Brittle Configurations

Practical Explorations on Games and Vibrotactile Media

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By: Ida Toft

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Signed by the final examining committee:

Chair

Adel Jebali

External Examiner

Emma Westecott

External to Program

Miranda Smitheram

Examiner

Chris Salter

Examiner

Bart Simon

Thesis Supervisor (s)

Lynn Hughes

Approved by

Dr. Rachel Berger Chair of Department or Graduate Program Director

Dec. 14, 2021

Date of Defence

Dean,

Abstract

Brittle Configurations: Practical Explorations on Games and Vibrotactile Media
Ida Toft, PhD
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This dissertation presents the written portion of a research-creation PhD exploring vibrotactile technology in the context of artistic and creative game development. *Brittle Configurations: Practical Explorations on Games and Vibrotactile Media* features four games that use vibrotactile technologies as a primary expressive modality. Vibratory expression crosses boundaries inexorably: materially, anatomically and semiotically. Focussing on the vibrotactile in the context of game development therefore allows for a refiguring of what Aubrey Anable has called the surface/depth dichotomy in game studies—a tendency to associate representation with the surface, and computation with depth. This dissertation details the development process of the four games mentioned above. Four chapters present these four respective development processes, introducing expressive, ethical, practical and technological concerns of artistic game development. These development chapters alternate with reflective chapters contextualizing and complementing the examined making processes. In seeking out a design strategy that not only accommodates difference but appreciates it, this dissertation articulates how I worked toward vibratory media that abandon the closed loop of signifier and signified and become open signifiers, hosting memories, speculation, imagination, poetry, and inquisitive thinking. A critical examination of the role of container-like metaphors in game studies offers new perspectives on how tasks and responsibilities (such as playing, executing, policing, evaluating, rewarding) are distributed throughout circuits of playful media. Together with non-verbal and non-human modes of communication, as well as a series of alien robotics, these examinations bring about reflections on what I call fragile games. A fragile game aesthetic features situated and relational game design as an alternative to universal guidelines of "good game design" and aesthetics of purity, stability, resilience, and individuality. The evolution of these explorations culminates with the development process of the game *Where Stillness Breaks*, an installation that explores memories, associations, and speculative connections in the space between felt vibration and words.

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Content

Chapter 1: Introduction

When Aubrey Anable turns her attention to touchscreen technologies in her recent book it is to explore what she calls "the structuring binary for game studies" (2018, p. 50). The binary she refers to is a dichotomy between computation and representation, a dichotomy that has most famously played out in what was coined the narratology versus ludology debate but which runs much deeper than a single debate. The computation/representation dichotomy organizes conversations about game media via a dichotomy of surface (screens) and depth (code), the subjective versus the objective, meaning versus system, narrative versus choice, aesthetics versus mechanics, game versus politics. Anable complicates these dichotomies with her study of touchscreens and the way they resist "locating properties like texture, tone, and feelings in a purely subjective experience of reception or as the exclusive property of a text." Instead, bodies, devices, images and code are enmeshed in dynamic relationships and properties like texture, tone, and feelings are located "in the slippery and intellectually fraught place in between" (2018, p. xiv).

When I chose to work with mechanical vibrations it was with a similar sense of its potential to complicate the systems with which we think about game media. Vibratory media is used as an interface technology yet it resists both language and easy tropes around politics and representation. Vibrotactile rumble is simultaneously referential and physical, it points to memories, metaphors and imaginations beyond the signal itself and it shakes our bodies to the core, causing specific bodily states of comfort, calm, agitation, or unease. Vibrotactility is part of the "superficial" representational layer of games, yet it comes from deep within the mineral bodies that hold the codes of the game. Like Anable, I wanted to address this slippery place in between. I chose vibrotactile media as the case for my artistic explorations of that place.

Vibrotactile sensation itself seems to embody the same paradox, spanning the surface/depth dichotomy. Vibratory sensation is categorized as one of the senses belonging to the sense of touch, often referred to as the haptic sense, yet vibratory frequencies are sensed beyond the skin– throughout the body, including the tissue around muscles, guts and inner organs. Thus vibrotactile stimuli affect the inner functioning of our bodies, including heartbeat, saliva production and the parasympathetic nervous system (e.g. Hiraba, et.al. 2014). Media scholar Steve Goodman has pointed out how these bodily and physical effects of vibratory sensation both above and below hearing range have been used as technologies with war, governance, and control applications (Goodman 2010). For instance, during November 2015, media outlets reported that

sonic bombs were being used by the Israeli military on civilian populations in the Gaza Strip, causing a long list of physical and mental injuries, including miscarriages, heart problems, headaches, stomach aches, ear pain, nosebleeds, and, especially in children, panic attacks[1]. Goodman anticipates such effects when he speaks of "a politics of frequency," referring to the ways certain frequencies manifest in our bodies in more or less livable ways, and the use of such effects in political disputes and domestic governance.

As I will elaborate throughout this thesis, on the one hand, touch-based media such as vibrotactility escape semiotics, strictly speaking. In this way such media might seem ill-suited for storytelling, politics and representation. On the other hand, Black feminist scholar Hortense Spillers has identified touch as the sensory realm that signifies, more than any other sense, social power, structural difference, and proximity to freedom (Spillers 2016, 2018a, 2018b). While we often think of touch experiences as both private and subjective, how we touch, how we are touched, by whom, in which context, and with what kind of entitlement or permission are all deeply connected to how we fit the grammar of social life. The meaning of touch, probably more than any other sense, follows the intersecting lines of systemic social division and power imbalances.

My study of vibrotactile games sits within what Tom Apperley and Darshana Jayemanne have called game studies' material turn (2012), as vibration never vibrates without an environment. Oscillating signals are transmitted into materials and how they come to manifest is highly dependent on the material they encounter: rocks, plastic, ceramics, wood, silicone, fingers and bodies with various geographic histories all have different ways of transmitting vibration. Vibratory expressions make clear what is true for all technologies: they cannot exist without a physical environment, and how they manifest depends on the histories of the environments they have found themselves in, physical and social ones alike. It seems that vibratory media works to "knock us down a peg," as Amanda Phillips writes, "to put us into our proper context: stuck inside the mess of stories, rules, machines, conflicts, desires, affordances, constraints, and politics with which we continually struggle to actualize ourselves" (2020a, p. 10). Vibratory expressions, like Anable's touchscreens, strike up conversations in that slippery space in between, a space that hardly exists in the polarized debates of computation and representation, and they do it in necessarily grounded and situated ways.

[1] McGreal, Chris, "Palestinians hit by sonic boom air raids," Guardian, Nov 3, 2005, https://www.theguardian.com/world/2005/nov/03/israel

In consideration of these perspectivally-multiple viewpoints, I have come to understand meaning in the context of vibratory media as a layered question. Vibratory expressions are simultaneously historical (referencial), situated (in relation) and biological (physical). How various frequencies manifest in our bodies is differentiated, with the multiple layers rarely easy to disentangle.

Choosing vibratory technology as a foundation for conversations around games and entertainment media does not easily map onto the dominant paradigms of game studies. It has given me a proxy to grapple with how meaning emerges in complex and difficult relationships to society, games, and game culture. Since vibratory perception is still a relatively understudied phenomena, Goodman suggests keeping an investigative approach. As he posits, "(w)e do not yet know what a sonic body can do" (2010, p. 191). Therefore, we ought to remain speculative, and create concepts open to the potential of "new, collective modes of sensation, perception, and movement" (p. xvi). Although Goodman refers here to the auditory spectrum of vibratory sensation, I suggest the same can be said for the felt mechanical vibration. As this dissertation's research will demonstrate, figuring out exactly how to do that was not straightforward. The dissertation narrates four attempts to work with vibratory media as a primary game technology. It concludes with a game where the main play activity is meaning-making in the gap between words and vibratory sensation.

As Amanda Phillips writes, in game studies, "We need new and different stories, but we also need to learn how to tell these stories differently" (2020b). This dissertation answers that call. There is a need for reimagining the field of game studies, a need for new stories that can restructure the expectations and rules of the field. I propose an artistic and creative approach to knowledge production as a new kind of storytelling in game studies. Research-creation projects have the possibility to draw conclusions without pruning out unaligned references and unresolved questions. I hope my approach to research-creation succeeds in telling stories that do not follow the lines of game studies' surface/depth dichotomy. Formalizing play using vibration technologies has worked as a proxy for exploring other worlds, novel logics, and new relations.

Introducing the Research Questions

The 19th century's introduction of new technologies, such as railroads, cars, the telephone, and radio, introduced a new phenomena: electrically-powered mechanical vibrations. More recently, we have witnessed a development of high-quality sound systems, small, affordable motor technologies, as well as the implementation of vibrotactile motors in everyday technologies such

as mobile phones and game controllers. These developments allow for computationally-produced vibration patterns to enter the context of creative and artistic expression. This thesis explores the possibilities of felt mechanical vibrations as a technology for digital game design.

Question 1: Game Creation and Felt Mechanical Vibrations

The first question explores, via research-creation, vibrotactile technologies as a primary technology for expression in digital games. As media scholar David Parisi has elaborated, considering vibratory technologies as potential carriers of meaning extends a tradition of 20th-century psychologists, scientists and interface engineers engaged in efforts to develop a tactile language around vibrotactile computer systems (2018).

If we think of games as relational situations, in which the rules, constraints and choices are given, they "ask us to understand, on a cognitive level, the underlying logic of their systems" (Anable 2018, p xii). Borrowing human computer interaction (HCI) scholar Lucy Suchman's terminology (2007), this means a form of communication takes place wherein the game makes itself intelligible to the players and vice versa. While it is true that game studies have treated the audio-visual aspects of videogames as inferior, the cases that have gained academic attention are almost exclusively games that rely on audio-visual technologies, such as screen, text and sound. Furthermore, even as a significant portion of contemporary games make use of either the rumble features of console controllers or the haptic features of mobile phones, game studies have left vibrotactile technologies noticeably underexplored. This first question asks: how might vibratory signals function as the primary carrier of information and meaning? Consequently, what might digital games look like if they feature vibrotactile motors as the primary expressive technology?

Question 2: A Praxeology of Creative Game Making

In the current landscape of game design research and game design theory, there are a good number of "fundamental" design principles and heuristics for designing games (e.g., Salen and Zimmerman 2003, Adams and Dorman 2012, Myärä 2008). In the area of vibrotactile technologies, there are similar recommendations and best practices for using the rumble feature. The Immersion Corporation, a company specializing in patenting and licensing touch technologies, published a report outlining a list of principles that function as advice for game developers, teaching them how to "give gamers more of what they want: fun, realism, and immersion" (2010). The report engages these three principles—fun, realism, and immersion—to make the argument for companies to invest in the "universal appeal of rumble."

The actual processes of creative game making are rarely as frictionless as these methodologies presuppose. Design advice based on tropes like these is not particularly helpful for creative design practices that have little connection to the mainstream, hegemonic cultures of game appreciation.

To that end, this dissertation presents accounts of what Annakaisa Kultima calls a praxeology of game making (2018). Kultima argues that while game studies have studied the artefacts and the players, they have left the creators and the creative processes of game making unattended (2017). This means we currently lack critical understanding of the processes that bring about the entertainment technologies that both shape and express our cultures. In documenting the making of four games featuring vibrotactile technology as the primary expressive technology, I chart the enmeshment of concerns, networks, and resources necessary to their particular game-making processes.

Game Design As Knowledge Creation Practice

The creative practice of creating games has been part of game studies since long before game studies penned its own origin story with the launch of the journal *Game Studies* in 2001. Ada Lovelace's experiments building a tic-tac-toe machine with Charles Babbage (1815-1852), Maggie Elisabeth's *The Landlord's Game* (1904), Margareth Minsky's work on the *Sandpaper System* in the early 1990's, and Brenda Laurel's 1986 doctoral work with virtual reality and interactive drama are just a few examples of creative and investigatory game-making practices that predate this alleged founding of the field.

Despite the historical precedence of game design practice within game studies, there is barely any conversation of the ways we might assess the value and validity of creative practices in game studies. Laureline Chiapello's discerning review of the epistemological foundation of a series of the most cited sources in game design literature points to considerable confusion about game design's relationship to knowledge production (2017). She points to how game design scholars seem to "craft their epistemology as they go," taking and leaving bits of it as they see fit, often shifting epistemological ground mid-text. Being clear about the epistemological ground on which the knowledge is being produced is useful for teachers and students navigating the literature. I would add that such surfing between epistemological positions results in a lack of clarity, in particular with regard to how each researcher understands the purpose of the game design literature they produce, including the generalizability and limitations of their contributions.

Consequently, there is a lack of both clarity and consensus about the roles and relevance creative practices play in game studies.

This dissertation is located within the tradition of research-creation. In a Canadian context, the term research-creation works to legitimize artistic and creative production within Canadian research institutions (Loveless 2019, St.Hilaire 2018, Noury and Paquin 2020). Accordingly, research-creation is a historically and geographically specific term that emerged when art schools in Canada were merged with their research counterparts and made to fit under the umbrella of the academic institution (Loveless 2019). Moreover, the trend toward recognizing artistic and creative practices as forms of academic productivity within European and other North American universities has also increased in recent years. But while the discussion about the role and purpose of research-creation has been more lively than the conversations addressing game design in game studies mentioned above, a similar lack of clarity and consensus about the roles and relevance of research-creation also persists.

