Mixed Media and Metaphor:

An Analysis of the Performance Technologies Utilized in *Drop* and *Decoder*

David Bird

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Abstract

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This research examines two pieces composed by me: *Drop*, for string octet, strobe lights, and electronic sounds (2015), and *Decoder*, for MIDI drums, holographic projections, and electronic sounds (2017). Both works interrogate a particular manifestation of digital technology: in the case of *Drop*, strobe lights, and in *Decoder*, digital screens. This process involves unpacking the character, language, and associations of a particular technology, and exploring how human performance complements, opposes, and negotiates with these elements. My analysis highlights the influence of Post-Digitalism in my work and aims to show how mixed-media performance technologies function metaphorically, and how their influence can be traced from their physical presence on stage to notated gestures in performance.

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Introduction

By 2014, my compositional output involving live performers and digital technologies characterized the role of electronics, or by broad extension digital technology, in a somewhat antagonistic way. Works such as *Drop*, for string octet, strobe lights, and electronics sounds (2015) and *Decoder*, for MIDI drums, holographic projections, and electronic sounds (2017), depicted digital and performance technologies, not as an extension of a live performance, but as an opposing or externally imposed force with which the performers were obliged to contend with over the course of a piece.

While I had explored the relationships between live performers and digital technologies in the past, mainly for their sonic or interactive potential, I realized that this new and repeated characterization was significant, as it reflected my emerging concerns about the broader societal relationships between individuals and digital systems and technologies. These concerns were certainly not unique to me, as beginning in 2013, often inspired by Edward Snowden's NSA surveillance disclosures, a mass of popular media emerged that sought to dramatize the growing suspicions of governments, corporations, and our engagement and reliance on digital systems more broadly. In a short span of time, these concepts would be explored in television shows such as *Black Mirror* (2011 -), *Halt and Catch Fire* (2014 - 2017), *Silicon Valley* (2014 -), and *Mr. Robot* (2015 -), and films such as *Ex Machina* (2014) and *Transcendence* (2014). Major literary figures would weigh in, including Thomas Pynchon with *The Bleeding Edge* (2013), Dave Eggers with *The Circle* (2013), and Jonathan Franzen with *Purity* (2015). Additionally, Adam Curtis's 2011 three-part BBC documentary *All Watched Over by Machines of Loving Grace* would historicize this shifting sentiment by examining historical narratives of digital utopianism

through the lens of contemporary disenchantment with digital technologies.[1] Curtis's documentary, as well as the variety of fictional media listed prior, are unified in their questioning of the dominant techno-positivist narratives of their time, as well as through their expression of a larger disillusionment with how digital technologies had been absorbed into, and utilized in, the broader corporate, economic, and governmental consciousness.

Post-Digitalism

This sentiment of digital disenchantment would overlap significantly with the term and aesthetic known as Post-Digitalism, a term introduced by American writer and composer Kim Cascone in an article entitled, "The Aesthetics of Failure: "Post-Digital" Tendencies in Contemporary Computer Music." Writing in 2000, Cascone's description of the emerging aesthetic suggests a growing disillusionment with digital media in the arts: "With electronic commerce now a natural part of the business fabric of the Western world and Hollywood cranking out digital fluff by the gigabyte, the medium of digital technology holds less fascination for composers in and of itself."2 Cascone demonstrates how composers have integrated the "failures" of digital technology into their work, via "glitches, bugs, application errors, system crashes, clipping, aliasing, distortion, quantization noise, and even the noise floor of computer sound cards are the raw materials composers seek to incorporate into their music."[3] By 2014, Post-Digitalism would embrace a broader social critique and provide a platform for critical discourse on relationships

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[1] Adam Curtis, "All Watched Over by Machines of Loving Grace," (BBC Two, May 23, 2011), Documentary film, https://www.bbc.co.uk/programmes/b011lvb9.

[2] Kim Cascone, "The Aesthetics of Failure: 'Post-Digital' Tendencies in Contemporary Computer Music," *Computer Music Journal* 24:4 (2000): 12.

[3] Ibid.

between humans and digital technologies. Florian Cramer's writings in particular sought to "historicize the fascination with such digital systems as well as critique the techno-positivist narratives exemplified by media such as *Wired* magazine, Ray Kurzweil's Google-sponsored 'singularity' movement, and, of course, Silicon Valley."[4]

Neutrality

Around 2014, inspired by the discourse surrounding Post-Digitalism, my work took a decisive detour. Most notably, I began to call attention to the technological elements utilized in my work, critiquing their supposed neutrality, and imbuing them with antagonistic qualities. In works such as *The Life And Death Of The Great Pop Star Maria Marapovich* (2014) and *Commercial Vignette* (2014) I imbue a seemingly neutral form of technology with antagonistic qualities. In *The Life And Death Of The Great Pop Star Maria Marapovich*, a soloist (a singer) becomes wrapped and bound by a XLR cable. In *Commercial Vignette*, a UPC barcode is projected on top of an organist, alluding to the idea that the organist is behind prison cell bars.

Philosopher Jacques Ellul has noted that technology is not neutral, and that even beneficial technologies often have unpredictable and negative secondary effects.

> Man can never foresee the totality of consequences of a given technical action. History shows that every technical application from its beginnings presents certain unforeseeable secondary effects which are much more disastrous than the lack of the technique would have been. These effects exist alongside those effects which were foreseen and expected and which represent something valuable and positive.[5]

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[4] Florian Cramer, "What Is 'Post-Digital'?," in *Postdigital Aesthetics: Art, Computation, and Design*, ed. David M. Berry and Michael Dieter (London and New York: Palgrave Macmillan, 2015), 20.

[5] Jacques Ellul, *The Technological Society* (New York: Vintage Books, 1964), 105.

Additionally, there is an assumption that when technology is portrayed as a neutral, unbiased tool, the user is in control. Psychologists such as Nicholas Carr have demonstrated that the concept of “Maslow's hammer” ("I suppose it is tempting, if the only tool you have is a hammer, to treat everything as if it were a nail.”) is a likely psychological reality. Carr argues as far as our brains are concerned, the hammer is a part of our hand.

> When a carpenter picks up a hammer, the hammer becomes, so far as his brain is concerned, part of his hand. When a soldier raises a pair of binoculars to his face, his brain sees through a new set of eyes, adapting instantaneously to a very different field of view. The experiments on pliers-wielding monkeys revealed how deadly the plastic primate brain can incorporate tools into its sensory maps, making the artificial feel natural. In the human brain, that capacity has advanced far beyond what's seen in even our closet primate cousins. Our ability to meld with all manner of tools is one of the qualities that most distinguishes us as a species. [6]

The Canadian director David Cronenberg explores this sentiment quite figuratively in films such *Videodrome* and *eXistenZ*, where tools critical in the development of a plot, a gun, a video game controller, become infused with their users, causing a crisis in subjectivity and a transformation of a character.

Metaphor

In characterizing or personifying technology in ways that exceeded their intended function, I realized I was engaging with technology metaphorically, and often prioritizing a technology's symbolic or metaphorical richness over any particular intended sonic result. Metaphors are critical conceptual tools that play a significant role in our language and psychology. In

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[6] Nicholas G. Carr, *The Shallows: What the Internet Is Doing to Our Brains* (New York City: W. W. Norton, 2011), 208.

Metaphors We Live By, George Lakoff and Mark Johnson write, "Metaphors... are conceptual in nature. They are among our principal vehicles for understanding. And they play a central role in the construction of social and political reality."[7] Lakoff and Johnson's book breaks down the common categories of metaphors humans tend to utilize. One of these categories is that of ontological metaphor, which seeks to represent a concept through the reference of objects and substances:

> Understanding our experiences in terms of objects and substances allows us to pick out parts of our experience and treat them as discrete entities or substances of a uniform kind… Just as the basic experiences of human spatial orientations give rise to orientational metaphors, so our experiences with physical objects (especially our own bodies) provide the basis for an extraordinarily wide variety of ontological metaphors, that is, ways of viewing events, activities, emotions, ideas, etc., as entities and substances.[8]

Ontological metaphors offer a means to describe objects or complex concepts on a human level, either through empathy, reference to corporality, or perceptual experience. In composition, I exploit these tools as a means to simplify the complexities of digital technology, and offer human a performers a means of interacting with them on an individual level. By placing human performers in complex webs of digital and mixed media technologies, I aim to examine the metaphorical significance of these situations and technologies, and in doing so, create conditions to critique or comment on the interactions we have with technology or technological systems.

The work presented in the following chapters showcases the relationship between technology and metaphor in 3 particular ways: 1. A seemingly 'neutral' performance involving

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[7] George Lakoff and Mark Johnson, *Metaphors We Live By* (Chicago: University of Chicago Press, 1980), 159.

[8] Lakoff and Johnson, 32.

technology becomes charged with human characteristics, physical or emotional. 2. The characteristics of a particular performance technology is broken down into concepts that can be expressed through adjacent performance media. 3. A performance technology acts as a proxy for a broader technology.

Chapter 1: Drop

Drop is written for string octet, strobe lights, and electronic sounds and was composed in 2015 for a joint performance with the JACK Quartet and Mivos Quartet. In performance the instrumentalists are amplified and pre-recorded electronic sounds accompany their performance through localized speakers positioned behind the ensemble. The work utilizes four four-foot vertical LED lights, which are situated between each performer. These LED lights are controlled via DMX, a digital communication protocol designed to control stage lighting and theatrical effects. In performance, a digital audio workstation synchronizes and plays back a pre-recorded electronics part, a MIDI score for lights, and a click track for the performers. The click track allows the performers to synchronize the notated score, with the lighting cues and pre-recorded sounds. In performance, the MIDI score directs the individual lights on stage to turn on or off; it also contains prompts to enact algorithmic or interactive behaviors at specific moments in the piece. As the digital audio workstation plays through the work, the MIDI score is transmitted via external MIDI to a Max/MSP patch which enacts the algorithmic or interactive processes and communicates with a DMX lighting control interface which communicates and sends signals to the LED lights on stage.

The vertical LED lights, which are situated between each performer and enact the stroboscopic effects of traditional strobe lights, play a significant symbolic role in the piece. In 1931, electrical engineer Harold Eugene Edgerton invented the electronic strobe light stroboscope, which allowed the study of the motion of fast moving objects. [9]. In stroboscopic photography, the flashing lights of a stroboscope reveal periodic instances of a subject's motion.

[9] Andy Grundberg, "H. E. Edgerton, 86, Dies; Invented Electronic Flash," *The New York Times*, January 5, 1990.

With the use of a long shutter speed, these individual instances become superimposed, creating a composite image that captures the range of a subject's motion over the time in which the camera's shutter is open. Early stroboscopic photography was used to study high speed industrial machinery, the motion of bullets in flight, and the first atomic detonations.

