechanisms that may automatically replace a condition with another if a given condition fails by being constantly active (disrupting the progression of the piece by effectively locking the performer in place) or add additional conditions if the given set are not activated for beyond some length of time (disrupting the progression of the piece, conversely, by failing to provide any forward progression).

In the designing of the programmed “rules” for the score, I examined earlier rehearsals during which I manually controlled the creation and deletion of conditions as well as all modifications of parameters, and attempted to initially mimic this progression of events. Once this was accomplished, further modifications were made in an attempt to open up the range of possibility of the generative score, allowing it to be less predictable.

While the computer-generated score can be seen as a pseudo-random structure based on programmed ranges and rules, the system itself is not responsible for any impulses being sent to performers. Rather, it is simply defining the relationships between

performers by connecting certain movements and postures (input) to impulses on the performers' bodies (output). While the computer generated score itself is, in a way, an open work, the performance as a whole would fail to be of much interest without the performers, who are moving in the space, modifying their performances individually and of their own choice within the construct of the piece, responding and reacting to the connections created by the system.

5.4 Sound Design

I collaborated with sound artist Kelly Michael Fox, who had previously worked on *Encounter 5*, on the sound design. Like the previous performance, the sound system was designed with the goal of making more obvious the interactions that are occurring to each performer, between performers, and between performers and the computer system which is creating connections between performers.

There exist several sound textures and events. Each corresponds to an event or type of event. First, any time a performer has an electrode pair activated or deactivated, a short, percussive sound was generated. As an impulse extends for longer durations, there was a sustained, more textural sound that fades in—each performer has a unique arrangement of sustain sounds, allowing the audience and performers to differentiate between the performers. Finally, the sustained sounds, which are activated in relation to longer-duration impulses, are fed into a complex feedback network, stretching the sense of influence on that performer. The feedback network also removes the sustained sound from its initial spatial positioning, allowing it to travel around the space until it slowly fades out. Additionally, sounds are generated any time a condition is created or deleted.

5.5 Light Design

This piece marks the first performance in the series to include interactive video projection. The video projection—projected onto the floor and marking the boundaries of the performance space—was responsive to any impulses that were sent to performers, as well as the creation and deletion of conditions, again with the intention of better illuminating the nature of the interactions that were occurring between performers and between the performers and the system.

The video projection is divided spatially the same way that the performers begin the piece. The quadrant that each performer inhabits at the start of the piece responds to any interactions or impulses that affect that performer. At the start and end of an impulse, the related quadrant flashes, with longer impulses creating a slow disappearing of the edges, as the sides of the quadrant begin crawling towards the center, leaving the performer in a darker and darker area.

The creation of a new condition was reflected visually by having the border of the performer's quadrant disappear and then slowly fade back in. Additionally, connections between quadrants (only visible on one side of the performance space) become visible any time a condition is created or activated. These visual cues are meant to allow the audience to see who is connected to whom at a given moment of activity.

As the piece continues, the separation of the performers into quadrants remains through the video projection, even as the performers cross boundaries and expand their movement throughout the space. With the goal being to focus on the performers, themselves, and not the multimedia environment around them — which should instead provide some visual and aural cues as to what is happening — as well as the extended opening sequence, wherein the performers are clearly separated, the continued spatial separation of the performers reflected through the video projection provides an additional possibility interruption and interaction with performers. When one performer is moving across the entire space, the flashing light, and creeping edges no longer represent what she or he is feeling physically, but could further push him or her to be aware of the connections between each performer.

The video projection is intended to be supportive of the performers and their actions and interactions while interfering as little as possible in the total performance, leading me to create something simple and minimal, while integrating the connections between performers as well as the sound integration in another format.

5.6 Performance

Field Cuts: Encounter 6 premiered at Rensselaer Polytechnic Institute's Experimental Media and Performing Arts Center (EMPAC) on Thursday, March 10, 2016. The performance took place in Studio 2, one of EMPAC's black box studios. Setup, system

testing, and rehearsal took place between Monday, March 7 and Thursday, March 9. The equipment setup, handled by EMPAC engineers, consisted of two projectors mounted to the ceiling, facing downwards, as well as seven speakers and four subwoofers.

The two projectors were arranged end-to-end, producing a single projected image that was approximately 13 feet wide and 46 feet long through the center of Studio 2. Aside from required egress lighting over the audience, the video projection was the only light during the performance.