As Natalie Loveless points out, the hyphenation of research-creation suggests that it is a hybrid practice that combines research (academic knowledge production) and creation (art and creative practices) and places them in some under-defined relation to one another (2019). However, the notion that academic knowledge production ought to be groomed for creativity has long become an outdated one. Researchers' creativity is increasingly embraced as a component of academic productivity. In the wake of the "reflexive turn" in ethnography and anthropology, for instance, researchers often include themselves and their personal relations to the fields and phenomena they study in their research. Along similar lines, early work in the field of science and technology studies demonstrated, in observing researchers in action, how scientists in the lab actively and creatively take part in "construction of sense" (Latour and Woolgar 1979). The imperative to deny the presence of a creative practitioner in fashioning knowledge obscures the actual impact of researchers on the practice of science. The image of the researcher as a "modest witness" (Haraway 1997) who simply observes the laws of nature no longer resonates with how we think knowledge is created in the academy. The hyphenation of research-creation is broken where we insist on a different vision in which creative practices are an integral part of the epistemic cultures of art and knowledge production.

A second problem with the hyphenation has to do with the gatekeeping practices associated with a traditional understanding of research as knowledge production within the academy. Academia has traditionally divided knowledge into "objective" and "subjective" knowledge, asserting a dichotomy whereby objective knowledge has represented the kind deemed verifiable within

academic research institutions and therefore considered superior to all other forms of knowledge. Just like the idea of knowledge production as a non-creative practice, the distinction between objective and subjective knowledges has been increasingly set aside. Objective knowledge was verifiable because it fit into what Black social theorist Patricia Hill Collins calls a "Eurocentric masculinist framework" (Collins 1990). This framework obscures how we think about knowledge—what can be known, by whom and how—in ways that create structures for gatekeeping. As in many institutions with significant colonial legacies, the presence of gatekeeping practices in Western universities and research institutions, whereby only select segments of the population are positioned to produce, hold, and verify knowledge, is not a coincidence. Academia's gatekeeping of the structures for knowledge represents an effective means of maintaining and further deepening existing systems of domination, power and marginalization.

To me, the combination of research (as knowledge production and knowledge expression) and creation (as artistic and creative practices) opens up opportunities for fruitful conversations about what it means to know, in particular conversations related to a destabilization of gatekeeping practices and of fixed protocols for knowledge creation. Like Loveless, I am interested in "what research-creational approaches offer to the project of re-thinking interdisciplinary practice and politics in the North American university today" (2019, p. 6).

With this in mind, I have worked to craft an epistemological foundation that might help me to think about valid knowledge outside the confines of the academically verifiable kind, knowledge connected, situated and always accessed in bodies.

I base this epistemological foundation on four related works: Sandra Harding's elaboration of Standpoint Theory (1986, 1992), Patricia Hill Collins' contributions to Afrocentric feminist epistemology in *Black Feminist Thought* (1990), Jackie Orr's conceptualization of symptomatic research (2006), and Donna Haraway's articulation of situated knowledges (1988). These takes on epistemology focus on how the specific circumstances and experiences in which we find ourselves significantly impact the kinds of knowledge and priorities we hold. This epistemological foundation was not clearly formulated at the beginning of my project, but gradually came to be via conversations that came up throughout the process that helped me navigate a creative practice within academia. I eventually came to think of it as the epistemological compass for this dissertation.

In Harding's formulations of standpoint theory, "objective" truth-telling is achieved not by rigorously following a set of predefined procedures but by being true to what one is able to know within differentiated circumstances specific to where one finds themself, circumstances which simultaneously enable and mark the limits of what is knowable. "Strong objectivity," as she provocatively calls it, needs detailed reflection on the connections between the claims of truth and the circumstances with which they are produced.

Learning from the standpoint theory-related concept of "double vision" (Haraway 1988), living (and knowing) at marginal positions make use of two layers of knowledge. There is a mainstream knowledge, which is the global knowledge created by and available to the elite, and local knowledge, which is necessary for navigating the everyday from a particular standpoint. It is this doubling of the ways of knowing that makes certain subject positions more suitable for objective knowledge. Practically, this means that a creative design practice activates both mainstream and local kinds of play, although distinguishing them from one another is not always straightforward.

Together with Sabine Harrer, I have elaborated a framework for standpoint theory in the context of design theory (Toft and Harrer 2020). Building on Harding's strong objectivity, we argue that staying connected to one's particular standpoint during a game design process makes for "stronger design relevance." What we mean by this is that game design that stays connected to lived experiences and particular play preferences has a stronger relevance not only to the designers themselves but for their community at large. These connections provide an alternative to hegemonic objectivity measures such as best practices and universal design guidelines and allows us to leave behind dominant notions of "good" and "proper" game design. This feminist notion of strong design relevance orients design practices toward radically prioritizing developers' unconventional preferences, knowledges, and design situations over, for instance, mainstream game culture's notions of "good games" and "real games" (Keorg 2014, Consalvo and Paul 2019).

Standpoint theory has a history in Hegelian and Marxist-feminist philosophy (Harding 1986, 1992). These White European roots are not without significance. In attempting to author a shared "feminist standpoint," scholars focused on factors that they agreed upon as defining characteristics of "womanhood." This meant that "divisive" factors such as race, class and sexuality were rejected (e.g. Hartsock 1983). Initial suggestions for a feminist standpoint theory, dependent as they were on a gender-essentializing agenda, were then unable to account for the oppression experienced by women who were not part of the White, upper-class, cis-gendered, heterosexual elite. The refusal to include differences as part of the feminist standpoint reinforced

existing social hierarchies amongst women and everyone affected by patriarchal and misogynistic systems, amplifying oppression instead of progressing toward the emancipation of those most disadvantaged.

Conversely, in *Black Feminist Thought*, Patricia Hill Collins (1990) was able to formulate a feminist standpoint theory that can accomodate difference. Instead of defining one centralized standpoint, Collins makes a call for everyone, Black women in particular, to self-define and self-articulate. This self-articulation is less about reclaiming the notion of a feminist objectivity as it is about resistance and survival in a dominant culture invested in Black women's marginalization and subjugation. In contrast to other contemporaneous explorations of the possibilities for a feminist standpoint theory, Collins' work crafts a feminist epistemology that is based on differences rather than sameness.

There is a distinction in Collins' work between knowing and articulation. Knowledge is connected to experience. The challenge is not so much to produce knowledge, as in academia, but to "see, value, and use existing alternative Afrocentric feminist ways of knowing" (p. 232). Knowledge and ways of knowing can, on the other hand, be articulated. While Collins is a scholar and her mode of articulation is written academic language, an academic format is not the only option in Collins' notion of articulation. She frequently references musicians, poets, autobiographers, fiction writers and storytellers as examples of how Black women articulate their standpoints, their knowledge and their experiences. These expressions are validated not according to protocols or "methods" reviewed by members of an external Eurocentric masculinist institution but by the community, by people who navigate similar standpoints. To put simply, Black women can validate expressions of Black women's standpoints.

However, the need for self-articulation is not, Collins writes, limited to a community of Black women. Clearly defined standpoints across social groups make for stronger alliances amongst social justice projects. Self-defined standpoints across different positions support social justice work as a collaborative enterprise by stimulating dialogue and helping to identify points of connection.[2] The need for self-articulation across groups is emphasized as there is no singular collective standpoint for Black women but rather a web of experiences that defines a variety of related standpoints. Members of the Black community have been central to the liberation and formation of a queer community (e.g., William Dorsey Swann, Marsha P Johnson, Sylvia Rivera, Laverne Cox, ALOK, and many more). The need for self-articulation over legally-assigned

[2] This is a point that she emphasizes in later editions of the book (2002, p. x)

gender, imperatives for gender-conforming dress codes, and/or hostile representation in mainstream media is an essential part of queer history and has been emphasized repeatedly (See, for instance, Laverne Cox's documentary "Disclosure," 2020). Self-articulation through clothing, gender-affirming body modifications, language, art, writing, dance, and performance is essential to survival—artistically, emotionally and literally. Games are one media frequently used for self-articulation, and the community of queer game makers has been growing quickly these last couple of years[3]. Part of this trend is game designer Anna Anthrophy's call to fellow "Freaks, Normals, Amateurs, Artists, Dreamers, Drop-outs, Queers, Housewives, and People Like You" to express themselves through game media. As she says, "(e)very new game is a voice in the darkness" (Anthrophy 2012, p. 200). With each game we play, we learn about the people and the cultures who made them. When we play games developed with unique styles, we learn about their authors. Similarly, for every new game that articulates such a unique style, our vocabulary for what games are expands.

Within game studies, a few examples that I consider proximate to this understanding of game development include the doctoral works of Jess Marcotte and Kara Stone, who both similarly bring the reader into the processes of creative game design. These accounts of research-creation-based game development are personal (Stone 2021) and auto-ethnographic (Marcotte 2021), giving the reader nuanced insight into a broad range of factors affecting how their games came to be. Stone, for instance, reports on the influence of topics in the news, concerns of the local community, coincidental encounters with a former student who ends up a co-writer for the game, as well as personal and relational psychosocial dynamics. Similarly, Marcotte's doctoral research includes reflections from conversations with their partner, influences of hobby interests, their trans identity, their community, as well as a constant balancing of desire for creative expression and work-related exhaustion. In contrast to protocols for "good game design," these projects reveal game-making processes that respond to particular circumstances, ressources, ideologies, social connections, and concerns related to community wellbeing. Such forms of game creation and documentation shift attention from conversations about universally good game design, or objectivity versus subjectivity, to ones concerned with situated practices where certain design decisions are expressions of the maker's particular situation.

Additionally, my epistemological grounding borrows from genealogical research. I theorize my creative work in a way similar to what Jacki Orr has called symptomatic research (Orr 2006). Considering my work symptomatically means taking ideas and preferences seriously even when

[3] See the lively attendance of the Queerness and Games Conference as an example

their origin, impact and significance is not obvious. As Orr points out, from a trauma theoretical perspective there is no coherent subject who remembers with conscious confidence how "the social" materialized the way it did—how norms and habits, obsessions and fetishes, came into being. These historically-made connections are often invisible so that both the social and the bodies performing it are oddly secrets to each other.

> *I don't know why this all seems so important to me. (2006, p. 86)*

In a context of creative game development, a symptomatic approach anticipates that even when decisions and play preferences might seem to come out of "nowhere," they have their roots, and it is not always obvious what the symptoms refer to.

The value of personal and autobiographical accounts of game making such as this one and the examples mentioned above is not individualism, uniqueness or self-indulgence. Rather, as Bochner and Ellis ask, "[i]f culture circulates through all of us, how can autoethnography be free of connection to a world beyond the self?" (1996, p. 24). If culture circulates through any moment, then any design decision is an expression of culture as it flows at that particular standpoint. The knowledge production produced in this dissertation is then primarily an exploration and articulation of already existing knowledge and its connections to history, as well as mainstream and marginal social practices.

To examine these connections, the structure of this dissertation shifts between two kinds of writing. Between the four accounts of making processes, I include chapters with theoretical and historical reflections complementing the processes. Each contextualizing chapter is partly an attempt to convey that the process of making existed alongside engagement with theoretical, philosophical and historical literature, and I found that the practical accounts of making did not give enough space for the intellectual aspects of creative game design in an academic setting. The contextualizing chapters were written later and are more evaluative. Treating creative game making practices as situated symptomatic practices allowed me to think of them as expressions that go beyond the individual cases. The objective of these intermediate chapters is to discern these different layers of creative motivations. In place of objective and narrowing principles for "good game design," I hope to contribute concepts, frameworks and language that can expand the imaginative possibilities for what digital games can be. Additionally, I hope to show the delicate and intricate processes of creative making, including a creative practice of navigating different forms of knowledge and shifting demands for the right ways of knowing in a web of various hybridized approaches. Some of these hybrids include art making as it intersects game media and

vibrotactile technology in a context of interdisciplinary research-creation at a colonial research institution on unceded Indigenous land.

Writing Methods: From Creative Making to Written Text

My writing process started in multiple parallel and serial notebook notations. The intended purpose of the making practice was double. I was both creating works to be played by an audience and generating data for a written dissertation. Throughout the creative process it was unclear to me what exactly the focus of the research was and what kinds of notes would turn out to be useful. Some notes were taken with the intention to make "thick descriptions" (Geertz 1973), descriptions that would be useful to the writing later. These included descriptions of my environment, the lab setting, reflections on design decisions, expectations and evaluations of playtests, and the sensory experience of work. Some notes were written in much closer relation to the creative process, with the purpose of being useful in the moment—for instance, by annotating the code with decisions, motor identifications, and vibration characteristics. In a parallel process, I was exploring literature cross-disciplinarily. Most of these readings had little reference to game development or game studies literature.

As I finished the creative production, I gathered all notes in a software that helped me code and categorize them (as learned by Hammersley and Atkinson 2007, p. 136ff). In a less nuanced process, I categorized the literature I had read throughout the process. I went back and forth between these two categories of notes looking for overlaps and conversations between process and literature in order to decide what to include, which parts to shorten, and which parts to elaborate. The descriptions are not one-to-one descriptions of every possible angle of every moment in the process. Projects and topics were cut out. I decided, for instance, to cut out work I had done on cross-species game design in order to maintain focus on the more coherent topic of vibratory technologies. Theoretical and reflective notes were moved to the theoretical sections—again, to create more cohesive production stories. Additionally, the description of the process of learning technical skills and debugging bluetooth technology has been drastically shortened, while maintaining a length that I think conveys a felt boredom and never-ending-ness of the process. In this way, the production stories are curated and modified for readability, while they still convey a sense of the respective affective relation I had to the projects while I carried each of them out.