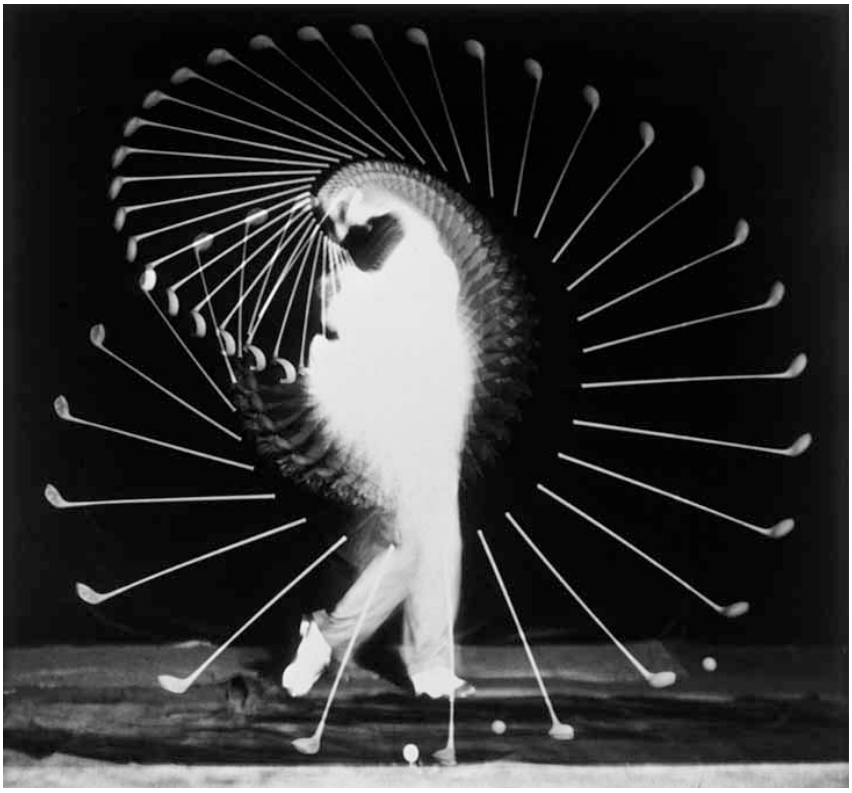

Figure 2-1: Harold E. Edgerton, Golfer, 1937, 7 1/4 x 8 1/8" (18.4 x 20.6 cm), 1937.

In addition to its application in photography, by the 1960s the device was being integrated in psychedelic happenings and multimedia events like Andy Warhol's *Exploding Plastic Inevitable*. The flickering light made performing artists and audience members alike appear as if they were moving in slow motion, as well as enhancing the effects of psychotropic drugs like LSD. The use of strobe lights in popular music is very much prevalent today, owing a

particular kinship to the world of electronic dance music, as well as club and rave culture more broadly, and can be found in most popular dance clubs around the world[10].

Marshall McLuhan proposed that, among other human creations, technology functions as an extension of the human body. "All of man's artifacts, of language, of laws, of ideas and hypotheses, of tools, of clothing and computers-all of these are extensions of the physical human body." McLuhan used the term artifact to describe technology which performs this function. Philip Brey expands on this, writing, "an artifact is an extension of a human organ… it has functional abilities also possessed by this organ and adds to, amplifies, or takes over, some of its functioning."[11] Thus, in McLuhan's definition, a shoe or motor vehicle would be an artifact of the feet, a glove or computer keyboard would be an artifact of the hands, and sunglasses or computer screens would be artifacts of the eyes.

However, strobe lights, and artificial light more broadly, do not conform to McLuhan's understanding, in that they do not extend a particular capacity of the human body. A strobe light, in fact, possesses no particular corporeal association, and is not an artifact in Brey's formulation: "There are many things that artifacts can do that have little similarity to anything humans can do. Electric lighting, for example, is able to give light, but there is no human faculty that even gives a modest amount of light. Explosives, electromagnets, ionizers, and roads are other examples of

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[10] Audrey Redfield and Marie I. Thouin-Savard, "Electronic Dance Music Events as Modern-Day Ritual," *International Journal of Transpersonal Studies* 36:1 (2017): 52.

[11] Philip A.E. Brey, "Technology as Extension of Human Faculties," *Metaphysics, Epistemology and Technology (Research in Philosophy and Technology)* 19 (2000): 59.

technological artifacts that have no interesting functional resemblances to human organs or behaviors."[12]

In addition to the non-corporeal qualities that strobe lights exhibit, their behavior bears a particular relationship to digital technology. Strobe lights exhibit exclusively binary properties, with only two operating states, on or off. While Edgerton's original stroboscope was built and controlled using analog technology, we can describe the device's behavior through the way it represents and expresses information discretely (on or off) as digital. In Languages of Art, Nelson Goodman defines the digital as a representational scheme comprised of discrete and differentiated components. He writes, "a digital scheme... is discontinuous through-out; and in a digital system the characters of such a scheme are one-one correlated with compliance-classes of a similarly discontinuous set."13 In contrast, Goodman writes that a "... symbol scheme is analog if syntactically dense; a system is analog if syntactically and semantically dense. Analog systems are thus both syntactically and semantically undifferentiated in the extreme..."14 The syntactic and semantic density Goodman refers to could also be understood in the context of a continuous range. To illustrate this, Goodman offers a simple example of a pressure gauge representing an analog computer, and a dime counter displaying differentiated numerals representing a digital computer.

Through the binary behavior that the strobe light exemplifies, as well as its complete lack of anthropomorphic resemblance, the strobe light positions itself as an oppositional entity to the

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[12] Ibid..

[13] Nelson Goodman, *Languages of Art: An Approach to a Theory of Symbols* (Indianapolis: Bobbs-Merrill Company, Inc., 1968), 159.

[14] Ibid.

analog world of the human performer. In *Drop*, this oppositional nature is exploited in order to juxtapose human and technological elements. In the work, strobe lights are implemented as a means to signify, as well as characterize, the various ways in which digital technology connects, controls, and affects human beings in our present day. In addition to the non-corporeal qualities of light, the binary language of strobe lights is analogous to the core binary language of the computer, while their positioning in the space (one between two players in the ensemble) alludes to digital technology's ability to connect and disconnect individuals. In composing for these oppositional parties, I navigate their conflicting ontologies, and the exploration and overlapping of these domains reveal moments of complement, opposition, negotiation, and failure.

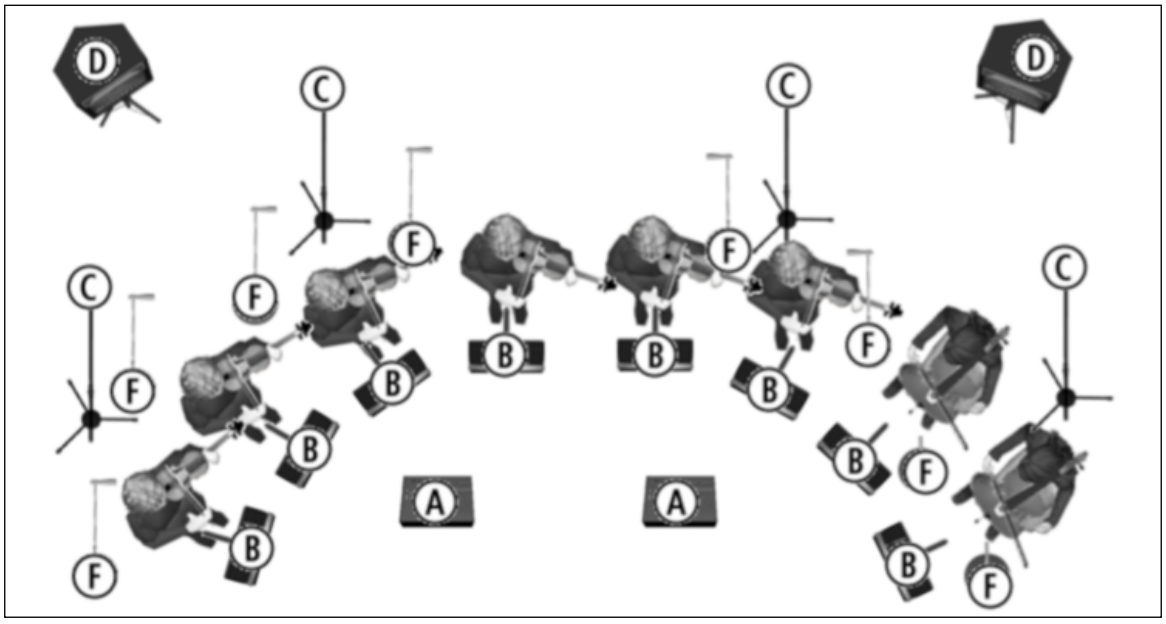

Figure 2-2: Overhead view of *Drop* staging. A: Headphone Mixer(s), B: Music Stands with Stand Light, C: LED Strobe Lights, D: Powered Speakers, E: Subwoofer (optional), F: Microphones and Microphone Stands

Figure 2-3: Performance of *Drop* by The Black Page Orchestra October 12, 2018.

1.1 Overall Form

The trajectory explored in *Drop*, which moves broadly from a character of curiosity to control, aims to characterize our varied relationships with digital technology. The strobe light functions as a metaphor for digital technology and is implemented on stage as a means to juxtapose human and technological elements. The title, *Drop*, is proposed in reference to two overarching influences in the work. The first being William Gaddis's novel, *Agapē Agape*, which explores a paranoid lineage between player pianos and modern computers. The title, Agapē Agape, juxtaposes two languages at a clash of meaning, the first, "Agapē," stems from the Greek concept of 'selfless love', and the mid-century English "Agape," which suggests the idea of something cleft or opened. The concept of the gap also relates to the player piano, which uses

gap-filled rolls to read and play music. Gaddis uses the player piano as a metaphor to propose and illustrate how emerging technologies are responsible for creating large 'gaps' (economic, artistic, and moral) in society. *Drop,* in one sense, refers to these chasms as well as a descent, or drop, through them. It also relates to the dramatic formal device used in various types of popular music.[15]

1.2 Lighting Design

One of the key inspirations for the character of the lighting came from Maureen McHugh's 2011 short story, *The Kingdom of the Blind*, about a computer program, called DMS, that apparently achieves sentience and begins to express itself through light. David Shaviro writes of the novel,

> "The Kingdom of the Blind" tells the story of what happens when DMS starts acting oddly… The program begins to exhibit what might well be thought of as deliberate behavior. One afternoon, starting exactly at "3:17 EST," DMS causes a series of "rolling black outs" - brief cutoffs of electricity - at all the facilities under its control. The blackouts take place in an orderly fashion. The lights go out in a fixed geographical pattern at each facility: from east to west, or from north to south. And the facilities are affected in the order that they are listed in DMS's lookup table.[16]

Throughout the story, Sydney and her co-worker Damien attempt to understand the cause of the glitch and begin to uncover a strange logic underpinning DMS's actions. Through these efforts Sydney and Damien develop both a fear of, and empathy with, the computer program.

> Truth was, she was beginning to get a feeling about DMS. About what DMS might be like. She felt as if she could sort of sense the edges of DMS's personality and although she knew it wasn't true, she knew it was just because Damien had used it as an example, more and more she thought of DMS as a shark… Sharks don't have a neocortex. Their

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[15] Sami Yenigun, "The 5 Deadliest Drops Of 2010," NPR, *The Best Music of 2010* (blog), December 31, 2010, https://www.npr.org/2010/12/31/132490270/the-5-deadliest-drops-of-2010.

[16] Steven Shaviro, *Discognition* (London: Repeater, 2016), 45.

> brain is simple. They aren't moral or immoral, ethical or unethical. DMS was like that because for DMS nothing else was alive. The world for DMS was data and DMS swam in the data. She was beginning to feel as if she wanted it to. DMS was creepy.[17]

McHugh's novel goes to great lengths to describe the "creepy" and perverse character and logic of DMS, how it expresses itself through lights, and how the humans become curiously absorbed and entranced in attempting to discern its intentions.

One of my aims with the design of the lights was to create a character that appeared to learn from and manipulate its environment in the way that an artificial intelligence system like DMS did. In doing this, I sought to imbue the lighted element with a character and logic that was musical, reactive, and independent, as well as (eventually) something that would develop a sort of agency that would take control of the performers and puppeteer them in various ways. Because of this, the strobe lights are implemented by different control methods that when summed aim to create a sense of conflicting logic and obfuscated intention. These methods combine a pre-composed light score, algorithmically generated lighting patterns, and audio-responsive elements to create a multi-faceted character. These methods imbue the lighted element with a sense of intention and independence, as well as chaotic tendencies, and interactive and responsive elements.