Three of the speakers were mounted on the ceiling facing downwards, directly over the performance area. The percussive sound events that were linked to the turning on and off of electrical impulses came from these overhead speakers, arranged spatially in relation to the starting positions of the performers. The remaining speakers, and the subwoofers, were located in the corners of Studio 2. Sustained sounds that were linked to impulse duration, as well as the output of the feedback network, were sent to these speakers.

The technical components of the performance were controlled from three computers, with dedicated machines running the video projection and sound systems. The third computer was responsible for generating the score, communicating with the hardware worn by the performers, and sending event messages to the projection and sound systems. All of the networking was done on a closed wifi network.

For the performance, the computers and the wifi network box were located in the control booth, which is on the second floor, overlooking Studio 2. I was concerned about the signal strength of the network when communicating with the wearable hardware, so time was spent testing the performers' packs throughout Studio 2 to ensure a strong connection.

The software generating the score created conditions based on some loosely defined rules that controlled the balance between performers, the type of condition (whether it was checked against the absolute or delta value read from the source accelerometer), and the possible range of threshold values. During testing, it was apparent that some of the generated threshold values resulted in conditions that were always evaluated as true, and despite tightening the range of possible values, this continued to be a problem. A modification was made to the software that automatically deleted conditions that had

been “true” for longer than a set threshold, while also adding a new condition to the score. This solution effectively dealt with the problem by ensuring that any conditions “bad” (inappropriate) threshold values would be deleted quickly, while also maintaining the overall balance of the performance.

Testing and rehearsal with the performers began on Wednesday, March 9, while the final tweaks to the rules guiding the construction of the score were made. We tested short sections, approximately five to ten minutes in length, followed by a full run of the piece, lasting approximately 35 minutes.

On the day of the performance, several last minute checks were carried out on all systems, including testing all of the wearable hardware packs. Several of the connections and wires on the performers’ packs were replaced and batteries were charged.

During the performance, it was clear that the previously discussed modification to the score software – automatically deleting over-active conditions and replacing them with new ones – positively impacted the balance of the piece. Performers were no longer receiving the kind of repetitive impulses that had previously occurred and had occasionally made it difficult to progress through the structure of the piece. The result was more balanced and well rounded; there were moments of intense impulse activity, followed by stretches of relative inactivity.

6. Conclusion

Field Cuts: Encounter 6, and the project series as a whole, has raised many new questions for me while also presenting a number of paths for future inquiry that I believe will be fruitful. The pursuit of open work and challenging performers in new ways is something that I've long been interested in, and I believe that this series has led me to explore new methods of achieving this goal. While I believe that I continue to fight with myself over the role of technology in performance, I do feel that I've succeeded in refocusing my own creative efforts onto the experience of the performers through this work, I hope with the effect of producing a more compelling experience for both the performers and the audience.

Through working closely with my collaborators on this project, I feel that this performance has successfully challenged each of the performers to go beyond memorizing a piece and reproducing it. The challenge of navigating a complex system of relationships which can produce unexpected physical feedback has managed to keep us all focused and aware, not allowing the performer to simply "go through the motions," while also challenging us to create new methods of organizing the structure of the work.

Coming away from this piece, in particular, I still feel at odds with the balance between being an active performer, myself, versus being the creator of such performances without an improvisational or even performative role. While my initial desire is to remain an improvisatory voice in performance, I believe this performance required me to step aside in order to focus on the performance and interactions of the movers.

Additionally, the setup of this series, with its inclusion of electrical stimulation, which can produce physical movements which seem uncomfortable or even painful at times, can easily slide into the realm of control and power relationships, which, while interesting, is not the reason for the inclusion of this hardware. Further investigation and development is needed if I hope to be an active performer alongside others in a similar piece, while successfully mitigating these undertones of control.

While reducing my own performative authority to be equal to that of every other performer would clearly level the field, I also believe there is a clear line of inquiry and development in creating performances wherein each performer has more authority over

the interactions and behavior of the system. In doing this, each performer could exercise a greater sense of influence, both through his or her own performance, and through paused, thoughtful input and decision.

Encounter 6 is the latest iteration in a project and line of exploration which has successfully lead me to new questions regarding influence and connection between individuals, our behavior in open, improvisatory systems, and the role of digital technologies in performance.

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