The writing style is inspired by my training in ethnographic and qualitative research reports. The inclusion of notes from my journal are included as quotes, a style inspired by game developer Jordan Merchner's journals of the making of *Prince of Persia* (2011). The braiding of stories from the making process with historical, theoretical and reflective chapters was inspired by American poet Maggie Nelson and her work *Bluets* (2009). I decided on this format in order to illustrate how theorizing, reading, and historical research happened neither before nor after the making processes. These activities were parallel, interlaced, messy and not always clearly connected.

A Few Words on My Positionality

I do not believe it is possible to account for the full position from which we work, including the myriad of relations, constructions and dynamics that marks a writer, scholar or artist. The following is a few notes on selected themes and frequently asked questions.

Education: The first 12 years of my formal education was in an alternative school system that strives to prioritize art and craft as equal to intellectual topics. At the age of eight, I began singing and choir lessons at the music conservatory. I enjoyed almost ten years of exceptional musical training and performed at prestigious concert halls across the world. I was uninterested in becoming a musician and have not practiced since my teenage years. After a "soul-finding" year studying mathematics and chemistry in the UK, my university education started at Roskilde University in the social sciences cohort, with a specialization in communication and public administration. Roskilde University was built in 1972 as part of the student revolution. It is founded on philosophies of education from the third generation of the Frankfurter School's critical theorists. The curriculum, including syllabi and topics, was developed collaboratively, both supervised and self-directed, with a broader agenda to teach general strategies for critical and "problem-oriented" thinking. Following my Bachelors, I did a Master of Science in Digital Design and Communication at the IT University in Copenhagen. There I met Amani Naseem, whom I worked with throughout the degree. In retrospect, we recognize that I followed her escape from what she calls the "narrow-minded" culture at our Danish-speaking program, and thus we migrated to the more international, and occasionally less racist, social life of the games program. In this way, I was fortunate to be proximate to a lively milieu of experimental game design and game academia. I attended lectures, joined lunch conversations, played early

prototypes, and listened to questions and frustrations that are part of the processes of game making. Eventually, I started making games myself.

Belief Systems: My ontological/religious standpoint spans across multiple paradigms and belief systems. I grew up in Denmark, a country with a history of paganism, violent viking culture, and Christian Protestantism, which has been the country's state religion since the 16th century. Currently, the majority of people are either culturally Christians or atheists who believe in Science over God. Many Christian virtues persist within this new scientific belief system, although under new names. Paganism is present in holidays, rituals, stories and everyday phrases. Christmas, for instance, is equally a celebration of the earth gnomes as it is of the birth of Jesus. My own family is possibly even more eclectic when it comes to ontological beliefs, with my parents simultaneously literate in scientific jargon, the virtues of Christianity, and European occult spiritualism, of which they are practitioners. I find these many overlapping systems of truth and logic refreshing. This cross-paradigm positionality functions in mundane and frictionless ways. I experience this the way many of us navigate the everyday, including our creative, reflective and artistic practices.

Gender: My gender is what is currently called trans non-binary. I identified myself as not-woman some time in my teens during a conversation with friends. It was perhaps most of all a reaction to a gender essentialization I found myself very factually not fitting into. I avoided gender conversations as much as I could until my late 20's, when gender-based violence in both the games industry and media art spaces made understanding the lessons of feminism necessary. I would only occasionally bring up my gender to correct situations in which I was explicitly labelled a wrong gender. This situation happened ten months after living in Montreal when I was labelled a woman three times by the same person. When I brought it up I was to my surprise asked what my pronouns were. The question was to some extent identity-changing, because I had never thought of my gender as fitting any other terms than those of negation. My current pronouns are they/them, but I do not flinch at the use of other ones. Sometimes I even like it, like cross-dressing.

Whiteness: I grew up in Denmark as a White, ethnically-Danish person in a predominantly White community. The racial segregation in Denmark meant that voices of colour were remarkably absent in both my immediate environment and in public debates, even (or especially) with regard to topics related to race. This segregation both shelters the White population from racial tension and protects particular kinds of ignorance and thoughtlessness. My relation to my own whiteness was, until I arrived in Canada, as unreflective as whiteness unfortunately often is.

This position is significant in the study of haptic technologies. As I elaborate in chapter 8, our relation to touch cannot be separated from questions of power and systemic differentiation, including racialization. I have learned from Hortense Spillers (2016) that White people's culture of touch comes with a right to not be touched and an entitlement to touch without invitation that is denied other racial groups in Western societies.

There is a metaphorical relationship between White people's license to touch the world and academic citation practices. My handling of ideas, scholarship and art works produced by colleagues of colour cannot be separated from a history in which White people have co-opted and appropriated the work, culture and land of people around the world. Think, for instance, of the way White settlers and explorers touched new land, charted maps, and worked to categorize every item, plant and specimen of the world. This also includes the way Black, Indigenous, and disabled bodies of all races have contributed, without their consent, to our knowledge about the human body and its senses. There is no undoing of White peoples' history apart from continuing efforts to learn, listen, give credits, and decolonialize.

These are a few themes particular to my epistemological position.

Thank you for reading.

Chapter 2: Vibratory Perception Through Culture and Science

Anatomically speaking, vibration can be felt throughout the body, from the surface of the skin to the deeper layers of our digestive organs. Which part of the body is active in sensing the vibration depends on the frequency. Lower frequencies (between ~10 and 100 Hertz) are sensed by Meissner corpuscles (Mason and Wenger 2019), small nerve arrangements in the outer layers of the skin, while higher frequencies (~20-1000 Hz) are sensed in the Pacinian corpuscles (Quindlen et.al. 2019). Pacinian corpuscles are most densely located in the deeper layers of the skin but have also been located in the connective tissue surrounding abdominal organs such as the pancreas, the thyroid, as well as large nerve trunks and blood vessels throughout the body (Morishita et.al. 2018, García-Suárez et al., 2010). The Pacinian corpuscles are larger, have less defined boundaries, and detect stimuli over a wide area of the skin, which makes them not as precise at determining the exact location of the stimuli. Vibratory sensation is considered part of a category of senses called the haptic sense, a term often treated as synonymous with both the cutaneous senses and the sense of touch. The first mentions of a vibratory sense was recorded in the 1880-90's, (Rumpf 1889, Tomson 1890, Treitel, 1897, Egger 1898). The notion that there could be such a thing as a distinct set of organs responsible for sensing vibrations later became a topic of controversy, in part because it played a significant role in the negotiations of transitioning from one sensory paradigm to another.

This short section gives a brief history of some of the mainstream and scientific ideas about vibratory sensitivity. The history of the senses in this section is from the perspective of those in power, those who wrote and still write the main narratives about our perception of the world. Later chapters will explore touch and vibration from other positions. I first outline a European history of touch starting from ancient Greece and the foundation of Christian philosophy through to the history of sensory physiology. I was curious why we, in Western culture, think of the human body as having five senses. From a contemporary scientific perspective, the number seems strangely arbitrary. As I will examine below, the mainstream models we use for thinking about the human senses make ad hoc use of multiple paradigms of knowledge. This includes both ancient philosophies, which understand the human body to exist within a model of four or five elements, and a contemporary scientific understanding, which has divided the body into many more parts using tools to empirically dissect and quantify the body at a minute scale. The emergence of physiology caused a paradigm shift to the study of sense perception. The discovery of vibratory sensitivity starts with the manifolding of haptic senses and a controversy about the

very existence of organs specifically responsible for vibratory perception. It later leads to the discovery of the two kinds of nerve endings sensitive to vibration.

As I studied theories about the senses it became clear that the history of the five senses is simultaneously a product of political and social struggles and a tool for the very same struggles. Since classical antiquity, senses have been frequently invented and eliminated using techniques of ridicule, shame, glamour and rational argumentation that do not always seem logical within contemporary modes of thought. Those who write the theories of our senses also define what is real, what is possible, what can be talked about, and not least who has authority to make claims about truth. Similarly, contemporary knowledge about the senses features the stories from the science labs written by supposedly detached scientists, and not the people whose bodies we are learning from.

The Five Senses: From the Ancient Greece to Christian Philosophy

This five-senses model of the human body goes back to ancient Chinese and ancient Indian medicine (Jütte 2005), although it is Aristotle who is most frequently referenced as its originator in Western thought. While the notion that we have five different senses was already present in both ancient Chinese and ancient Indian medicine, the sense of touch is absent from most of ancient Greek philosophy. The sense of touch was thus “reinvented” via a theoretical framework developed by Aristotle c.350 B.C. In Aristotle's philosophy, the organ of touch is not the skin (as we later come to think) but a mysterious, undefined inner organ (Heller-Roazen 2007), sometimes translated as the heart or the soul (Jütte 2015). Touch was described as the finest of all the senses, connected to a “higher level” sensing. It seems likely that the use of metaphors such as “being touched” to describe feeling emotionally affected by something stems from Aristotle’s rather mysterious sensory philosophy. The theory of touch, however, did not become widely popular until the foundation of Christian philosophy a few centuries later. Interestingly, while touch, in Aristotle’s texts, had been considered the finest sense, closely connected to the soul, the Christian philosophers gave touch the lowest rank in the hierarchy of senses. Influences from Arab and Jewish philosophers inspired the Christian philosophers to conceptualize a separation between the intellect and the physical body. The senses, which were now more solidly located in the physical part of the body, became associated with sinful thought and behaviour, an ideology that was effectively communicated with the analogy of the human body as a walled city (Classen 2012 p. 12f). The senses were described as being analogous to said city’s walls, with enemies

able to trespass the body's defences through its gates. A noble citizen kept the gates closed to protect their pure soul from an unclean world. This fortification analogy was convincing during the medieval times, when war activities were frequent. Touch became associated with shame, desire, and limited intellect. The eyes and the ears were held in higher esteem, as these were physically closer to the brain and therefore deemed closer to the intellect, so better suited for perceiving knowledge about the divine (Jütte 2005, p. 65). The despicable status of the sense of touch seems surprising considering that Aristotle's writings still held significant authority. The paradox was resolved with the creation of a second hierarchy, one that followed the evolution of man (Jütte 2005, p. 69f.). Touch kept its place as the foundation for the four other senses, the base for all sentient activity. Touch was thereby closer to nature and further away from civilization. The twist that justified the position of the elite and strengthened the idea that they have the finer intellect: fine and delicate skin signified better sensitivity and therefore an increased probability of higher intellectual capacity. While Aristotle's sensory philosophy was mildly modified during the foundation of Christian philosophy, the main elements, including their established total of five, remained relatively unchallenged until the emergence of physiological anatomy in the 18th century.

Physiology: Vibratory Perception as "Haptic" Sensation

Until the 18th century the study of the senses was a topic for philosophy. As the empiricist approaches increased in popularity during the late 18th century, the study of the senses moved from philosophy departments to science departments (Jütte 2005), and thus came to be held accountable to the methods of scientific inquiry. The transition caused a foundational restructuring, conceptually and anatomically.

The five senses, which had survived well in the discipline of philosophy, fell apart as laboratory practices and physiology became the appropriate means for studying them. A multitude of nerve endings and nerve clusters were discovered and, consequently, a plethora of senses were hypothesized, documented and conceptualized. The sense of touch was especially bursting with discoveries that refused to fit any previous philosophical schematic of how our perceptive system works. The "haptic sense" (Dessoir 1892) was coined as an alternative to touch, intended to function as an umbrella term for a range of sub-senses that could be said to somehow belong together.

In the history of haptic physiology, the study of vibratory perception is probably the one that has caused the most controversy. As Echlin and Fessard summarize it, "Anyone who is acquainted with the literature on vibratory sensibility will be aware of the wide divergence of opinions as to the receptors responsible for its appreciation." (1938, p. 313). Central to the debate was psychologist David Katz's phenomenological studies (1925, english ed. 1989). Katz's studies of surface recognition led him to conclude that it is through the sense of vibration that we recognize and differentiate surface textures. Observing his patients recognizing materials significantly better when moving hands and fingertips over materials than they did with a static touch, Katz concluded that the vibrations emerging in the bone joints from this active touch are responsible for the surface recognition of materials. While the vibrations coming from stroking materials can give information about the surface of a material, the vibrations following a tap with the fingertips, or a hit with a hammer, give information about internal structures of a material. When Katz asked his patients to guess materials like metal and wood by hitting them with a hammer, they were able to do so even though the hammer was only in contact with the material for a fraction of a second. Again, Katz claimed, this material identification was due to the vibratory frequencies activated in the material. However, it was Katz's claim that vibratory sensation made up a distinct sense, and thereby also had designated perceptor organs allocated, that was met with most resistance.

Max Von Frey, another expert on vibratory perception, argued that the sense of vibration was simply a temporal aspect of the organs for pressure sensation. The debate between David Katz and Max Von Frey formed strong fronts with arguments on both sides and lasted twenty years before it was settled by a series of papers reviewing the case (Geldard 1940a, 1940b, 1940c, 1940d). The controversy fuelled the research into the vibration sense, giving momentum to a larger debate around the sense of vibration.

Possible receptors for vibration were said to be found in muscles (Neutra 1905), joints, bones, tendons, "deep end organs," middle layers of the skin (Gilmer 1942 and Adrian and Yamagiwa 1935), tissue around muscles (Echlin and Fessard 1938), connections between tissues (Egger 1898), stretch receptors (Echlin and Fessard 1938), and the glomus body (Gilmer 1941). An often-mentioned special bone sensitivity was regularly brought up as much of the research on vibration was done using a tuning fork, a tool that produces the most sensation when placed on a bone and little sensation if placed on soft parts of the body, like the stomach or the tongue. A couple of decades later, the theories of bone, muscle and tissue sensitivity were abandoned. Contemporary literature has settled on the theory of two receptor organs (Pacinian and Meissner

corpuscles) placed in different parts of the body and responsible for different frequencies of vibration. The effects of vibratory stimulation go beyond the specific location of these two receptors, as these have been reported to affect the heart beat, saliva production and the parasympathetic nervous system (e.g. Hiraba, et.al. 2014).