1.3 Pre-Composed Lighting Elements

Drop contains a unique lighting score which is used to indicate the rhythm of the pre-composed lighting part in relationship to the instrumentalists. My approach, in composing for lights

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[17] Maureen F. McHugh, *After the Apocalypse: Stories* (Northampton: Big Mouth House, 2011), 101.

independently, aims to contradict the tendency to treat lighted elements exclusively as a secondary, or reactive “light show,” and instead to imbue the strobe lights with a function and agency equal to the human performers distributed between them. The composed lighting part then is included in the notated score above the instrumental parts and represents the resulting actions of the lighted element. However this part is controlled and implemented in different ways. In the piece, the lighting is primarily controlled through the sequencer which is used to time-sync the pre-recorded "tape" part as well as the click track that accompanies the live performance. The pre-composed lighting elements are played back as a MIDI track where certain MIDI notes correspond directly to the different lights (C4 (strobe one), D4 (strobe two), A4 (strobe three), B4 (strobe four). Additional MIDI values trigger processes that occur outside of the scripted sequencer program such as moments of algorithmic generation and interactive elements.

1.4 Algorithmic Generation

In overtly procedural sections of the work, as well as in sections with chaotic tendencies, algorithmic elements are implemented. Such algorithmic elements comprise both procedural and randomized processes. At measure 82 the lights briefly escape their binary characteristics in favor of a procedural "sweeping" gesture (lights fading from one to the next) that gradually accumulates in intensity. This sweeping gesture is controlled by two low-frequency sine tone oscillators, one with a phase offset of 0.25. In the Max/MSP performance patch, the value of the first sine tone is mapped to the Y position on an X/Y graph, and the value of the second (the phase offset signal) is mapped to the X position. This creates the effect that the sine tone data is

is being passed clockwise through the four coordinates of the X/Y graph. By adjusting the frequency and amplitude of the sine tones I can adjust the speed in which lighting data is transferred from one light to the next, and the intensity of the lighted signals. Over the course of eight bars the frequency of the oscillators accelerate and decelerate, the amplitude of the oscillators is also adjusted so that the intensity of the lighting gradually fades in and out.

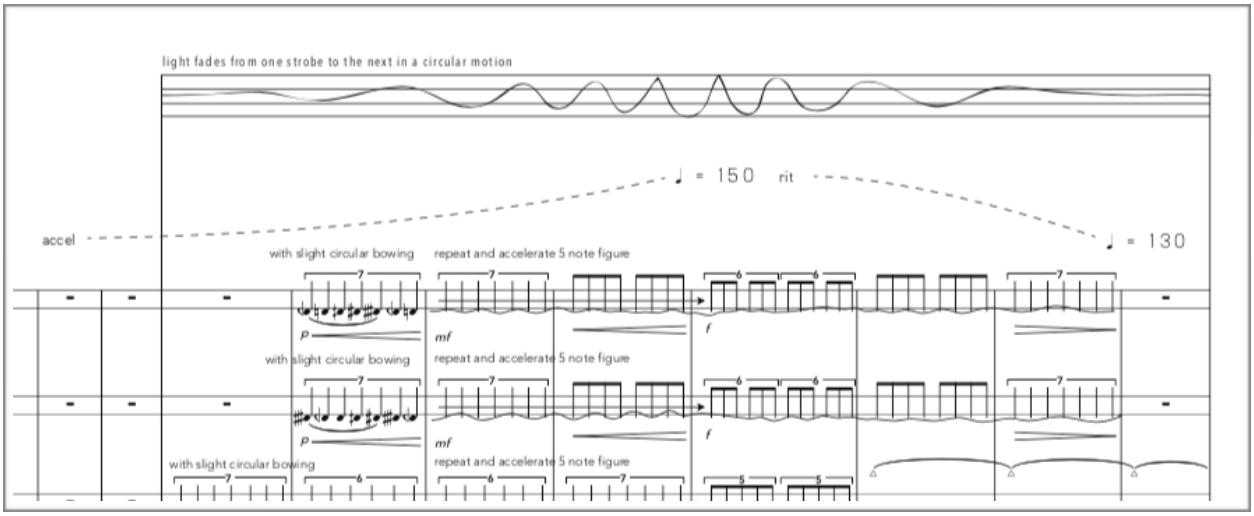

Figure 2-4: An example of procedural lighting.

For scattered and randomized passages a MIDI cue in the sequencer program triggers a randomized lighting operation in Max/MSP. In this operation, Max/MSP's "decide" objects are triggered at rapid 20 millisecond intervals to select random binary digits, turning an individual light on or off in a “glitchy” or densely scattered array. This length of MIDI cue from the sequencer program determines how long these randomized passages occur. This operation occurs at moments like measure 132; following two bars of stasis in which the first violin sustains a tense whispering high pitch, the remaining violins erupt in an ecstatic overpressure gesture in synchrony with the rapidly punctuating lights.

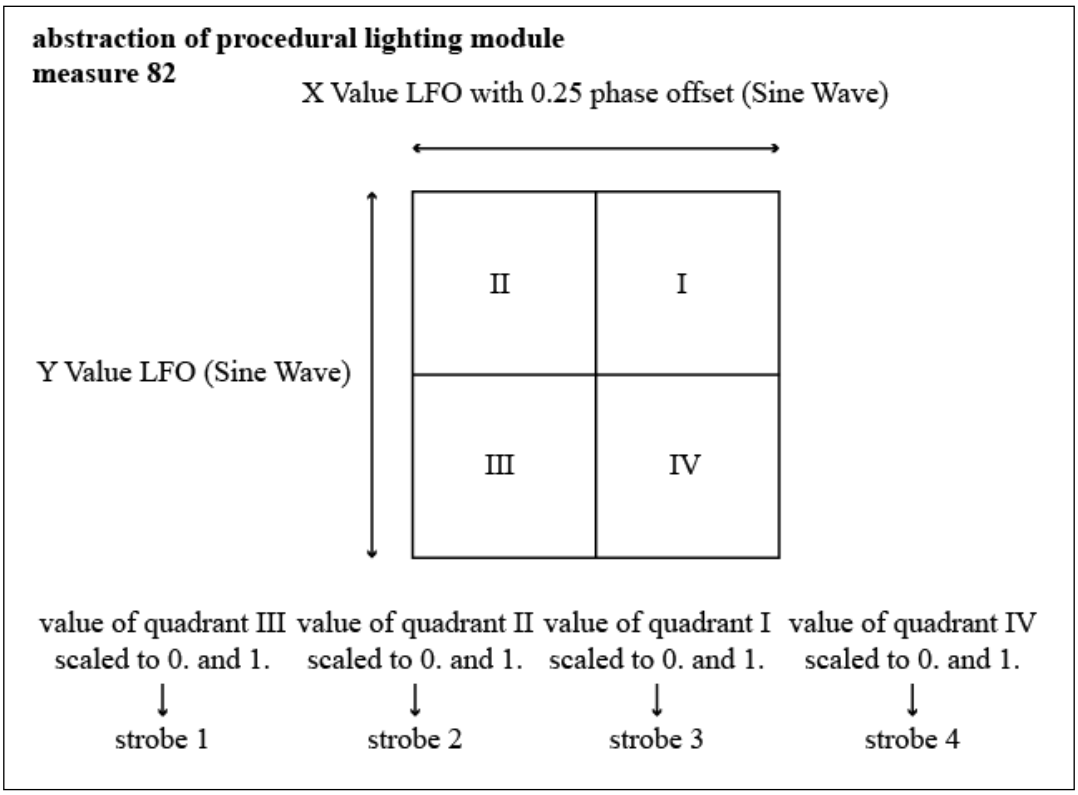

Figure 2-5: Abstraction of procedural lighting module implemented in Max/MSP.

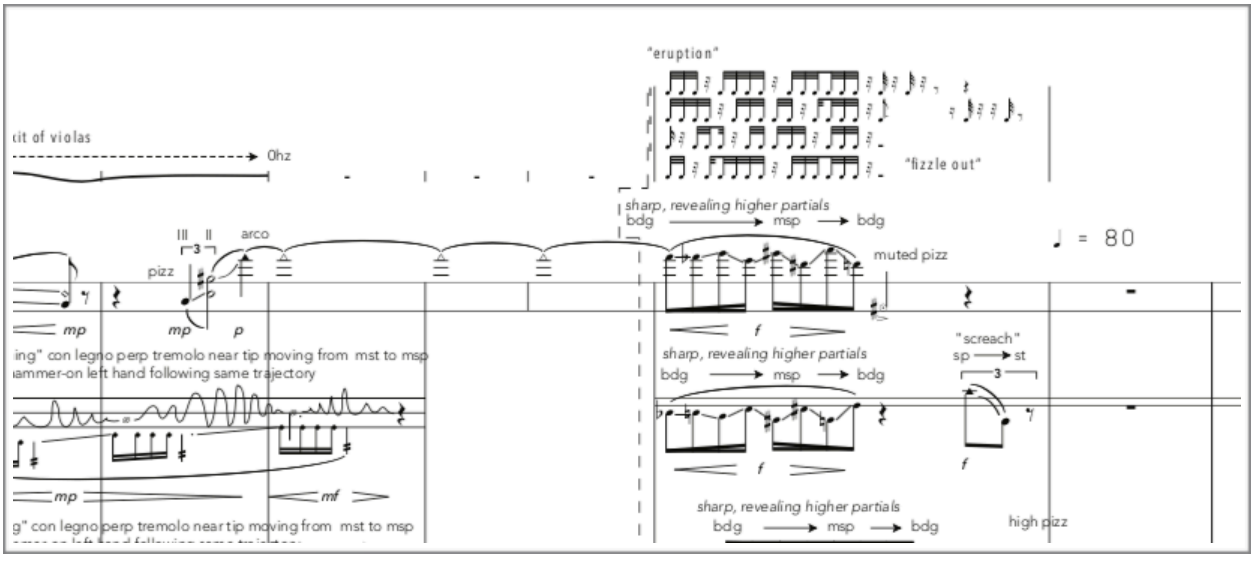

Figure 2-6: Measure 132, an example of randomized lighting.

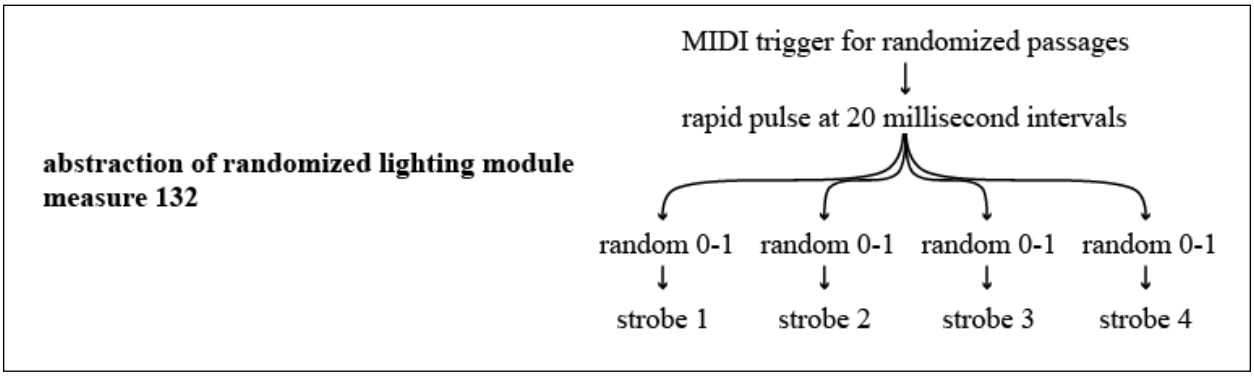

Figure 2-7: Abstraction of randomized lighting module implemented in Max/MSP.