In chapter 4 I reflect on a couple of historical examples of the use of mechanical vibration for communication, from attempts to create a media able to convey information through vibratory means to a contemporary commercialization of a playful mechanical touch.

Chapter 3: The First Experiment - *Variation 0*

This chapter describes the process of making my first vibrotactile game. The process behind this first game was one of learning and encountering challenges on many levels. I was learning hardware engineering, game programming in Max/MSP software, and how to design vibratory sensations that could be effective in communicating information such as game content, instructions, clues, feedback, and atmospheres. This first game process felt long and frustrating. For most of the process I worked without inspiration. The write-up of this first development phase is more technical than the later projects, in part because I had a lot of technical skills to learn, and in part because I was more technically ambitious. The practical exploration of the possibilities for a vibrotactile game begins, then, with technical concerns, including the relationship between game design and software environment, as well as some basic challenges related to vibratory communication. The playtest at the end prompted some important lessons that I carried forward into the subsequent design work.

The Game: *Variation 0*

Variation 0 was a game concept I decided to work on while learning the technical skills needed for development, including both the software and hardware I had chosen to work with. *Variation 0* drew on sports game conventions. I first imagined it being played in a large hall, outdoors, a big gallery, a warehouse or maybe a sports arena. The main game mechanic was the formation and dissipation of teams. Each player was given a vibrotactile device with a particular rhythmic vibration. They were then told to find their team: players with devices with a similar rhythm. This idea uses vibration as a private and discrete mode of communication only perceivable when in touching proximity. The first team who found all their team members and registered themselves by holding the vibrotactile device close to an RFID reader would gain a point. A timer would then start ticking, giving the other teams a short time window to find each other and register themselves at their own RFID reader bases. If another team succeeded in that, they got the points instead of the first team. The vibrating rhythms were designed with an appropriate difficulty in mind, enough similarity to cause players to slow down and spend at least a couple of seconds listening.

The process of making this game, in contrast to those that came later, was driven by this idea formulated at the beginning. This is not my usual way of working. I chose this approach to focus

my attention on the technical implementation and vibratory communication. No major design changes were made to the initial formulation of the idea, and the final game diverted from this idea only in order to accommodate technical limitations. Thus, the main idea, game mechanics, and game structure stayed unchanged throughout this process.

Reflections on The task

Because I wanted to explore the possibilities for the kinds of games one could make with this technology I chose to work with vibrotactile technology as the only actuator technology. With this setup the design challenge was to use only the vibratory actuators to communicate with the players. I avoided the use of a screen and I wanted to avoid text and images as much as possible. If I was going to add sound, it would not be a central component. I knew this challenge was ambitious, likely unobtainable. There is a difference between games and art forms such as dance, video, and sound performances, where ambiguous communication is not disruptive to the experience and is often even desired. In game design, there is a communication loop that needs to be established between the system and the players. In conventional games, players must understand what they are supposed to do and how their behaviour will be evaluated by the game's system for the system to work as a game. Here, this exchange of communication was put to a test.

Technical and Material Setup

The technical setup for *Variation 0* consists of the following:

- Vibropixels in silicone casings
- RFID readers,
- Arduino board
- USB connections (and Bluetooth)
- Arduino software
- Max/MSP (Max)
- Polyfill material

The Vibropixel System

The Vibropixel System is a flexible, modular system of vibrotactile actuators developed by Ian Hattwick as part of his doctoral research. The Vibropixel system has a flexible number of wireless devices small enough to fit comfortably in a hand and can be attached to arms, legs or torso of a person (see images 3.1 - 3.3). They are controlled through the Max/MSP software and developed as technology for vibrotactile expression in the context of art production. Each device has two tactile motors, four LED lights and an antenna. The system also has an accelerometer implemented, the software for which, however, was still in development when I was introduced to the technology and therefore not used throughout this project.

The Vibropixel devices are centrally controlled from a single computer and can be addressed individually or in groups. The system is modular, meaning it can host from 1-200 devices distributed over an area of 15-20 meters if physical barriers such as walls and pillars do not get in the way.

The two vibrotactile motors each have different expressions. The smaller motor gives a soft buzzing feel, while the larger motor is stronger and more distinct. The motors can be addressed individually or together like a duo playing in tandem. Each device also has four LED lights that I only used minimally throughout this project.

The system was developed as part of a research grant in the X-Modal lab, directed by media artist Chris Salter. Through this grant, PhD student Ian Hattwick was commissioned to develop the system for artistic uses of vibrotactile technologies with expressive possibilities that went beyond the commercial solutions on the market.

I was given a set containing twenty Vibropixel devices, a transmitter and a couple of Max patches from which I could control the devices. These patches made it possible to tweak thirteen parameters: a simple amplitude, vibration frequency, length, decay, and attack; a second order envelope which has its own length, decays and attack times; and four parameters to control the LED lights. Finally, each device had two motors which could be addressed individually or together, as mentioned above.

Workflow

As mentioned, when I was introduced to the Vibropixel System, it was an actuator system only. Actuators process and perform output signals, whereas sensors such as the accelerometers process input signals. There is a convention when it comes to the flow of information in digital games: the technical setup includes a two-way communication system with both input and output. This means the computer gives both cues and feedback and monitors the behaviour of the players. So, I purchased hardware to build a module for input signals. I bought a set of four RFID readers, Arduino boards and Bluetooth dongles and created my own system for the simple tracking of player behaviour. As I imagined the game being played in a big space, I was convinced that the objects with the sensors ought to be without cables. I wanted players to move around freely, without wires entangling their legs and bodies. The RFID readers were easily implemented with the Max software. More serious challenges came with the Bluetooth connections. I struggled with continually failing connections. It was a long process, with many hours of dashed hopes and failed attempts. At some point a module short-circuited in my lab beyond repair. I had been too casual, working at home with my computer on my knees and hardware devices sitting in my lab and hanging down on the sides, only connected loosely with jumper-wires. Other modules had short-circuited in other ways. The Bluetooth connection was buggy and frustrating to work with and, at times, I lost both discipline and focus.

Game Making in Max/MSP

The Vibropixel setup was controlled via Max/MSP software (see images 3.4 - 3.10). While it is possible to make an interface between Max and a development environment more geared towards conventional game making, for instance by building a plug-in for software made for game making, I was curious what would come out of making a game using software like Max; perhaps a different software would yield different opportunities and structures.

I had no prior experience with visual programming like Max. Switching between software and programming languages is usually not a big challenge for the way I work. With an Internet connection and online resources it is easy to find the syntaxes that fit the new language. Visual programming, however, follows a very different set of building blocks. I had to start from scratch. Ian and his team had designed a beautiful-looking visual interface to control the Vibropixels and he was always kind and generous in helping me when I asked for help. But starting with my blank slate of knowledge, I did not even know which questions to ask. Instead, I poked around in the patches I had received from him to see if I could follow the logic. I did the

tutorials that come with the software, learning about patches[4], patch cords, knobs, and objects[5], then moving on to amateur video tutorials online to get information specific to the functions I needed to learn about. Eventually, I became acquainted with a skilled undergrad student familiar with Max. We sat down one weekend and I learned how to implement the remaining functionalities necessary to make the game I had in mind.

The game structure was fairly simple. It had four phases: 1. a standby mode in which it was ready for play; 2. a phase for play in progress; 3. the last ten seconds of increased urgency; and 4. a "celebration" of winners. As the core mechanic of *Variation 0* was that of finding your unknown teammates, the game code started by randomly assigning the players into teams. It then assigned one of the RFID readers and one vibration signature to each team. As the game moved from phase 1 (standby and ready) to phase 2 (play in progress), the system allowed readings from the RFID sensors. Each reading was first pulled through a procedure to check if the reading was intact, and then through a second procedure to check which team it was assigned to. A counter noted if the reading belonged where the RFID sensor was assigned. When the counter of any of the teams had reached its maximum—an adjustable value depending on the number of players—a 10-second timer began counting down and the game moved to phase 3. After ten seconds the game moved to the last phase. Here a permanent point was added to each member of the winning team and a "celebratory" vibration envelope was sent only to the devices belonging to that team. When the celebration ended, the game reset to phase 1 and assigned the Vibropixel devices to new teams, new vibrations, and a new reader.

Max is a software developed for live performance, not for game engineering. Although the structure I had planned was relatively simple, at times it was almost impossible to implement in the logic of Max. Two examples illustrate this—the need for saving/retrieving data, and the need for conditional processes.

Saving and retrieving data: as a software for live performance, storing and retrieving data is not native to the logic of Max. Game making in Max can be compared to making games on an instrument like a violin or flute. There is a function called a matrix~, which works for saving some types of data but not for storing data such as game states, levels, points, or teams combinations. With help from an expert Max user, I found a workaround, which included storing data in what is called a dictionary. A dictionary is a plain text file that is saved outside of Max

[4] The basic file through which the user of the software can interface with the software

[5] Objects communicate with one another inside a patch by sending messages through what is called "patch cords."

and can be read and rewritten by the program. This made the procedure for storing and retrieving data more cumbersome than any other software I am familiar with. Image 3.5 and 3.6 illustrate the procedure for retrieving and updating data stored in a dictionary file "dict player."

Conditional processes: a similar example is the fact that the software offers no easy functions for making conditional logic. As conditional and procedural logic is often considered to be the core logic of games, this was no small challenge. The solution I settled on was a rather complex set of procedures that could be carried out to check if two indexical numbers or string variables were identical or not (see image 3.7 and 3.8).

Over time I became apt at performing these rather complex strings of functions to control the game logic, retrieving player-ids, game states, and levels from the dictionary and checking the validity of data input by comparing them to the ones stored in the dictionary file. It is possible that there are other and/or smarter solutions available, but these were the solutions I found in consultations with experts who have years of experience making professional use of the software.

Working with Vibrations

In Max, functions are represented by "objects." Objects are connected with "patch cords." It is a common Max user complaint that patches get visually messy. There is an option to make a "presentation" look and therefore separate the patch into a kind of frontstage and backstage. This means any neat-looking frontstage can be opened up to reveal a messy looking backstage. Ian's interface was user-friendly with pretty-looking knobs and colour gradients. However, I wanted to know the logic behind it. To me, strings of numbers are more tangible to work with than graphical interface objects like knobs, sliders and memory squares.

I opened the back side of the patch to find a mess of cords and objects. In trying to learn the software, I was looking for the logic, how data circulated around and what kind of data was sent to the Vibropixel devices. Not surprisingly, the data sent to the Vibropixel modules was sent in a string of binary code. That is usually how wireless communication works. The visual interface felt too general to me to give me a connection with the Vibropixels; the binary code had other problems. It took too long to calculate while manipulating and it was too easy to get lost in the string of 0's and 1's. Between the visual interface and the binary code there was a decimal number system. This was where I found myself most comfortably manipulating the expressions of the vibrotactile motors. The signal coming from the computer is a string of numbers with 14 values between 0-250 (decimal system).

I explored these strings by trial and error, typing numbers to see what they did, identifying which number in the string had which effect. The first number indicated a particular device addressed. The second number controlled which motors were addressed. The next five values addressed different features of vibration (frequency, amplitude, length, attack, decay), the next three addressed features of the envelope (length, attack, decay), and the last four controlled the lights. With this information, I made my own much more messy-looking compositional area [image 3.10]. When I liked a particular vibration pattern, I copied the numerical string from the console and saved it in a message box, sometimes with annotations next to them.

Compared to the visual interface, the strings with the numbers visible gave me space to annotate each vibration and provided visual information about the content of the signal at a glance. My own "composing interface" was and looked messy, but it worked for me.

Once I had a decent grasp on composing continuously-looping vibrations, I realized I needed another level of complexity. Having one looping vibration was akin to playing one note on a violin. To give shape and rhythm to the expression, I needed to create another envelope that could differentiate the rhythm a few seconds at a time.

I used my knowledge from the tutorials to make simple clocks and timers. With these I devised a method using just a few simple functions: a metronome gave a basic beat, multiple metronomes following different tempi added different volumes, counter-object combined with route-object more diligently defined the count of beats in a sequence. With the route-object, I could route different beats to different basic vibrations, and this added more nuance and complexity to the rhythm, contrasting soft and hard, for instance, by addressing one or the other motor. I made gradual changes using mathematical functions like a sine wave or simple calculations that could provide long stretches of slowly changing expressions, but for the most part I found them too dull and predictable. With these basic functions I could make everything from slow pulsations such as a calm heart beat or pulse to wild, chaotic expressions that became too complex even for myself to predict or comprehend. The layering metronomes, counters, delay and route-objects seemed clumsy but it gave me plenty of possibilities.

Making Vibratory Information

The four different phases of the game were made with four aesthetically different vibratory expressions. The first phase, the game on standby, was soft and pulsating. The second phase had vibrations addressed individually to each player indicating which team they were on, the third

phase gave a warning signal using a sudden and strong one time vibration, and the final phase, the celebration of winners, was indicated by what I considered a happy and celebratory vibratory expression, transmitted only to the players on the winning team. The players who had not won were given a different, more mellow, less noticeable vibration.

Additionally, each reading of the RFID tags was accompanied by a short and subtle vibration, giving feedback about whether the reading was successful—meaning that the player was checking in on the base that its object belonged to—or not. This feedback also had a visual clue, a white flash for successful connection or a red flash for an unsuccessful one. The number of white flashes indicated the number of teammates who had successfully checked in. Additionally, there were specific vibrations for technical details and system updates, such as how many players were connected or the connectivity status of a specific player. Lastly, the different phases were connected with transitional vibrations to give the game a smoother aesthetic feel.