1.5 Responsiveness

In only one area of the work do the lights function in a truly responsive way. In measure 110 the first and second violas sustain open A strings. Over the course of 9 bars, viola one gradually adjusts its A string fine tuner to achieving a beating frequency of around 4 Hz. The performance patch pitch-tracks the individual instruments using Miller Puckette's pitch~ object, and the pitch-tracking reveals two distinct frequencies. In the patch, the calculated "difference" of these frequencies creates a third frequency which is used to pulsate the light connecting the two violists. With the instruments being amplified in performance the live signal of the individual instruments is sent as a direct or auxiliary output from the concert audio mixer directly to the computer running the performance patch. At this point the difference frequency is calculated and the resulting data is sent to the light connecting to the two violists.

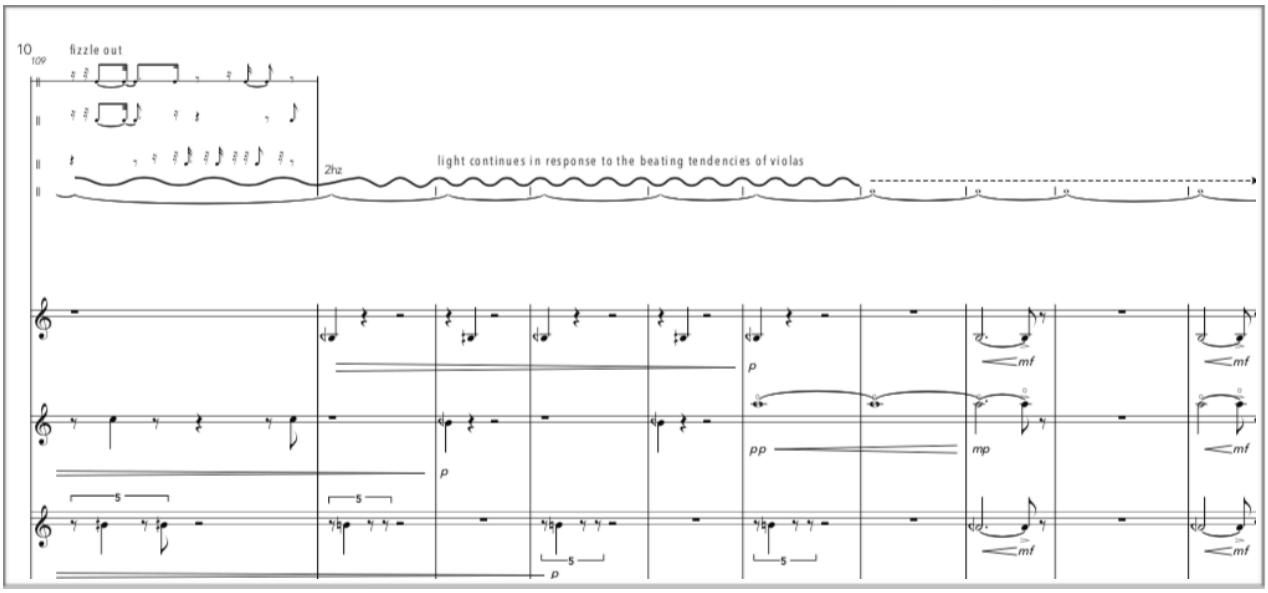

Figure 2-8: Measure 110, an example of responsive lighting.

1.6 From Curiosity to Control

The pre-composed, algorithmic, and responsive aspects of the lighting join to form a particular trajectory that unfolds over the course of the piece. The piece begins literally and metaphorically "in the dark," in an effort to highlight the difference, unknowingness, and unacquainted manner in which the performers and lighted elements find themselves in. Yet over the course of the piece the character of the lights, as well as their relationship to the performers, evolves in a significant manner. This transformation could be understood broadly as a shift from "curiosity" to "control." mirroring the way in which the computer system DMS in The Kingdom of the Blind gradually learns to express itself through appendages of light, as well as the way in which it grows to control and command the attention of the data scientists who become increasingly absorbed in its strange digital logic.

A type of behavior that occurs prominently over the course of the piece is that of probing. This act of curiosity is engaged with as a way for either the lighted element or the performers to prod the other, with the hopes of activating a response and using these response patterns to better understand the character and behavior of the different elements. Forms of "curious" interactivity yield various moments of caution, trepidation, and agitation. Examples of this occur prominently at the beginning of the piece, when musical elements enter carefully and tentatively. They display opposition and contrast in their gestural behaviors, almost appearing to act defensively while also providing space to listen to and monitor their oppositional element.

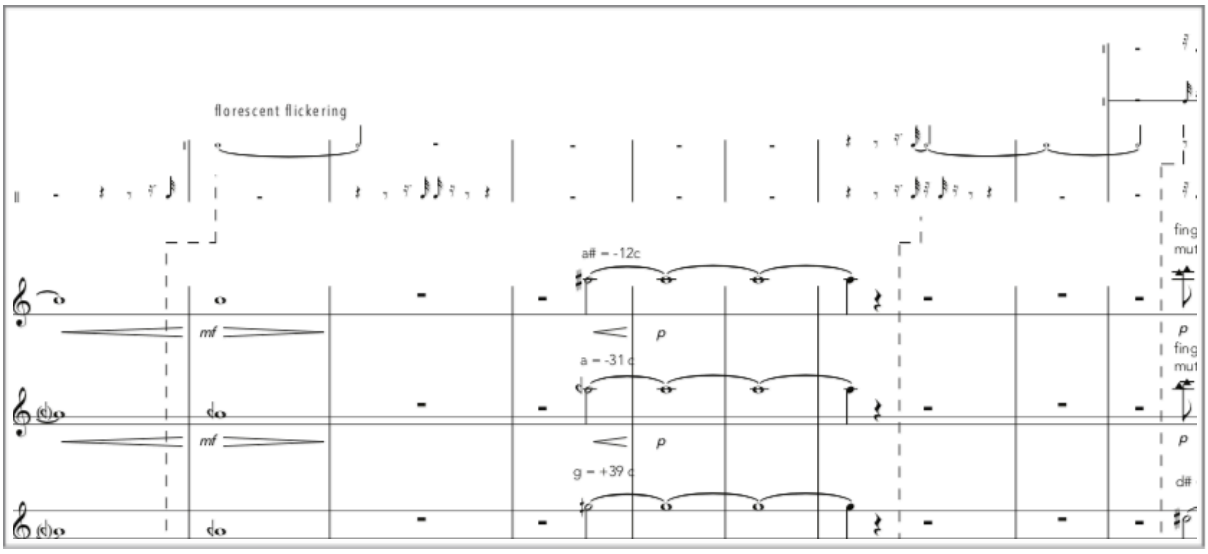

Figure 2-9: Measure 40, an example of probing.

In measure 40, the lights and instrumentalists take turns exhibiting sustained passages. There is a character of trepidation imbued into this section, which is performed by the instrumentalists generally at a soft dynamic level. In this section, probing occurs when the instrumentalists exceed a particular dynamic threshold and appear to agitate the lighted element. In measure 41, the high strings reach the dynamic level of a mezzo forte, which accedes that of

the broader section. At this moment the lighted element exhibits a response, and the instrumentalists appear to back off, allowing space for the response of the lighted element.

Another "curious" mode of interaction occurs in the many conversational relationships that occur over the first half of the work. Conversational relationships are explored through retrograde and offset rhythmic densities and work by restating the initial musical statement in question form, after the fashion of a Rogerian psychotherapist, restating a patient's reply to incite added information and confession from them. This is a technique that has a special relationship with the history of computers and artificial intelligence. ELIZA, a famous early artificial intelligence from the 1960s, rephrased user input to enact complex interactions with users. The following is excerpted from a conversation between an individual and ELIZA.

> Men are all alike.
> IN WHAT WAY?
> They're always bugging us about something or other.
> CAN YOU THINK OF A SPECIFIC EXAMPLE?
> Well, my boyfriend made me come here.
> YOUR BOYFRIEND MADE YOU COME HERE
> He says I'm depressed much of the time.
> I AM SORRY TO HEAR YOU ARE DEPRESSED
> It's true. I am unhappy
> DO YOU THINK COMING HERE WILL HELP YOU NOT TO BE UNHAPPY
> I need some help, that much seems certain.
> WHAT WOULD IT MEAN TO YOU IF YOU GOT SOME HELP
> Perhaps I could learn to get along with my mother.
> TELL ME MORE ABOUT YOUR FAMILY[18]

Measure 52 exemplifies this style of conversational relationship. Out of the decay of the viola and cello chord on the fourth beat, a scattered accumulation of lights emerges. The apex of their accumulation coincides with the cut-off of the instrumental chord. The conversational

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[18] Adrianne Wortzel, "ELIZA REDUX: A Mutable Iteration," *Leonardo* 40:1 (2007): 31.

trajectories of lighted and instrumental components encapsulated in the broader envelope of the 3 bar gesture suggest individuation as well as connectivity.

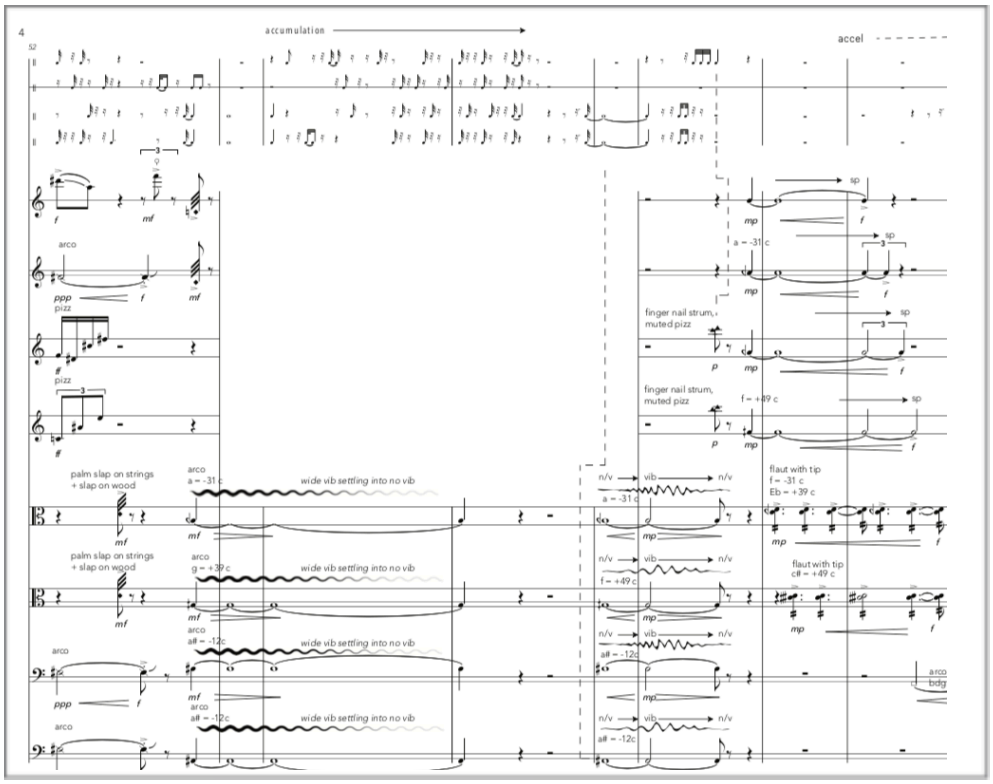

Figure 2-10: Measure 52, an example of oppositional relationships between low strings and lights.

At measure 165, the virtual midpoint of the work, the character of the lighted element evolves from curiosity to control. From this point onwards, the instrumentalists become increasingly locked in synchrony with the lighted element, which is becoming increasingly aggressive and dictatorial. The first stage in this process occurs through a process of mirroring, which can be seen as a more reified extension of the oppositional relationships explored earlier

in the work. Mirroring occurs when the performers and lights perform the same rhythm or gesture simultaneously or slightly offset.