Consequently there were different categories of information: system states, game states, individual information, and atmospheric ambiance. I made the patterns by following my own cryptic feeling of what a vibration expressed. I did not follow metaphors, or make a dictionary system that could be explained to the players before starting the game. I followed an assumption that if I found something encouraging, then that was also what the players would feel.

There were easily more than 30 types of messages to convey. These messages were either arranged sequentially or layered, depending on their function. When slowing down and paying attention, it was possible to feel different rhythms layered over one another, for instance a longer looping pattern underneath a more specific one. At the same time many layers of very specific messages were not easy to decipher, especially for a player who had just entered the game and the world of vibratory information transmission. In addition, as vibration takes time to perceive there was a tight bottleneck for how much could be conveyed at any given time.

After having spent my days trying to stuff particular meanings into small snippets of looping vibratory patterns I was feeling rather unmoored. They seemed to be everywhere, layered and floating over one another like waves in the ocean. I myself had difficulty deciphering the various expressions of looping vibrations from one another, as noted in my work journal:

> *March 12th: The transition from the basic rhythms to "winning" does not work aesthetically. I swapped the vibration for "leading up to winning" and "winning" around. It works better. The basic rhythms are too dominant, even when it is only sent to the small motor.*

March 13th: How do I display or communicate "winning" and "points"?
Undated: I am a little lost. There is a lot but I think I have a feeling I can work with.
Undated: Today, nothing is working.

Could I even find my own way around my own self-constructed maze of vibratory semiotics? On a more tangible level, hardware was still short circuiting, batteries were not charging, bluetooth connections were falling out, only occasionally catching as I moved around my office and grey university corridors dodging concrete pillars and metal structures. When I finally had a connection, the data I received was often cut in half or formatted incorrectly. I had scheduled a playtest, which was coming up in a couple of weeks. Nerves and frustrations were gathering around me.

Play: The First Playtest

The playtest took place at the TAG Lab at Concordia University. The day before, I charged batteries, checked that all Vibropixel devices were working, and made a playthrough to see that the code was working well. I made last minute tweaks that made the game more open to a flexible number of players, as I did not know how many people would come. I kept tweaking the vibrations, making them more distinct from one another, improving the feel of the atmospheric signals, massaging the transitions between different states and messages. And I kept believing that I would find a way to make the bluetooth devices work.

Eventually, I made a last-minute decision to skip the wireless option. Instead I connected the RFID readers with USB cables and redesigned the game so that the RFID stations were fixed in place. I placed the four RFID readers on a table. Each was tied to a Vibropixel device and wrapped in white polyfill material so the technology looked like small clouds. A pile of Vibropixel devices were arranged on the table for people to take. There was also a large screen against the wall, ready to give a short introduction to the project.

Eight to ten people showed up, enough for the game to work. Most were colleagues from the lab, some worked in the industry and came out of an interest in vibrotactility. I started with a presentation explaining the project before introducing the game. We ended with a lively discussion, with questions on programming in Max, ideas and comments on the game design and, most importantly for me, comments on the design of vibrations.

What Worked

- People were excited about the game and its potential.
- The mechanic of finding teammates based on vibration signatures was both possible and interesting.
- Players were able to find the base to check in once they had found their team.
- It was possible to distinguish the different team's vibration patterns. We discussed the length and how distinct the vibrations were as a way to tweak the difficulty level.
- More generally, I gained a perspective on what I had been working on for a long time.
- I learned valuable things about felt vibration and its capacity for communication.
- I was encouraged to keep going with the work.

What Did Not Work

- Several vibrations designed with particular messages were interpreted to have the opposite messages than the intended ones. E.g., the vibration I had designed as "celebratory" was perceived as "angry" or "wrong."
- Players did not easily understand what the system expected of them.
- More feedback effects were needed to increase the transparency of the system's operation
- Aesthetically, more atmospheric vibrations were needed, both vibrations that are static (do not develop over time) and some that are good for transitions (with progression).
- There was a disconnect between the hectic and competitive pace of the game and the time required to feel vibrations.
- The experience felt too technical and rushed.
- In general, the experience had a different aesthetic than what I was interested in.
- People were too focused on the game system. Their attention was on interpreting the system, which meant they were not attending to the vibrations nor to each other.

Most significantly, I realized how much time vibrations take to be felt in contrast to other media technologies. If the game was going to actually center the quality and feel of the vibrations players could not be rushed. The time constraint created chaos and did not allow enough time to pay proper attention.

I also had incorrect expectations of what vibrotactile messages would be able to communicate. Vibrations that were communicating specific information messages like system states and game states were not doing that job well. For instance, when players checked in at a base, the vibration

I had intended to signal positive feedback (correct check-in) was often interpreted as negative (error/wrong check-in). Bright light and multiple vibrating pulsations were not understood as celebratory as I had thought they would be, but were instead perceived as unfriendly and therefore signalling "wrong connection." The cues were so confusing that some participants suggested that I used a very explicit system like red for "wrong" and green for "right" to avoid confusion.

Lastly, I found that players' attention was fixed on the system, searching for cues, feedback and instructions, and not on the qualities of vibration patterns and the social cues present in a gathering of people. By making references to conventions of sports-like games, I had prepared a mentality to "game it." Players were looking for instructions from the system, ready to fight for their status by finding the smartest way to handle whatever obstacle it was going to put in front of them. But the vibrations were not easy to game. From that perspective, the game was an ambiguous space of never-arriving meanings.

The Afterlife of *Variation 0*

I decided to leave this game concept for now. To me, *Variation 0* was too rushed, too strategic, felt abrupt, and I was not convinced I could develop it in a direction that I would like. I had made an early decision to bracket off concerns about game concept and player experience as a way to focus on learning technical skills. In that context, it was not surprising that the initial playtest was not the play experience I had imagined.

At this point I felt creatively discouraged. After working for so long on a game system, making a whole infrastructure for two-way communication, struggling to learn so much, wireless data transmission protocols, vibrations, Max software, etc., I took a break from design work for a couple of months.

Images to Chapter 3

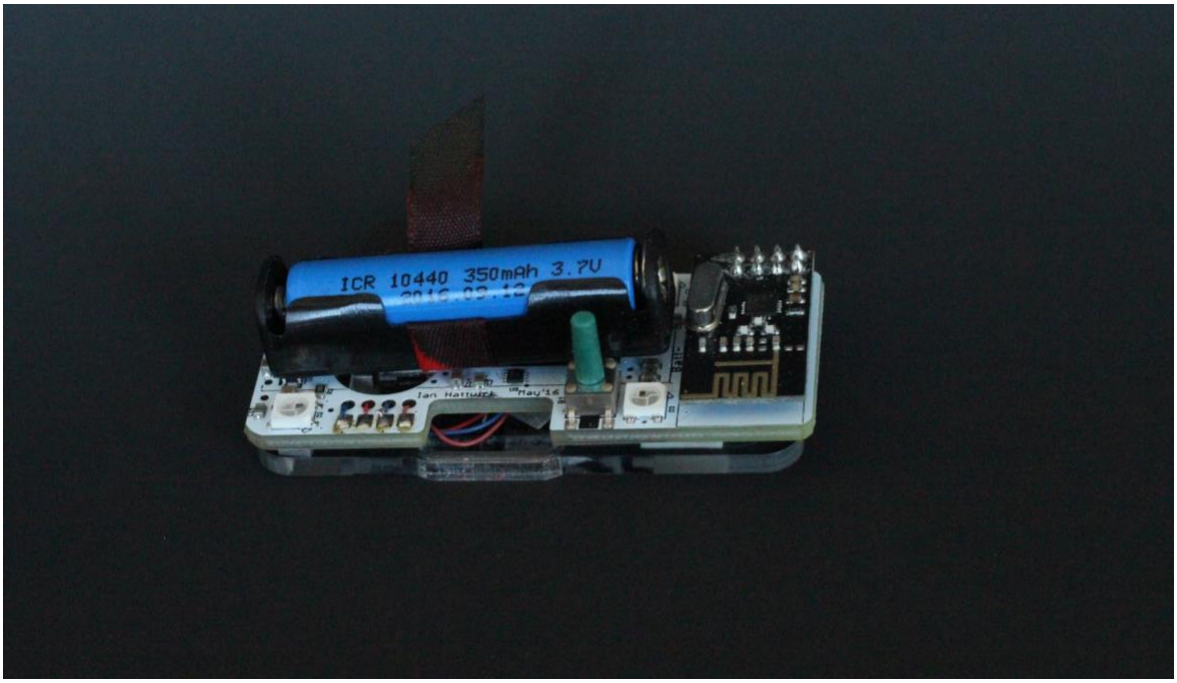

Image 3.1: A Vibropixel module

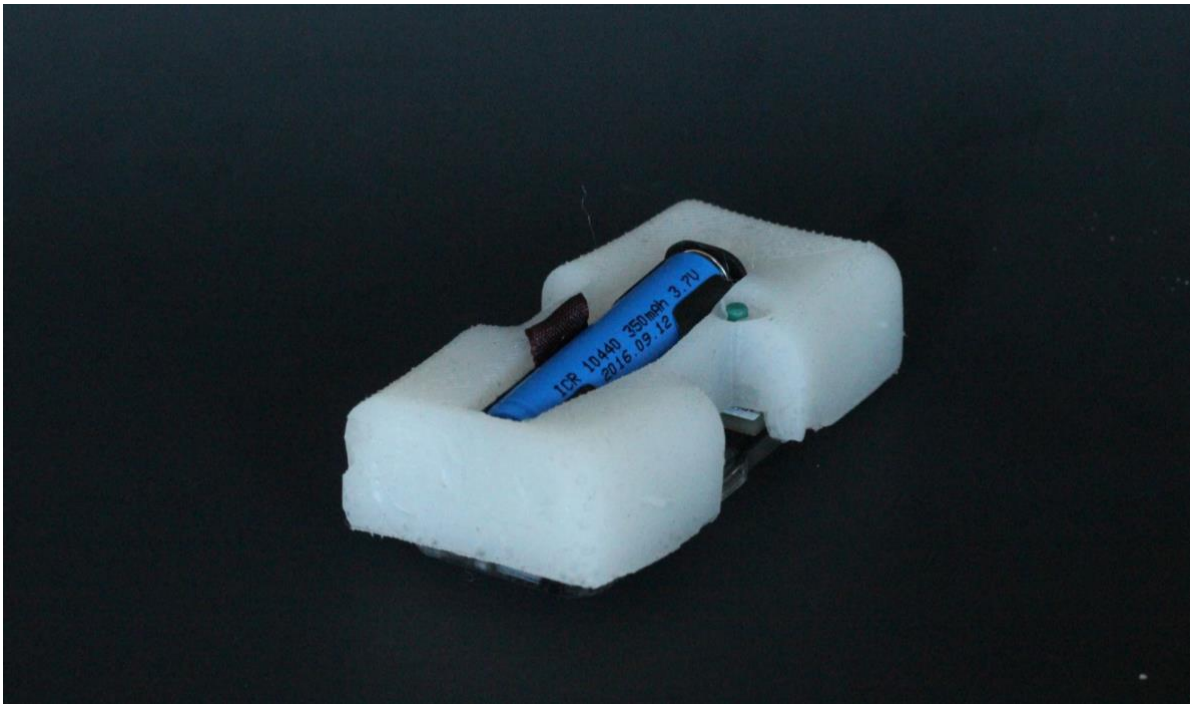

Image 3.2: A Vibropixel module in silicone casing

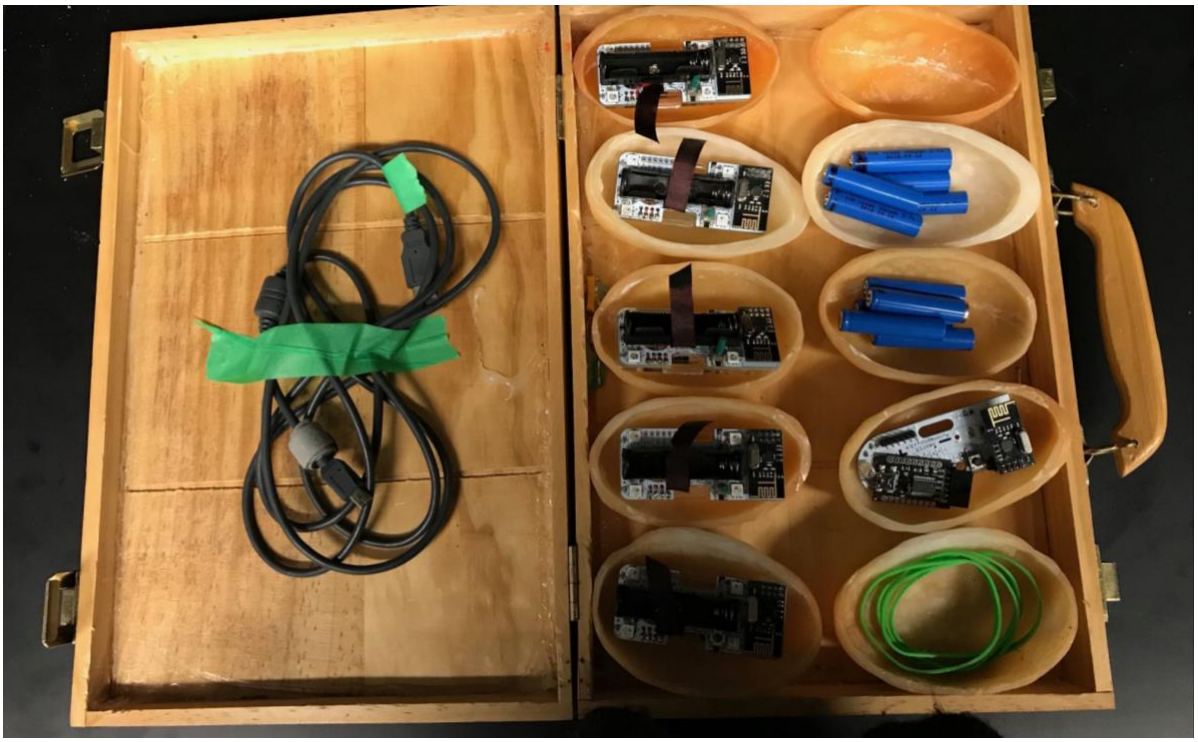

Image 3.3: A set of five Vibropixels, antenna, batteries, cables and early DIY casing