Mirroring is regarded as a common psychological behavior, attributed to the existence of 'mirror neurons' initially discovered in macaque monkeys. Jessica Marshall writes,

> These neurons were active not only when the macaque performed an action like grabbing an object but also when the macaque watched the same action being performed by a person or another monkey. The researchers named these neurons "mirror neurons" and proposed that they provide the basis for what became known as “action understanding" in macaques, allowing them to interpret the intentions or goals of the person or monkey whose actions they are observing.[19]

The invasive measures taken to test mirror neurons in macaque monkeys cannot be used on humans, but it is widely postulated that humans contain similar neural tendencies.[20] Uta and Chris Frith write, "This social brain, for humans at least, has a ‘theory of mind,’ which enables us to predict what others are going to do on the basis of their desires and beliefs. It also has a ‘mirror system,’ which enables us to understand others’ goals and intentions and to empathize with their emotions by a mechanism of motor resonance.”[21]

While mirroring can be seen as a method to empathize with an individual's emotions, when enacted by non-human agents it can lead to a range of unsettling or uneasy reactions. This is called the uncanny valley effect, and could be used to describe the mirroring efforts at measure 165 and the broader emotional atmosphere that surrounds the ensuing sections of the work.

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[19] Jessica Marshall, “Mirror Neurons,” *Proceedings of the National Academy of Sciences* 111, no. 18 (2014): 6531.

[20] Ibid.

[21] Frith and Frith, “The Social Brain,” 165.

Shawn Steckenfinger and Asif Ghazanfar expound on the concept of the uncanny valley effect, writing,

> It is natural to assume that, as synthetic agents (e.g., androids or computer-animated character) come closer to resembling humans, they will be more likely to elicit behavioral responses similar to those elicited by real humans. However, this intuition is only true up to a point. Increased realism does not necessarily lead to increased acceptance. If agents become too realistic, people find them emotionally unsettling. This feeling of eeriness is known as the "uncanny valley" effect and is symptomatic of entities that elicit the concept of a human, but do (not) meet all the requirements for being one.[22]

With the uncanny valley effect, Steckenfinger and Ghazanfar suggest that when a synthetic agent becomes too realistic it causes unsettling or agitated behavior in humans. In *Drop*, the closest the lighted element gets to resembling human behavior is through immediate mirroring of the instrumentalists. I use the act of mirroring to highlight the behavioral evolution of the lighted element, and by means of the uncanny valley effect, spark dramatic tension between the lighted and instrumental elements. The types of interactions demonstrated up to this point suggest a rapid evolution in perceived awareness, expression, and gestural potential on the part of the lighted element. At measure 165 the four lights flicker on and off in synchrony with soft half-note col legno taps from the instrumentalists. The combination of soft dynamic and synchrony make it a truly uncanny moment. This uneasy mechanical unison lingers for some time, with the half-note clicks at 135 beats per minute suggesting a slightly agitated and accelerated ticking of a clock.

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[22] Shawn A. Steckenfinger and Asif A. Ghazanfar, "Monkey Visual Behavior Falls into the Uncanny," *Proceedings of the National Academy of Sciences* 106:43 (2009): 18362.

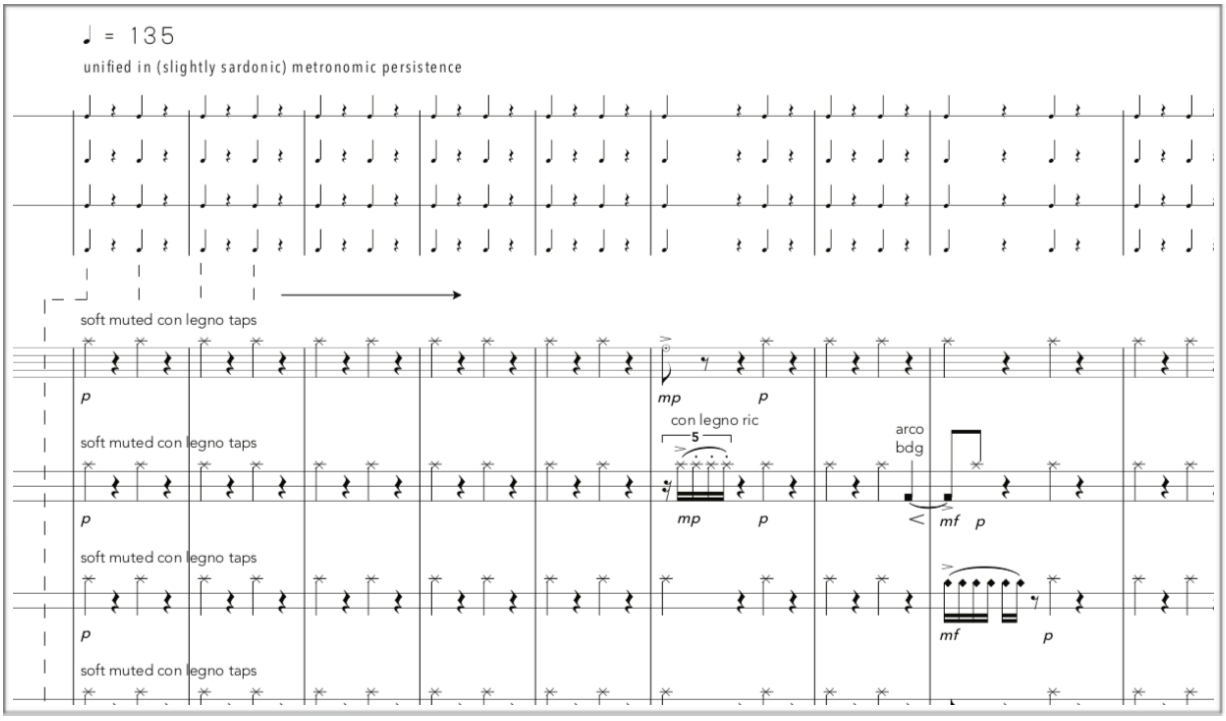

Figure 2-11: Measure 165, col legno “click” section.

This moment marks a shift from the ambivalent yet balanced relationship between lighted and instrumental elements towards a relationship where the lighted elements become personified with aggressive and dictatorial tendencies. As moments like this accumulate, the instrumentalists become increasingly agitated, and frequently strive to express their freedom within the increasingly confining mechanism of the lighted elements. This is made increasingly clear when the synchrony of the “mirrored” col legno gestures begin to phase at measure 183. Phasing is when one musical passage is played at a fixed tempo while another is played slightly slow or faster, and at measure 183 this phasing process prompts a nightmarish agitation amongst the performers which leads to the introduction of a new section of the piece.

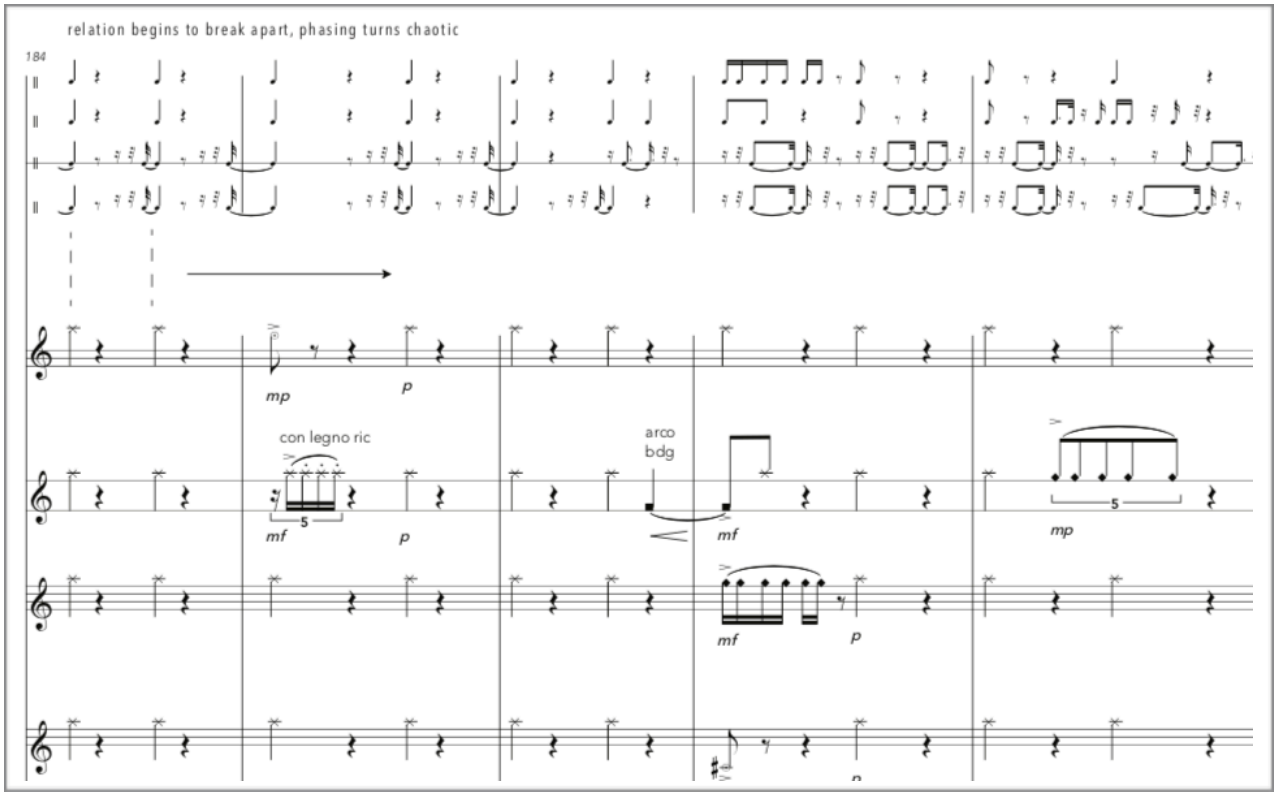

Figure 2-12: Measure 183, agitated col legno “click” section.

Throughout the rest of the work, the instrumental elements struggle to find expression in the heightened control of an increasingly commanded and mechanized soundscape. This struggle is explored as an expressive feature in its own right. At measure 230 the first violin is locked in a rapidly repeated perpendicular bowing pattern, a malformed tremolo which is combined with synchronized lighting and gurgling synthesized sounds evoking the connection ritual of modem dialup. The repeated pattern is not idiomatic and places considerable stress on the bowing hand which causes frequent synchronization issues. These variations would likely go unnoticed if they weren’t tied to the repeated flickers of the strobe light directly behind the player. The combined visual experience of the two elements portrays a performer, tasked with an inconvenient technique, struggling to keep pace with the rigid perfection of the technological device. This is

an act which resonates with several pre-existing human/technology narratives in fiction, including the folk stories of John Henry, Charlie Chaplin's 1936 film *Modern Times*, Ambrose Bierce's 1899 short story *Moxon's Master*, and others.