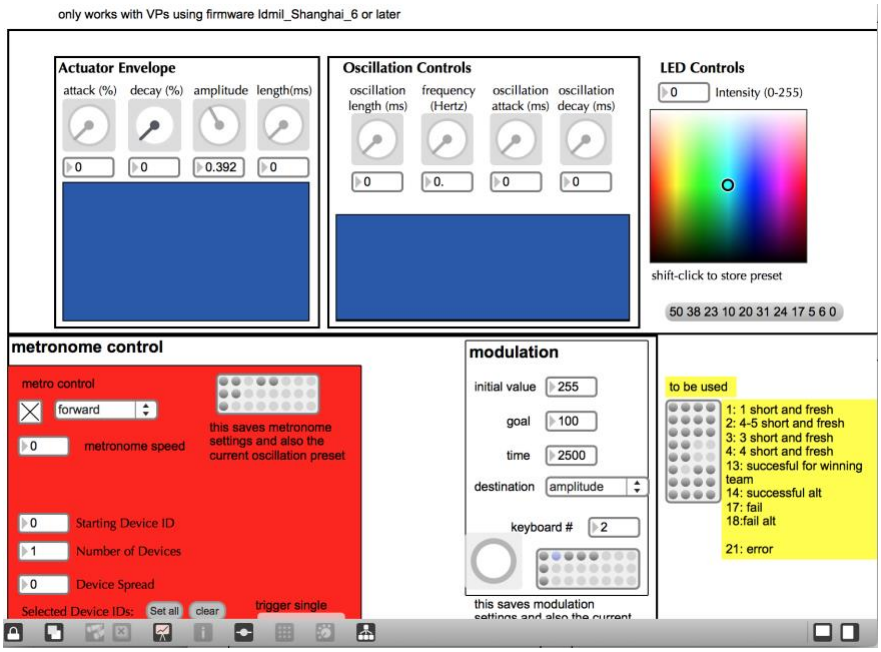

Image 3.4: The interface I started from to compose vibrations

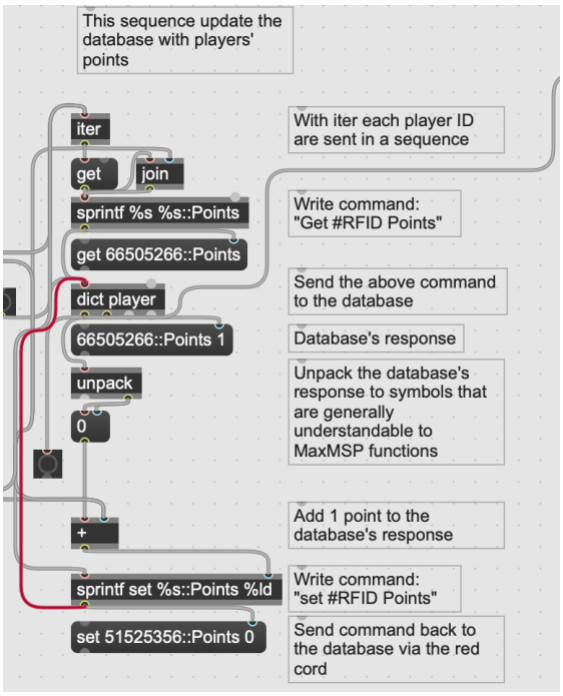

Image 3.5: Updating data in the "dict" database

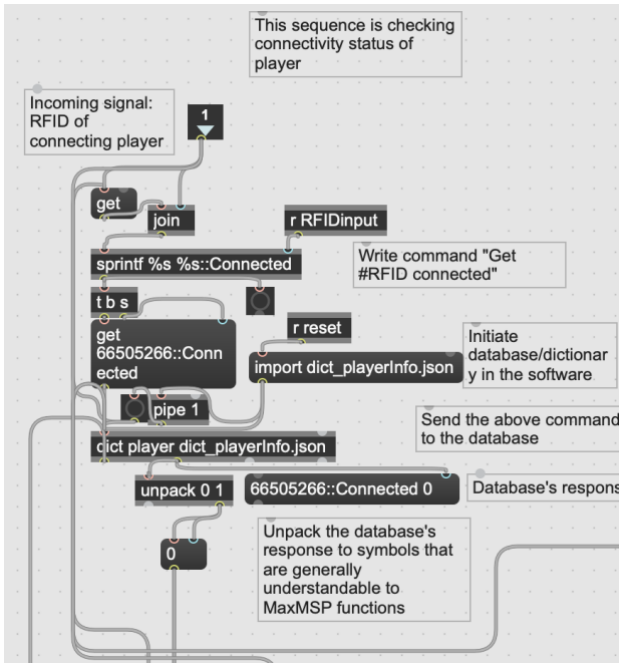

Image 3.6: Retrieving data from the "dict" database

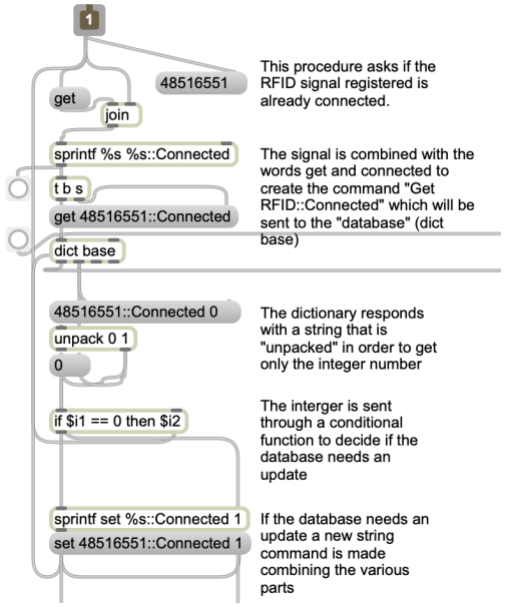

Image 3.7: A workaround for conditional logic

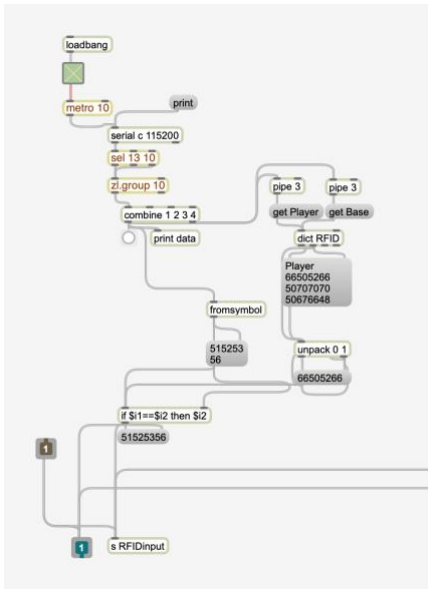

Image 3.8: Checking the validity of a signal

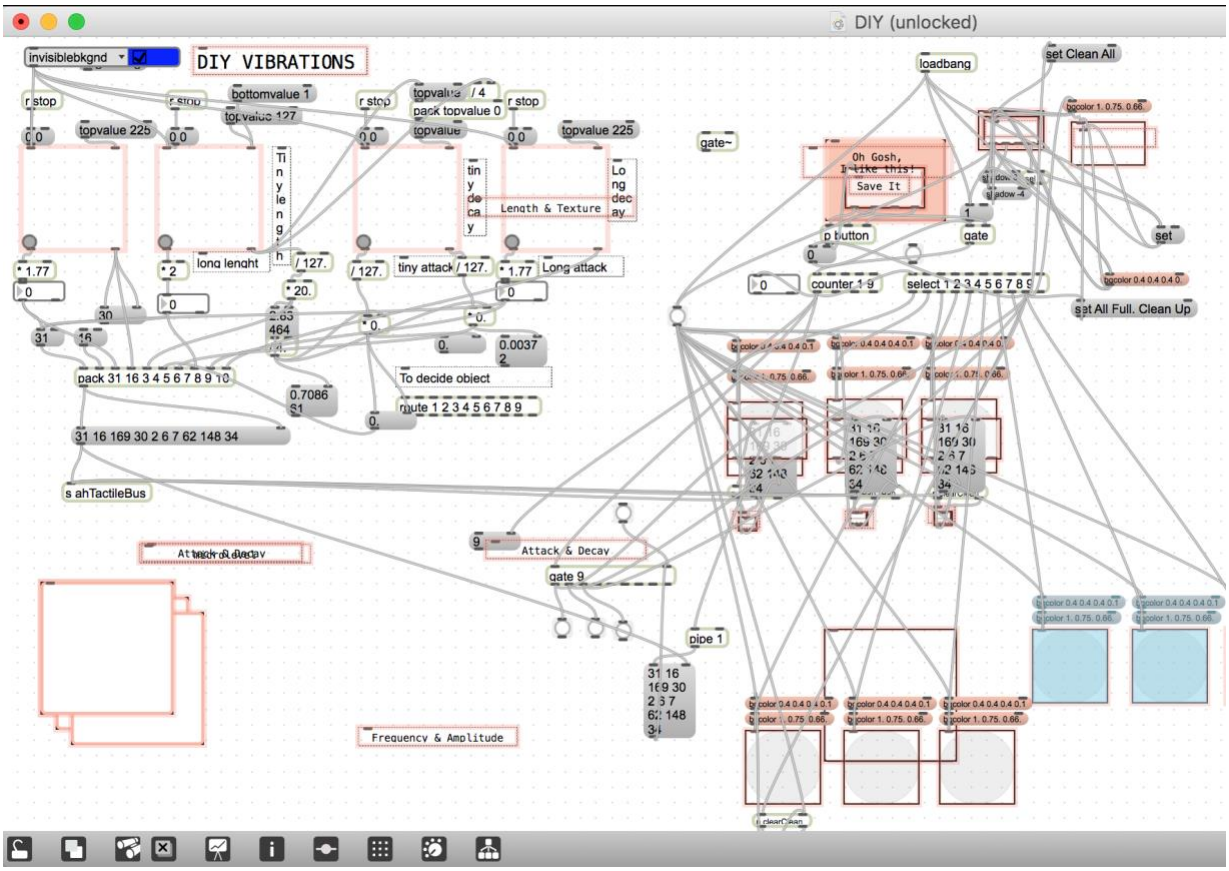

Image 3.9: A messy background in Max/MSP

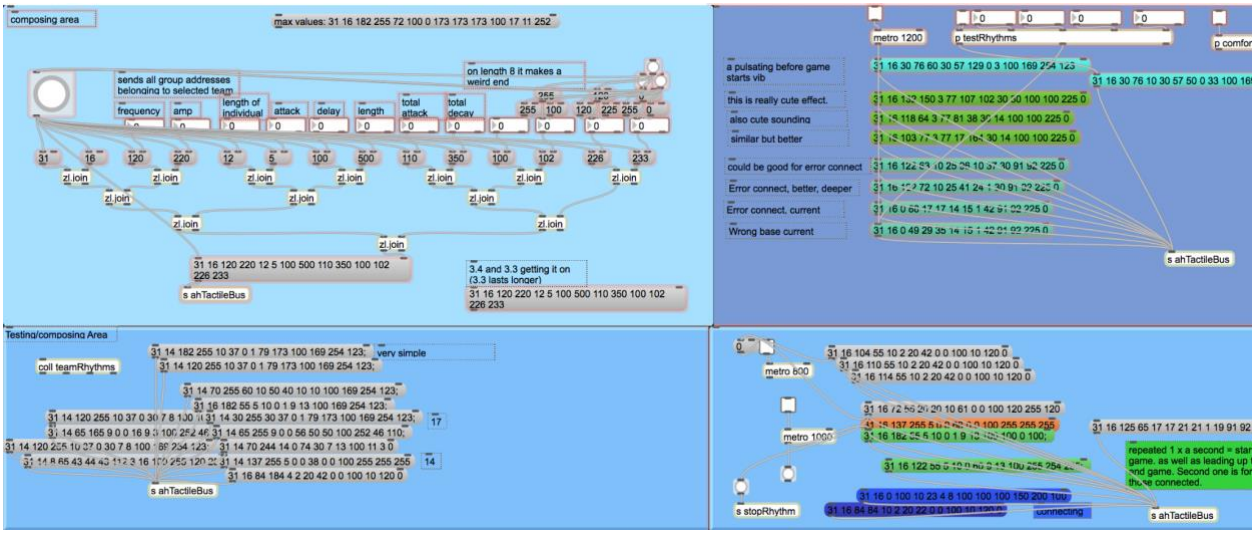

Image 3.10: The composing area in Max/MSP

Chapter 4: Data, Simulation and a Ghostly Buzzing

Meaning is probably one of the most rehashed concepts in the tradition of Western thought. Each paradigm, time period and discipline seems to have its own theory of what meaning is and how it occurs. Within an interdisciplinary study such as games studies, meaning has become one of the concepts through which interdisciplinary tension plays out. On one hand, as Paolo Pedercini has pointed out, there has been an aversion in game studies to the very idea that games could be imbued with meaning (Pedercini 2015). On the other, my initial work with the Vibrotactile system taught me that without some kind of agreement about what the various expressions referred to, the game was all confusion, stressful guesswork, and no action. While verbal speech, writing, screen and images have successfully established themselves as information media, as capable of conveying meaning across time and space, vibrotactile media has not. The challenge of arranging vibratory sensation in a solid and standardized system of meaning is still in progress. This chapter presents examples from the history of haptic media development, various efforts to create vibratory media that each present different challenges and possibilities for conveying information using vibratory motors. I present the *Teletactor*, a engineering research project that sits within what we can call the information transmission paradigm of the first half of the 20th century. I then reflect on Margareth Minsky's *Sandpaper System*, a vibratory game interface that came out of the 80's preoccupation with data virtualization. Minsky's work with the *Sandpaper System*, in addition to her prior work with arcade cabinets, is among the early examples of vibratory game technologies. The 90's brought vibrotactile motors to what has become the two most popular present-day types of game platforms: the console with a rumbling controller and the mobile phone. I end with a twist brought to us by the phenomena of phantom vibrations, a ghostly presence of constant notification—often real but sometimes not, the distinction rarely mattering. This is not a comprehensive history. I have selected four cases that each describe three different approaches to working in the gap between vibratory sensation and semantics. These various approaches represent different philosophies regarding the relationship between vibratory sensation, information, and meaning making. They also lay out a map of design possibilities, which, once compared and contrasted, help me understand my own aesthetic and philosophy regarding game design using vibratory media.