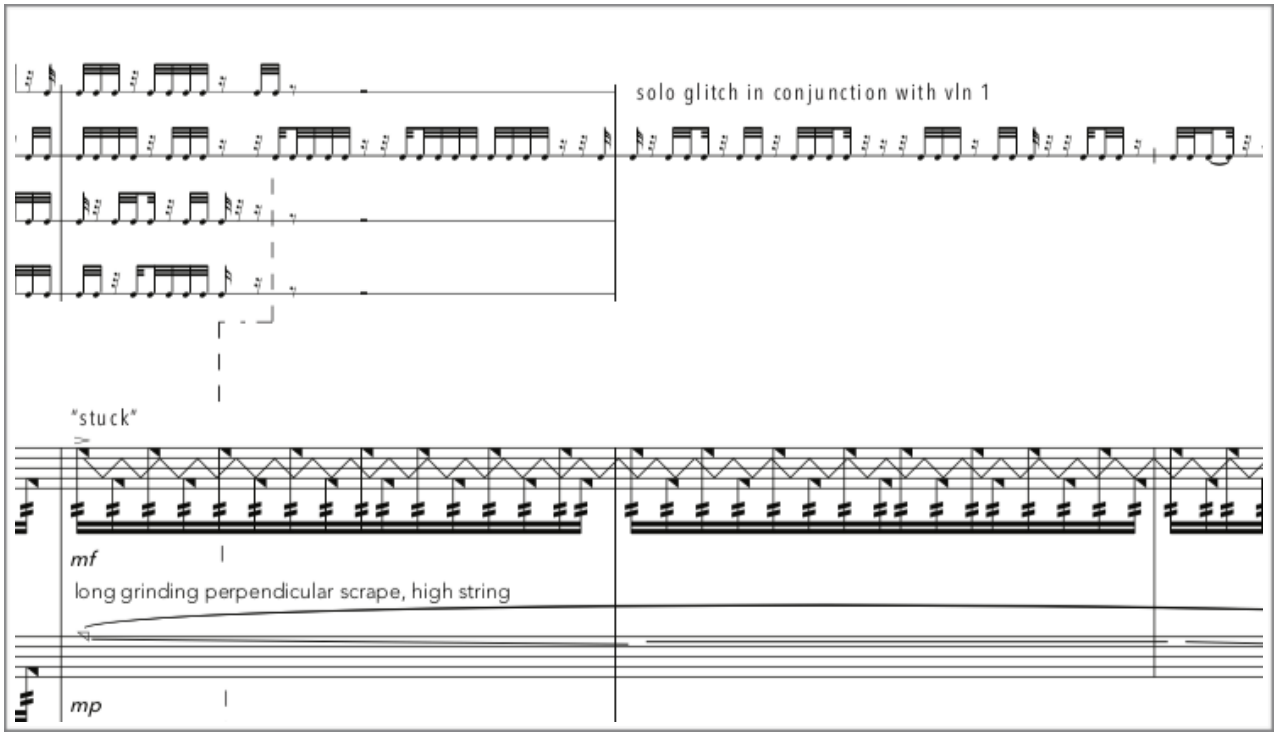

Figure 2-13: Measure 230, 1st violin perpendicular tremolo.

Another example of heightened control occurs when the lighted element seeks to illuminate tutti moments of rest. In moments like this, the performers are instructed to freeze and appear frozen as a result of the lighted elements. "Heightened control" in this context suggests that the lighted element is puppeteering more than just the musical actions from the performers, but their entire physical behavior. An example of this occurs at measure 271, where the performers freeze in the silences between wild tremolo outbursts, and this moment contrasts with

structurally similar moments earlier in the work such as in measure 223, where those tutti silences are punctuated by darkness.

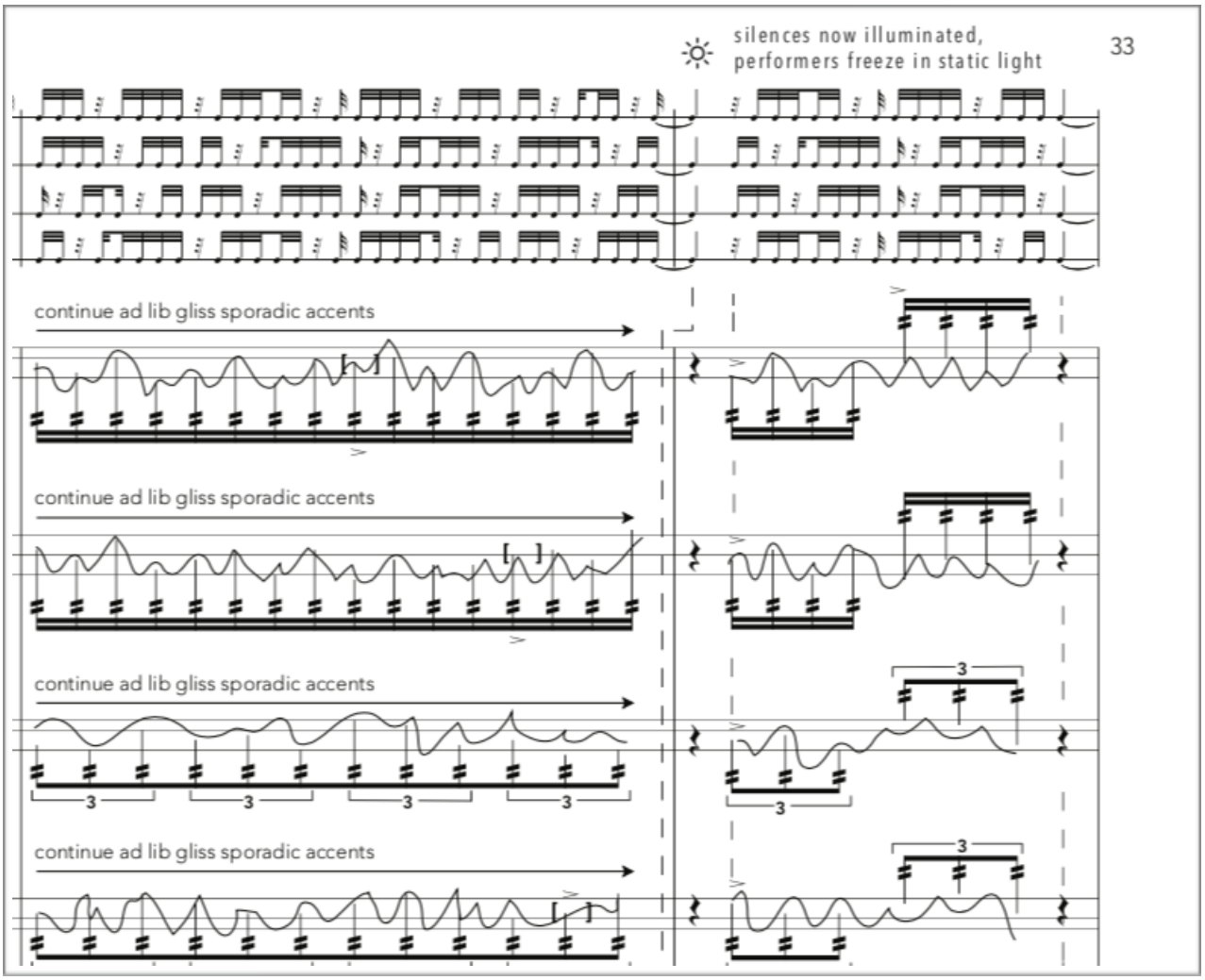

Figure 2-14: Measure 271, tutti tremolo and “frozen” rests.

Exploring Hybridity

Up until this point, the lighted elements have exerted increasingly more control over the instrumentalists, unveiling a rather dystopic narrative and antagonistic characterization of digital

technology in the process. The culmination of these actions, however, reveals a less heavy-handed and more ambiguous outcome. After infiltrating the tutti rests, from which the lights have commandeered all performed and unperformed modes of expression, the relationship between the lighted element and the instrumental component enter an odd hybrid relation. At measure 287, the performers are frozen, illuminated by the lights. Collectively they enact a tutti up-bow, which visually appears to anticipate a unison attack from the entirety of the ensemble. However, at the moment of the expected entrance, the lights turn off; the performers (now in darkness) do not bow their instruments, and instead, a room-rattling 60-hertz sine tone emanates from the speakers. By showing the anticipatory gesture and hiding the expected moment of attack, this creates a momentary illusion that the instrumentalists are producing the 60-hertz tone. This moment constitutes a new hybrid relationship between the instrumentalists and lighted element, one which collapses the preceding oppositional entities into a singular multi-media instrument.

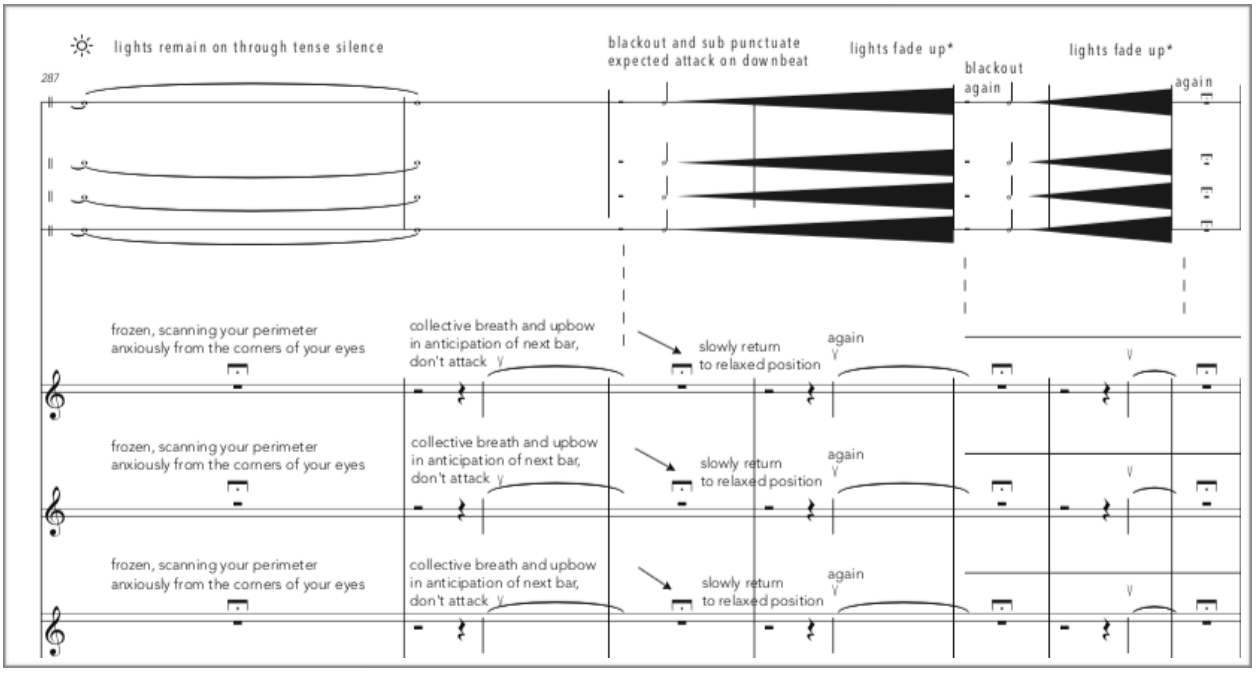

Figure 2-15: Measure 287, hybrid anticipatory gestures.

Chapter 2: Decoder

2.1 Overall Form and Narrative

Decoder is written for 3 MIDI drums, scrim projections, and electronics. It was composed for the Geneva-based percussion collective Eklekto Geneva, and was premiered in Geneva, Switzerland on November 4th, 2017. The work utilizes three percussionists, arranged in a row facing directly towards the audience. In between the performers and audience are three large projection scrims which receive video-mapped projections from a projector above the audience. The percussionists perform on MIDI drum pads which are connected to a computer and trigger and manipulate audio samples. In addition to this, a digital audio workstation is used to synchronize pre-recorded sounds, the projected video component, and a click track which is sent to the performers. The click track allows the performers to look directly towards the audience while continuing to stay in sync with the other members of the ensemble. Ultimately, the work extrapolates on the characteristics of screens to examine the various ways that digital screens connect and disconnects individuals. These characteristics influence various levels of the work, including the notated musical material, the performance technology, video projections, and the dramatic staging of the work more broadly.

As the strobe light was for *Drop*, the screen becomes the primary metaphor and inspiration for the work *Decoder*. Our contemporary world is saturated with digital screens, as they have become the primary way to interact with the internet and the digital content it provides. With our lives becoming increasingly dependent on notions of connectivity, whether through social media, work email, or streaming digital content, the value, use, and pervasiveness of screens continue to escalate. As Farhad Manjoo writes,

> For much of the last decade, a technology industry ruled by smartphones has pursued a singular goal of completely conquering our eyes. It has given us phones with ever-bigger screens and phones with unbelievable cameras, not to mention virtual reality goggles and several attempts at camera-glasses. Tech has now captured pretty much all visual capacity. Americans spend three to four hours a day looking at their phones, and about 11 hours a day looking at screens of any kind.[23]

While a screen offers a direct connection to the digital world, the etymology of the word in English provides an opportunity to reflect on how its technology shapes the world, its information, as well as its viewers more broadly. While a desktop, smartphone, laptop, or television screen could be thought of like a window, or portal, to gain access to digital content, the origin of the word relates predominantly to that of a barrier. As Lucas D. Introna and Fernando M. Ilharco write,

> The origins of the word 'screen' can be traced back to the 14th century. According to the Merriam Webster Dictionary (MW, 1999, 2000), the contemporary English word screen evolved from the Middle English word screne, the Middle French escren and the Middle Dutch scherm. It is a word akin to the Old High German (8th century) words skirm, which meant shield, and skrank, which meant a barrier of some kind.[24]

While a screen can be understood within the context of a physical barrier, it's contemporary usage unquestionably extends to other functions and applications, as well as hybrid iterations of 'barrier-ness' as well. As Lucas D. Introna and Fernando M. Ilharco write, "Today, the word screen is used both as a noun and a verb and its contemporary plurality of meanings can be brought together along three main themes: projecting/ showing (e.g., TV screen) hiding/protecting (e.g., fireplace screen) and testing/selecting (e.g., screening the

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[23] Farhad Manjoo, "We Have Reached Peak Screen. Now Revolution Is in the Air," *The New York Times*, June 27, 2018.

[24] Lucas D. Introna and Fernando M. Ilharco, "The Ontological Screening of Contemporary Life: A Phenomenological Analysis of Screens," *European Journal of Information Systems* 13:3 (2004): 226.

candidates)."[25] While the acts of projecting/ showing, hiding/protecting, and testing/selecting tend to conflict with themselves, their conflicting features become important areas of analysis when discussed in the digital domain, as a digital screen may function as a projection surface, a window, a barrier, a frame, or a filter, or all of these simultaneously.

Outside of their varied uses, screens manipulate social behavior in a significant way, having the ability to attract, gather, and isolate individuals.

> From our initial attempt at "seeing" the screen, as it screens, we note that a screen gathers the attention of the people that surrounds it. The actions of those people are usually directly shaped by the presence of the turned-on screens, by the kind of information they present, and by the understanding people surrounding them implicitly assume of that data, which generates – or assumes – particular comportments and attitudes. The above description of a screen points to the notions of showing relevant information for and about each particular situation: of calling for attention, of suggesting relevance, of acting as mediation between ourselves and the world, and of gathering and positioning what is appropriate in each particular context.[26]

Introna and Ilharco's analysis suggests that screens possess a dominant psychological influence in our world, and have the ability of shaping individuals, as well as society more broadly. Ultimately, it is for these reasons that the screen becomes an intriguing and elusive topic to explore in composition, and *Decoder* in many ways becomes an exercise in exploring the various interactions and implications suggested between digital screen technologies and live performers. Even the title bears a relationship to one of the many functions of a digital screen. Broadly speaking, to decode is to "convert (something, such as a coded message) into intelligible form," "to recognize and interpret (an electronic signal)," and "to discover the underlying meaning of

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[25] Ibid.

[26] Ibid.

[something]."[27] As Stacey O'Neal Irwin writes, "Most digital devices today include a screen of some sort as part of its interface, to "translate" the technology code."[28] She also notes that most screens, "cannot reveal their inner workings. In fact, almost all interfaces are designed to hide the code."[29] If one of the functions of a screen is to hide a digital devices inner workings as Irwin suggests, the act of "Decoding" could be understood as an effort to peer beyond the veil of that which is encoded on these devices, and the illuminate and seek to understand the ways in which we may manipulate and in turn be manipulated by digital screen technologies.

2.2 Screens

Partitioning the performers and audience are three 3x6 reflective nylon mesh projection screens. Visual projections designed by Myles Emmons are front projected onto the screens, though the porous nylon mesh material allows some light to escape through the screens and illuminate the performers. Because of this, from the audience perspective the projections and performer are often in view simultaneously.

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[27] "Decode," in *Merriam-Webster*, n.d., accessed January 20, 2019.

[28] Stacey O'Neal Irwin, *Digital Media: Human-Technology Connection* (Lanham: Lexington Books, 2017), 57.

[29]Ibid., 55.

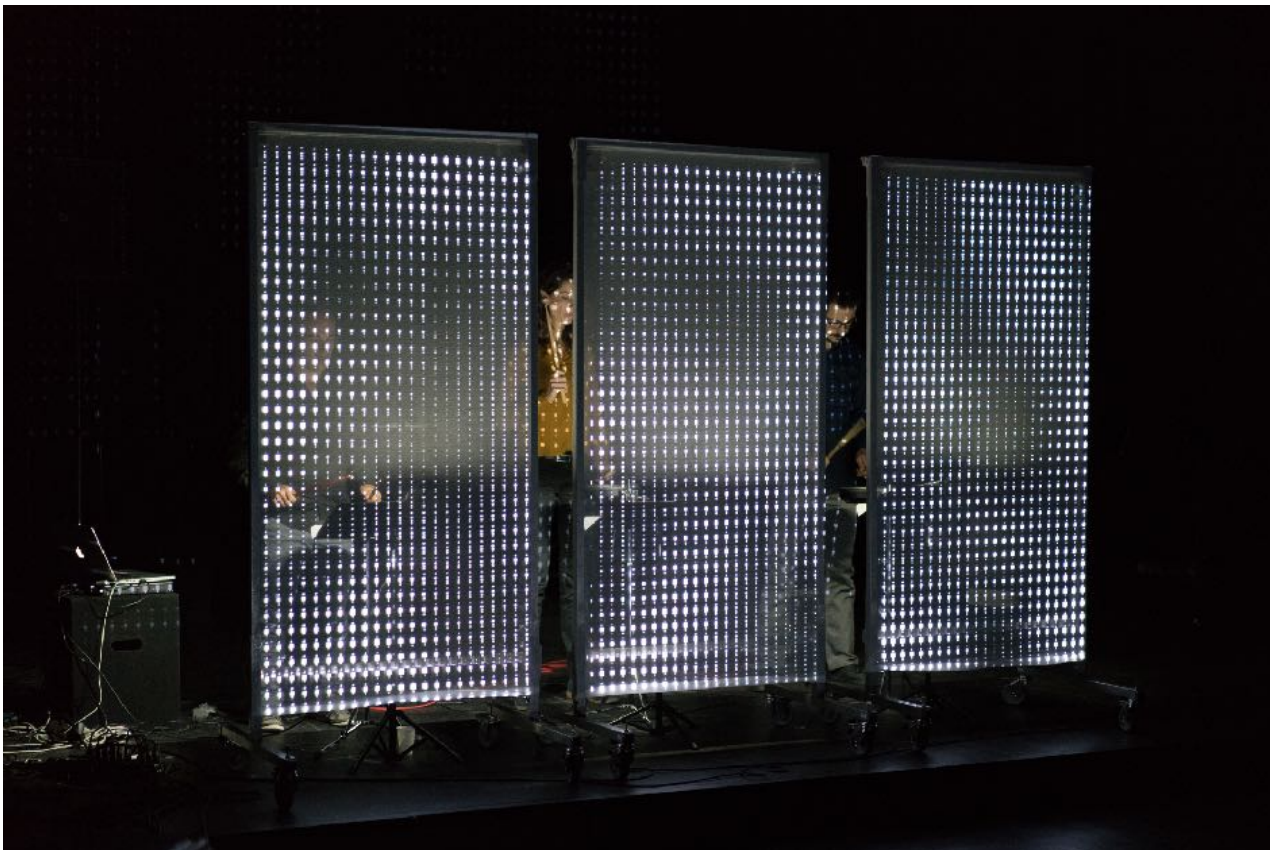

Figure 3-1: Rehearsal photograph depicting an audience's view of the screens in *Decoder*.

Oppositionally, the performers are largely blinded by the front facing projector and can only focus on the notated music directly below them. Importantly, because the performers are facing forward and down, they never cue or make eye contact with the adjacent musicians onstage; all synchronization occurs via click track. The perspective imbalance between the audience and performers objectifies the role of the performers, trapping them in a logic in which they are unable to fully grasp the reality and intention of the experience they're supposed to grapple with. Additionally, it could be interpreted that an audience member sees the failings of performance in this imbalanced presentation as the individual performers "blinded by their pursuit of perfection" (indeed, they are always playing to a click track as well as highly

mechanized pre-recorded rhythmic material), any mistake readily becomes apparent to an audience.

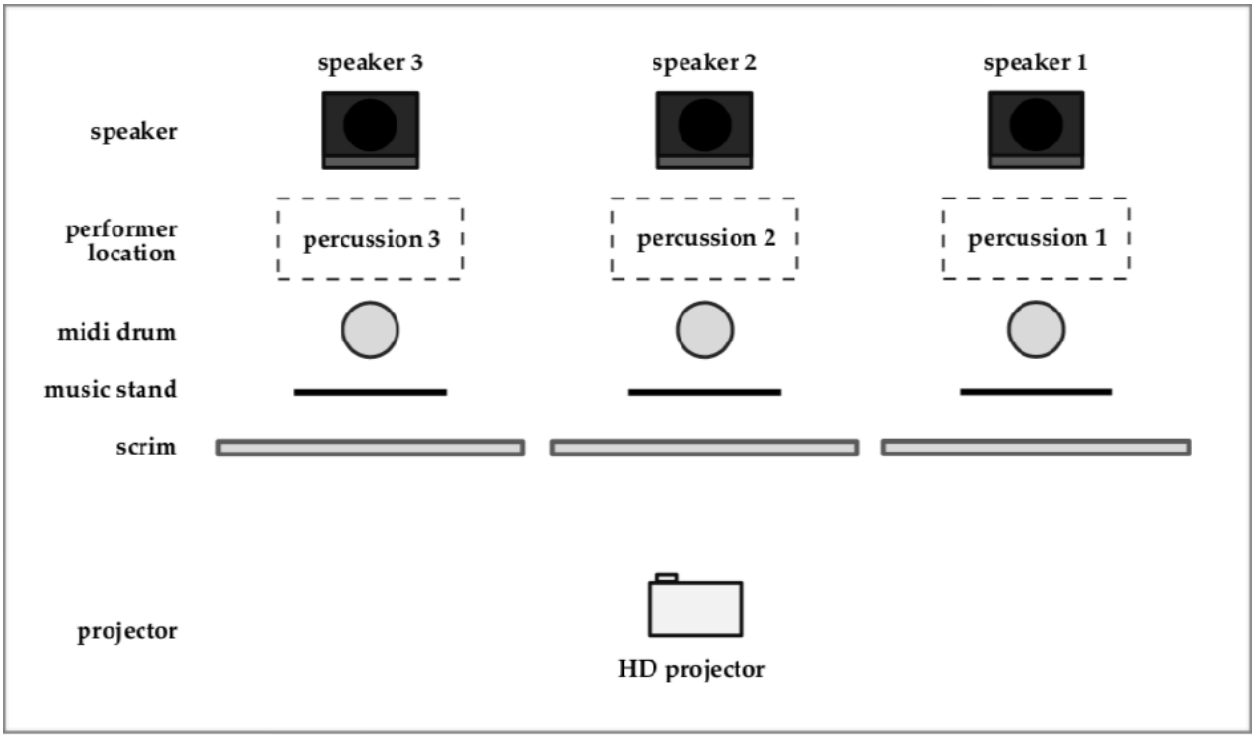

Figure 3-2: Overhead view of performance technologies in *Decoder*.