Vibratory Codes: The Teletactor

The *Teletactor* was developed throughout the 1920s and 1930s in the Vibro-Tactile Laboratory at Northwestern University, Illinois. The project was developed by a psychologist with normal hearing sensitivity, Robert H. Gault, and a large group of people from the hearing, vision, and speech impairment community. The *Teletactor* investigated a question about the possibility of listening with skin. If the ear can hear voice because sensors register vibrations in the air, might it be possible for it to listen with skin in a similar way? In other words, could skin be trained to register different vibrations and organize them in a formalized system of meaning similar to spoken language? The first test setup was a simple analogue experiment in which one person spoke into a tube that was pressed against the skin of someone "listening" (Gault 1927). The listener would then try to guess what had been said. Based on the sensations, vowels and diphthongs (sliding vowel sounds) were arranged according to a measure of "weight" so that a sound like "e" was light while a sound like "aw" was heavy. These initial experiments seemed promising. Gault reports that the listeners at this point were able to differentiate thirty-eight different sound categories. During almost two decades of research and development, several iterations followed. The *Teletactor* was expanded to include five vibrating units (one for each finger tip), adding location of vibratory sensation as a parameter. The apparatus was also improved with an electronic amplifier so that the voice was recorded in a carbon transmitter, electronically amplified and transferred onto a diaphragm on which the listener could gently place their fingers. This allowed the media to be spread out over a greater distance, allowing for immediate communication between two rooms.

Using this setup, listeners were able to practice connecting variations in vibration to sounds that are common in the English language. After 30 hours of training, for instance, two people were able to understand the content of a story spoken by someone in another room (Gault 1927). Gault also describes that listeners who were listening to poetry through the diaphragm had clear aesthetic preferences for certain expressions over others. At the same time there were considerable differences in how quickly listeners learned to associate specific words with the vibratory sensations. In general, the *Teletactor* required hundreds of hours training. The project did, however, support listening comprehension when it served as a substitute to lip-reading.

In the present literature, Gault alone is typically credited as the inventor of the *Teletactor*. Portraying the development of this apparatus as a collaboration between Gault and members of the hearing, vision, and speech impairment community might seem controversial. While creating a two-way communication system as a single person would be impressive, this is not the story of

the *Teletactor*. Reading reports and articles from the project leaves no doubt that the development team was enormous. It was not unusual at the time to give the title “test subject” to a large portion of such a team. From a contemporary point of view, however, this seems like an aspect that invites reconsideration, especially considering that those who contributed to this project under the title “test subjects" are individuals with expert knowledge of the topic, and, at the same time, the lack of this acknowledgement falls in line with how contributions from members of the hearing, vision, and speech impairment community, and of disabled people in general, are systematically discredited and erased. Unfortunately, as Gault was the one reporting, evaluating and directing the project, it is not easy to know what the rest of the team thought about the potential of the project. Neither is it easy to decide how much they contributed to the creative parts of the development. It is clear, however, that their expertise was crucial. The knowledge of touch and frequency sensation particular to perspectives informed by various hearing, vision and speech capacities were notable contributions at the core of the project. Gault explains that some of these “test subjects” spent several hundred hours working on the project, and from a 1927 image text titled “Group of deaf subjects at work” we can understand that Gault himself acknowledged this investment as ‘real work.’

The *Teletactor* never left the laboratory and never practically benefited the community. The setup was expensive and unfit for mass production. The device required hundreds of hours of training, and its setup was deemed too cumbersome for the more complex context of everyday life, (Gault 1927). The *Teletactor* was probably more successful in suggesting an unexplored potential of signal transmission through the skin than in actually benefiting the community of people with hearing impairment. As elaborated in chapter 2, the haptic senses had, until this point, been kept at the bottom of the hierarchy of senses, where it was considered devoid of “intellectual” capacities necessary for communication. The *Teletactor* experiments were the first in a series of projects to begin nudging these assumptions, posing investigative questions about the assumed lack of connection between thought and sensations in the skin (Parisi 2018, p. 154 ff).

While the *Teletactor* arose from an assumption that the codes enabling communication through the ear could be extended to the skin, subsequent developments of tactile communication devices took a different approach. In the years that followed, engineers and psychologists invested in the idea that, as both eyes and ears are based on unique coding systems specific to the sense organs, so was development of unique formalized tactile signals necessary for a tactile communication system to be successful. Thus the development of several formal languages for mechanical vibration accelerated. Frank Geldard’s *Vibratese*, for example, used a modified version of Morse

code (Geldard 1957). *Vibratese*'s intended use was the battlefield, presumably as military research funds were easy to secure. Like the *Teletactor*, the need for extensive training sessions in which operators learned to associate certain vibratory sensations with certain symbols proved to be too tedious. Furthermore, the practical construction of the media, vibratory motors placed in a grid and attached to the back or chest of frontline military workers, was too delicate for actual use in the field (Parisi 2018, 191).

Both the *Teletactor* and *Vibratese* were developed following a philosophy expressed in Shannon and Weaver's model of communication (Shannon and Weaver 1964). This is a model that has been characterized as relying on standardization and dismissing material and circumstantial qualities of the communication situation. It describes communication as data transmission, meaning a transferral of digital patterns from one material substrate to another without the pattern exhibiting any form of change during the process. In other words, the codes transmitted (signifiers) and the context it is referencing (the signified) are considered to live in two distinct realms isolated from and unaffected by one another. Any contamination between the two would cause a breakdown in communication. To achieve this clean-cut isolation, standardization became a top priority. Bodies were divided into two groups, either qualified or disqualified as a "normal test subject." In the case of haptic media, bodies were trained so they could perceive the codes and decode them as intended. Meaning and information were intractably paired, one sensation was imagined to produce the same set of associations across multiple bodies, times, and spaces. The transmission model of communication, especially as it was presented by Warren Weaver (1964), regards variation, in bodies and otherwise, as noise that must be eliminated.

The original purpose of Shannon's model was not to describe meaning as it occurs in interpersonal or mass media communication. It was intended to advance the engineering project of digital communication systems, and thus it was explicitly bracketed off from semantics and sense-making beyond machine logics (Shannon 1948). However, it settled as the standard model for communication in much broader arenas. When published by University of Illinois Press in 1964 it included an introduction written by Warren Weaver, which described the theory as applicable to all forms of communication. Accordingly, Shannon's mathematical model of communication, intended to aid the engineering work of communication systems, became available for use beyond the realm of engineering, with implications far beyond the initially stated purpose. This transmission model of communication is arguably the most criticized theory of the 20th century, for many reasons. It has been thoroughly criticized for its inability to account for contextual, cultural and situational factors (e.g. Hall 1980 (1972 original), Fiske 1989, Carey

1989, Slack et. al. 1993), and therefore the way it not only assumes but relies on context stability, hegemony and uniformity. The model actively worked to reenforce a wide range of oppressive systems, including racism, sexism, ableism, neurotypical normativity and so much more. The "noise" that distorted the signal was in fact everything and everyone who did not fit within narrow hegemonic modes of being and living.

It is interesting that, despite the efforts of scholars across disciplines to point out its fallacies, Shannon and Weaver's theory of communication still seems to be a carrying pillar in both games studies and game design culture. Keogh's depiction of games studies' purity complex testify to a lingering presence of the transmission model paradigm. Game studies' purity complex points to a common game studies's aversion to attending the messy and unruly assemblage that makes up how digital games function. At the turn of the 21st century, game studies became a search for the pure game and pure play that could prove games worthy of academic attention and resources. This search established a tradition of narrow game analysis in which "one neat part is often taken to stand in for the whole messy assemblage that is videogame play[sic]" (2014). A purified game studies, however, not only promotes and sustains a homogenous and hegemonic culture around play and games but also rids itself of tools for accounting for games as technologies developed for the cultural practices of play and pleasure (Phillips 2020b, Murray 2018). Simply put, a game studies ill-equipped to study the cultural aspects of games has also developed an aversion to looking at play as culturally embedded and practiced.

Not unlike the implications of Shannon and Weaver's conceptualization of communication, in which everything that fails to fit the standardized forms of communication is excluded, the purity complex in games studies excludes what does not fit the model of decontextualized, disembodied procedural play, typically by marking them as not "real" games (Keogh 2014).

Thinking back to my first playtest with the Vibropixel system, I realized I had cultivated a similar model for thinking about communication between the player and the vibratory game setup. I had placed all my attention on learning new technical skills, visual programming, failing Bluetooth connections, and useful sensor data. I had stuffed design ideas, examinations of values, ontologies, and ideologies into the background. Consequently, for the game to be successful it required a training session in which the players learn the intentions associated with each vibratory expression. I was not aesthetically interested in this kind of training session. More importantly, the idea I had about how the system and players made themselves intelligible to one another, what communication was and could be in the context of vibrotactile play, was too narrow. The problem was not just that I naïvely assumed players would pick up on the meanings I associated

with the vibratory sensations I had designed, and it was not just that I had forgotten to take into account that players would bring different bodies from different paths in life—with different cultural anchors, and with different relations to vibratory sensations—to the game. The problem was that the game did not know how to appreciate this. Reflecting on the politics of these aesthetic choices, it seems easier to reconcile my abandonment of the first experiment in my series of vibrotactile games. I was seeking a different approach, one that would be more open and in conversation with the players and the situation at hand.

Virtual Touch: The *Sandpaper System*

As Parisi notes (2018), vibratory media projects from the first half of the 20th-century have a distinct social justice agenda. The mid-century's vibratory media research was further driven by military research. As we move to the later half of the century, interest in work environments and entertainment technology, gaming and virtual reality in particular, become the research's primary drivers. One milestone in the development of vibrotactile media is the research of doctoral student Margaret Minsky, who worked during the 80's as an engineer building arcade machines. In particular, she is known as one of the engineers behind the arcade machine of the Atari game *Hard Drivin'* (1989), a racing game and the first game-arcade with force feedback technology. The steering wheel had force feedback implemented so that the player felt a resistance when turning the wheel at high speed. *Hard Drivin'* also presented a significant rumble sensation during collisions and crashes. Both were early instances of virtual representation of material conditions in game technologies.

Under the supervision of HCI scholar Susan Lederman at MIT's Media Lab, Minsky advanced her research on virtual materials by building a motorized game controller. With two motors either pulling and pushing the stick in lateral directions, she made a system for four-dimensional force feedback. In front of the player, or test person, was a simple visual display showing a black square and a cursor on a white background. This served as a minimal map representation of the player's navigation. Minsky invited fifteen test players to try the system and share which materials they felt they encountered in different parts of the map. With this setup she was able to simulate a long list of materials and scenarios, including hills, slopes, lakes, puddles, sand, and gravel with different roughness. Some textures were easier to simulate; for instance, materials with a rough texture were easier while smooth and jittery textures were more challenging. I find her thoughts about the material choice for the interface interesting. The stick was hidden by a box

to cover up some of the common expectations of joystick navigation. At the top, she placed a ping pong ball, as she found that ping pong balls have a texture that avoids calling attention to itself. “Ping pong balls are made of paper which has been waxed (not a plastic as many people assume.) The empirical neutrality may be a result of the fine texture, familiar material, or thermal properties. It would be worth looking further at the concept of neutrality within various haptics applications” (1995, p. 65). The choice of a ping pong ball was made after careful testing of a series of other materials—plastics, wood, porcelain and glass, each of which were abandoned due to characteristics such as “slipperiness or waxiness.” Egg shells were considered but not tried.