2.3 MIDI Drums

The work utilizes three percussionists, each performing on an electric MIDI drum. These instruments do not produce sound on their own, but use a piezo transducer to detect attacks on the head of the drum. These attacks are registered as bursts of amplitude which are sent through a traditional quarter-inch cable to a MIDI decoder, a crude audio-to-digital converter, which turns the analog bursts of amplitude into an abstracted digital MIDI signal, which could then be used to trigger audio samples, effects, or new sections in performance. I was attracted to the idea of MIDI drums in the context of the project due to the immensely didactic quality exhibited in

traditional percussive performance, and how the visual/sonic relationship between anticipation>impulse>sounding result follows a rather expected and realized trajectory.

Figure 3-3: Image of MIDI drums and performers in *Decoder*.

Because MIDI drums separate performance impulse from sounding result, they offered a sonic analog to Stacey O'Neal Irwin's depictions of a screen, functioning similarly as veils for the code and digital workings underpinning computer interaction. In doing so they offered the ability to obfuscate the expected visual/sonic relationships between anticipation>impulse>sounding results in a percussive performance. The attack, decay, sustain, release of a triggered note could conflict with the visual expectation of a particular attack, or a sharp attack could trigger an evolving pad texture as well as virtually any non-percussive sound.

2.4 Unpredictability

As Jacques Ellul notes, one of the salient characteristics of a technological society is the prevailing notion of unpredictability,[30] a feature which I sought to integrate into this performance system in a significant way. In *Decoder*, there are 29 different cues which are triggered throughout the piece. These cues tend to occur around prominent formal progressions and mainly function to provide performers with new sounds for each section. For each cue, each instrument has a database of 4 - 10 possible sounds from which the computer can choose. Each cue has a different method of selection; it could be randomly weighted, or it could be step-wise. The sounds could also be pitch-shifted or reversed in unexpected ways.

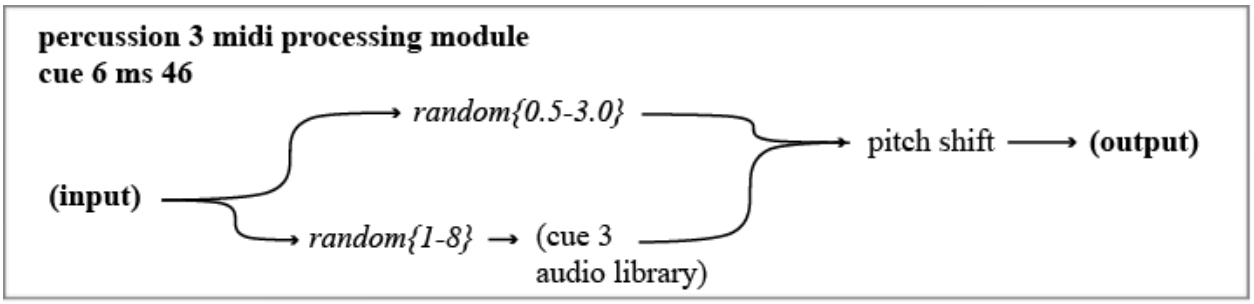

Figure 3-4: A typical processing chain for MIDI events in the piece.

At cue #6 in ms 46, MIDI input triggers two random objects, one selects a random sound file within cue #6's database, and the other randomizes the playback speed of that sound. At that point, the signal is outputted to the corresponding speaker for that performer.

An additional layer of unpredictability is added, where an impulse from one instrument can trigger or "sabotage" the sounds of the adjacent performer. This effect is realized in the form of a glitch which momentarily freezes or defeats the musical intentions of the nearby player. The

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Jacques Ellul, *The Technological Bluff* (Grand Rapids: William B. Eerdmans, 1990), 77.

glitch is comprised of rapid repetitions, short (30-100 millisecond) samples, of the sabotaged player's preceding performance. Additionally, the repeats are subtly randomized per each implementation, occasionally with collapsing or expanding sample ranges, creating the effect that the density of the glitch is accumulating or dissipating. Ultimately the effect lasts until any member of the ensemble triggers a subsequent note, and while the sabotage effects are implemented sparingly, and are randomized and triggered only in certain sections of the work, they offer a valuable layer of fragmentation and instability in the overall musical texture. Additionally, they obscure the audiences visual expectations of the live performance and also blend into the pre-recorded/acousmatic sounds that coexist in the work.

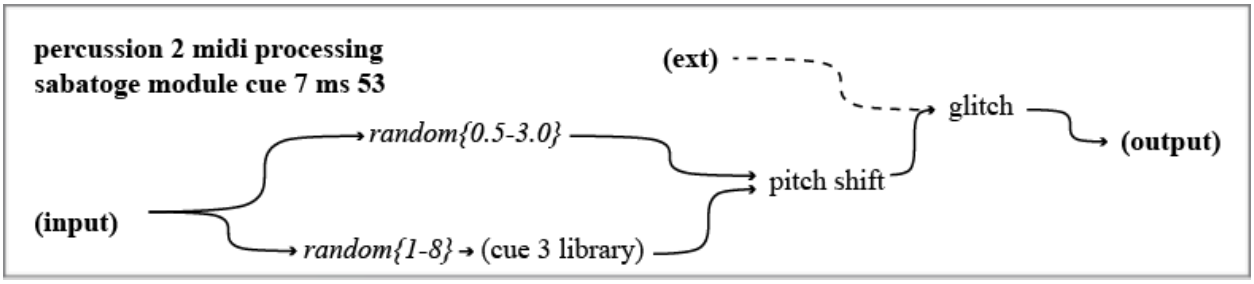

Figure 3-5: Processing chain for "sabotage" effects

“Sabotage” effects occur sporadically throughout the piece. At cue #7 in ms 53, just like the traditional instability module, MIDI input triggers two random objects; one selects a random sound file within cue #6’s database and the other randomizes the playback speed of that sound. At that point, the sound is susceptible to sabotage from an adjacent performer. When a performer is a victim of sabotage, their signal is glitched using Max/MSP's stutter object. That signal is then outputted to the corresponding speaker for that performer.

Another layer of unpredictability occurs on the structural level when performers are asked to enact large swells of acceleration and deceleration. In these instances the performers are equipped with a simple performance module that slowly shifts the pitch of a Roland 808 electronic tom drum sample upwards. Because of the natural instability of the acceleration and deceleration passages, certain performer's sounds are pitch-shifted at separate rates than others causing a gradual fracturing of the starting pitch's general sense of stability. This module is used to slowly enact a swarming dissonance among the performers and create a general sense of tension before moving onto the penultimate section of the piece. Even though the act is very straightforward if one person gets off, it becomes impossible to tell who is right or how to tune if the only option is to pitch shift upwards slowly.

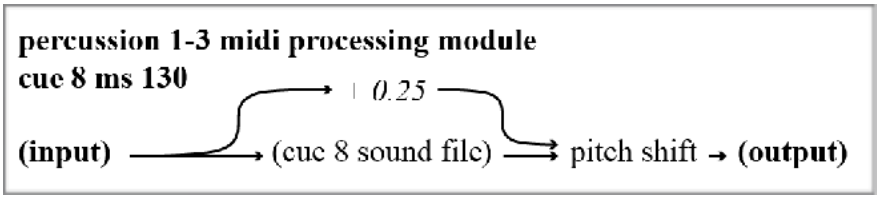

Figure 3-6: This figure depicts the processing module for the pitch shift gesture that occurs at measure 130.

2.5 Blind Influence

Ultimately the elements of unpredictability, sabotage, and swarm aim to highlight and negotiate the division between intended human action and technologically mediated result. The performance technology in the work places the performers in a situation where they are unaware of the consequences of their actions; they might be following the score correctly but be

influencing an adjacent player's sound, obscuring the overall musical structure, or leaving traces or sonic elements that bear no relation to the input they are providing the system. This invisible influence was an important feature to convey in the work, as it does suggest a relationship to the way in which technology hides its negative consequences. As Jacques Ellul notes, "technology leads a double life, one which conforms to the intentions of designers and interests of power and another which contradicts them—proceeding behind the backs of their architects to yield unintended consequences and unintended possibilities."[31] *Decoder* ultimately designs a situation inspired by the metaphor of a digital screen and does so by implementing elements of unpredictability, sabotage, and unintended consequences.

2.6 From Skin to Screens and the Digital Hand

In the final section of the work, a wire mesh hand is depicted on the center screen, faintly glitching while rotating. During this passage, the performers are *tacet*, yet the moment is accompanied by a granulated vocal fragment, arbitrarily scanning through different vowels on a unified pitch. This is the first sound and image relationship that bears a strict resemblance to a human feature, and the moment is significant for its relation to the various materials in play in the work. As Introna and Ilharco note, one of the original definitions of "screen." related the idea of a screen to that of skin:

> The word screen still suggests another interesting signification, further away from us in history. It is a word "probably akin" (MW) to the Sanskrit (1000 BC) words carman, which meant "skin," and kra¨nti, which signifies "he injures" (MW). These meanings, possibly, are the ones from which the Middle Age words evolved. The Sanskrit meaning suggests the notions of protection, shield, barrier, separation, arose, possibly within the

[31] Ellul, *The Technological Bluff,* 39.

> older Proto-Indo-European language, as metaphors of the concept of skin – possibly that of human (or animal) skin.[32]

While the performers are visible behind the screens throughout almost the entirety of the piece, their skin acting as a secondary screen, this particular moment highlights the distance/difference between the two entities to significant effect. It also aims to show how the screen, as well as digital technologies more broadly, account for this distance.

Additionally, the choice of the hand, as well as the symbolism it carries, attempts to cement this connection further. The initial definition of "digital" from Merriam-Webster highlights the word's corporeal roots: "of or relating to the fingers or toes."[33] The definition relates the adjective to a culmination of digits (fingers) stemming from the Latin root digitus meaning "finger" or "toe." Historically, as fingers became synonymous with counting, as well as elementary math, the concept of digitus or digits could be described with the adjective digital.

Today, the connection between corporeal and mathematical concepts of the digital are particularly strong, as portable computers have made our tactile relationships with computing technologies, including gestural behaviors, more important than ever. This moment aims to highlight and explore the linguistic connection between human and technological, namely digital, elements. However, it could also be seen as an exemplary aim of the entirety of *Decoder* more broadly, in its effort to explore the connection between human and technological elements, in this case the screen and digital technologies.

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[32] Introna and Ilharco, 226.

[33] "Digital," in *Merriam-Webster*, n.d., accessed January 20, 2019. Web dictionary?

Figure 3-7: This figure depicts the wire mesh hand that appears at the end of the work.

Conclusion:

The various characterizations of the technologies explored in *Drop* and *Decoder* offered a means to examine and exploit dramatic relationships between human and technological elements on stage. Additionally, these characterizations informed the design of the performance technologies and inspired the musical material and dialogue between human and technological entities in a significant way. Ultimately, my aim with these works was to create a space in which to critique, comment, and reflect on the interactions we have with technology in our daily lives.

Despite these technologies often being characterized with hostile attributes or personified with malicious behaviors, it was not my intention to equate Post-Digitalism with being "anti-digital." While I was inspired by the dialogue surrounding Post-Digitalism and the broader disenchantment with digital technology, In many ways I used these works as a means to reflect and process my relationship with technology in both my personal and artistic life. As a result, this research imbued the interactions between performer and electronic elements with a heightened degree of intention, drive, and detail which I hadn't considered prior. Additionally, this approach also had me reconsidering the role of the physical performer in electroacoustic music in a more thoughtful manner. Ultimately, whether informed by a Post-Digital critique or not, I do believe that this approach to characterizing performance technologies through metaphor will continue in my upcoming works.

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