The influence of Lederman’s supervision and prior research is evident in Minsky’s work. As a leading figure in the field of digital texture simulation, Lederman was strongly inspired by the work of psychologist David Katz, whose texts she had read in the original German long before the English translation came out. As explained in chapter 2, Katz observed that it is by moving our fingers across a surface that we recognize texture, especially texture roughness. This motion, he claimed, generates tiny vibrations in the skin. Further, texture can be recognized from the vibrations generated when moving a pencil held in the hand or a stick-like probe between the teeth. Based on a long list of inventive experiments, Katz concluded that we perceive texture through a unique kind of vibratory sense. During the rise of research into computational interfaces, these claims were examined and re-evaluated. Together with colleagues, Lederman modified Katz’s observations. Texture is experienced not so much through vibration as through the simple deformation of the skin, including depth, strain, volume, area, etc. The modifications make me wonder what exactly Katz meant by vibration. His research seems to expand into a grey-zone between what we might call vibratory sensation and something else. However, these observations moved the research of Lederman, Minsky and their colleagues from rumbling motor expression to more refined expressions of motorized pulls, pushes, jigs, and jolts. Minsky’s *Sandpaper System* combined Katz’s experimental tests with sticks and Lederman’s research on motorized texture simulation into a unique game controller capable of simulating textual qualities.

For my own work, I was not interested in a simple one-to-one simulation of material conditions. The connection between vibratory sensation and texture, however, was of interest to me. While the information transmission paradigm locks signifier to signified in a loop, textures are open. They host barely accessible memories, speculation, imagination, and investigatory thinking. As far as I am concerned, only a limited part of my thinking exists in plain language. Investigations,

storytelling and ethical judgements all live in textures and material properties, imagined or not. I knew I did not want to work within the purified paradigm of information and transmission.

Speaking of texture, it seems to me that there is a textual connection between the purity aesthetic of the transmission model and the smoothness created by the techniques often recommended as best practices for game design, of which Immersion's best practices for using rumble in videogames is a good example (2010). I am specifically thinking of techniques to facilitate experiences of immersion, realism, flow, fun and engagement. I did not want to create a game aesthetic with this usual frictionless experience of success. It seems to me that, in such a case, all the challenge resides in the gameplay, and there is no challenge that implicates liking or relating to the game. These techniques author "good game experiences" but lack connections to the texture of everyday navigation. I was searching for something different from pure delight, beautiful colors, effort and celebration, challenge and validation. I was looking for more complex socio-technical textures, a connection with society, life, my life, and resistance. In any case, if I was going to continue my work with vibrotactile game technologies, it had to be in a way that made space for differences and less easy relations to unfold.

Commercialization of the Playful Mechanical Touch

Motorola's StarTAC, the first mobile phone with integrated vibrotactile technology, was launched in 1996. Nintendo's Rumble Pak was released a few months later (in 1997). These first launches of haptic technology in both mobile phones and game controllers were an implementation of a regular EMS motor that could spin and thereby make the phone or the controller shake. With the phone, the main selling point of haptic technology was to allow for a discrete alarm that could be felt rather than heard. Nintendo's Rumble Pak was launched with the game *Star Fox 64*, at the time one of the best selling Nintendo Games, promising to provide a supplement and amplification to the gameplay. Players could buy the Rumble Pak device as a separate module and attach it at the bottom of the N64 controller. The Rumble Pak remained a console add-on for a couple of generations before becoming a standard feature in most standard home console controllers.

From a technical perspective, the spinning EMS motor remained the main technology for haptic interfaces for the two following decades. In 2015, an LRA motor (linear resonance actuator) entered the market for popular technology with the release of the Apple Watch. Since the release of Iphone 7 in 2016, LRA motors have been the standard for haptic technology in both Apple and

Android phones, and concurrently became somewhat more readily available for commercial, artistic and DIY game making. These LRA motors give the possibility of precise force feedback, such as a controlled number of "shakes" and precise timing. This precision makes it possible to simulate buttons, scrolling wheels and sliders. Game-designer's under-exploration of these possibilities is most likely due to restrictions from platform owners.

The launch of PlayStation's DualShock3 controller in 2006 gives us an indication of what mechanical touch had come to signify in the popular market of videogame consumption. Sony decided to omit rumble from the PlayStation controller, allegedly due to a pending lawsuit brought by Immersion, a tech company specialized in haptic technologies.[6] The announcement was met with outcry. Leading voices in mainstream gamer communities demanded rumble and urged Sony to resolve the technical, possibly legal issues keeping rumbling sensations out of players' hands. This apparent sidelining by Sony of the vibrotactile aspect and the subsequent rush of consumer complaints tell us about the perceived value and worth of rumble in a commercial and mainstream gaming context. Ten years after the introduction to the Rumble Pak, players had developed strong affinities for the rumbling dimension of the videogame experience.

Although it has been 25 years since vibrotactile technology was first incorporated into commercial consoles, the untapped expressive potentials of current technologies remain seemingly vast. The dual-motor system of the DualShock controllers, for instance, can generate 4,282,908,855 different combinations of outputs (Parisi 2019). Yet rumble has almost exclusively been used as a supplement to the visual and audio channels of games (Orozco, et.al. 2012). As media scholar David Parisi points out, there is a paradox between the plentiful and diligent precision that characterized haptic research throughout the 20th century, including vibrotactile media, and the "ad hoc ways" rumble is used in the design and development of games (2019). Moreover, the vibrotactile aspects of digital games have been given notably little scholarly attention. The dearth of empirical studies of what the haptic possibilities in game consoles could mean for game styles and gameplay experiences is particularly puzzling.

Only a few experimental game projects stand out as working with a vibratory dimension of games as a primary modality. Mathias Nordval's *Haptic Pong* (2011) is a project that translates the visual representation of screen-based pong into vibratory signals. Players then have to listen to a rumbling "vibroscape" and attempt to press the button (the paddle) at the right time. I played

[6] Reimer, J, "Sony settles legal rumble with Immersion," Arstechnica, March 2, 2007, https://arstechnica.com/information-technology/2007/03/8963/

one iteration of *Haptic Pong* together with Amani Naseem at the DiGRA conference in 2011 (featured in New Atlas 2015[7]). My personal evaluation is that *Haptic Pong* was difficult. Perhaps a quieter environment, or more time to learn to read the feedback, could have taken some stress out of the situation.

Another non-commercial game using commercial console controls is the two-player party game *Magnetize Me*, developed by Amani Naseem, Patrick Jarnfelt, Lena Mechtchanova, Morten Mygind, and Giacomo Neri (2012). In *Magnetize Me*, two players have PlayStation Move controllers strapped to their bodies (ankles, upper arms and waist). Strong blue and yellow colour-coded rare earth magnets are strapped to other parts (also ankles, upper arms and waist). As the game starts, dance-friendly music encourages the two players to bounce and dance until one Move controller suddenly sends a strong rumbling signal to one player while lighting up either blue or yellow, matching one magnet on the body of the fellow player. With this prompt, the two bodies figure out how to twist together so that the rumbling controller and the matching magnet are pressed against one another in random combinations of arm to ankle, ankle to waist, waist to arm, ankle to ankle, etc. After a couple of beats, the music changes, and the two bodies disentangle and go back to dancing break-out style, waiting for a new challenge to be given. Regardless of postures, the two players keep on bouncing, jumping and/or dancing as controllers must keep moving; it is a dancing game after all. *Magnetize Me* was a popular game in the European experimental game design scene during the early 2010's, often played at festivals, game parties and game shows.

One of the few studies exploring the presence of rumble in digital games is Ea Christina Willumsen and Milan Jaćević's semiotic typology, developed from a study of nine popular games for the PlayStation console. This typology suggests that rumble is often used to signify four types of information. The first category of information they identify is environments with features such as explosions, falling trees, and helicopters. Secondly, they identify actions of either avatars or non-playing characters. Thirdly, they point to objects and how these are often indirectly signified by a rumble—for instance, when a weapon is being fired or a treasure chest is opened. Lastly, they identify rumble in the interface items such as menus and notifications. Additionally, rumble is used in gameplay to indicate ludic elements such as system states, danger, or for dramatic effect—for instance by heightening a sense of narrative particular to interactive realism (Willumsen and Jaćević 2019). Using a different approach, Lipkin has suggested that the haptic

[7] Moss, R, "Haptic Technology: The Next Frontier in Videogames, Wearable, Virtual Reality, and Mobile Electronics," *New Atlas*, January 15, 2015, https://newatlas.com/haptic-tech-vr-wearables-games-sightlence/35616/

aspect of games, including rumble, has potential for more affective impacts and therefore for more "bodily realism." As he writes, "there is no cultural construct that explains the meanings of different rumbles delivered through a controller" (2013, p. 36). He argues that, since rumble directly touches the body of the player, in contrast to the visual and the auditory, it bypasses the more complex systems of representation. I share Willumsen and Jaćević's concern for the way Lipkin writes rumble out of the cultural systems of meaning that we all take part in. While it seems difficult to map vibrotactile sensation onto a system like linguistic language, and it seems even more difficult to decipher which vibrotactile associations are unique to the individual and which are shared by a larger social group, this does not mean that rumble does not partake in these shared cultural and political systems of meaning and values. Yet Willumsen and Jaćević's typology addresses rumble only as a supplement to screen-based games and not as a primary initiator for meaning making in game contexts. Furthermore, the typology decodes the significations rumble seems to intend. Again, I wonder how these signals manage to make practical sense to players across all our glorious differences.

Notification Culture: A Ghostly Presence

While mobile phone notifications continue to buzz in pockets, hands, bags, and on nightstands, scholars talk about a new kind of "notification culture."[8] Buzzing notifications have gained increasingly finer resolution and precise expression, yet what exactly the refined buzz is good for remains seemingly unclear. The concepts of "haptic play" and "haptic ambience" theorize the buzz of mobile phones as boundary mediating technologies. As mobile games migrated to mobile phones, a temporary stretching of the game space became the norm. Games now exist alongside and in between mundane everyday tasks, such as cooking, bathroom visits, grocery shopping, and commuting. Developed by Ingrid Richardson and Larissa Hjort, "haptic play" (2017 and 2019) points to the centrality of the buzzing notification in an increasing number of games on phones. It is precisely the buzz that connects the player to the game space. It is therefore the buzz that reconfigures the different spaces in relation to one another: the world of the game, the home, the commute, the shopping centre, the body, the intimate space of the smartphone and the player's intimate sense of play. As Hjort and Richardsen point out, it is not simply the phones that allow for an interlacing of the activities of playing and not-playing, it is specifically the buzzing notifications. These haptic notification effects bridge and blur distinctions in sensorial and

[8] I heard this term used casually by a few scholars at a panel on haptic media at AOIR 2018

material ways. Tom Apperley and Kyle Moore's concept of "haptic ambience" (2019) builds on Hjort and Richardsen's ideas of haptic play, but focuses specifically on the multiplayer aspects characteristic to mobile games like *Pokemon GO*. Haptic ambience points partly to the way texture, affect, and embodiment become central qualities of the game. By extension, these qualities take on a shared quality. As social media, pedestrian flows, and play activities intersect, the felt notifications from the game creates an awareness that other bodies are playing the same game, moving through the city via similar routes, and performing similar gestures. This also represents an awareness that we are all being touched by our buzzing devices at the same time and in the same ways. This shared sensorial aspect is central to making the game a collective experience that connects and synchronizes bodies, play, and pedestrian flows across the city.

Meanwhile scholars report on a particular ghostly aspect of the buzz, a new kind of connection between imagination, meaning and vibratory sensation. Phantom vibration syndrome (Rothberg et al. 2010) refers to the experience of feeling vibrations, usually from the pocket, as if a phone is ringing or receiving messages. Phantom vibration sensation often happens when the phone is switched off or not even in our pockets. Scholars estimate that around 75% to 90% of mobile phone users have at some point felt one of these fictitious buzzes (Drouin et.al., 2012, Rothberg et.al. 2010) and more than half experience phantom vibrations regularly (Tanis et.al. 2015, Kruger and Djerf 2017, Goyal 2015). As such, it is the most prevalent phantom sensation phenomena related to the mobile phone (Tanis et.al. 2015, Goyal 2015). The statistics on phantom vibrations differ from study to study, and I am not sure if the sample of test persons, often students, can be said to represent the general population. However, the numbers indicate that the phenomenon does not represent a single, obscure incident or a headline gone viral. Phantom vibration sensations are seemingly a familiar experience to a majority of the population.

Physiological explanations of these sensations are still being developed and several competing theories exist. Some of the most common theories explain the misinterpretation as a sign of cognitive anticipation for social interaction (Rothberg et.al. 2010), an expression of social anxiety (Drouin et.al., 2012, Rosen 2013), or a case of habitual interpretation (Rosenberger 2015). The habitual interpretation explanation is an interesting one. It posits that the habit of relating sensations on the skin to the activity of the phone is so strong that we apply it to other sensations, such as clothes touching the skin or small muscle spasm. In each of these explanations, our relationship to our phones is treated charitably. The line between fiction and reality is warping, the desire to get news from friends and social media makes us fast and skillful at connecting the

buzzing sensation to possible messages from someone or something that wants our attention—a friend, a flirt, a game, or a low phone battery.

Looking back at Gault and colleagues' work with the *Teletactor* and Geldard's (1957) experiments with the *Vibratese*, there is an irony in how vibratory media circles back on itself. Back then, training and bulky technological setups impractical for everyday use were described as the main barriers for creating vibratory communication systems. With the popularity of smartphone use we now have a handy and standardized technology busily engaged in extensively training populations worldwide, and a common literacy is emerging. Perhaps we are more skilled than ever at associating particular events to particular rhythmical vibratory sensations. Yet, as Parisi and Farman observes (2018) in their evaluation of the failure of Immersion's Instinctive Alerts Framework for Android wearables (2015), the release of Apple Watch's Taptic Engine (2015), and the emergence of phantom vibrations, the vibratory signifier is simply a signifier for itself. The vibratory signifier indicates nothing else than that the user is being notified, technically, possibly, or in their imagination. The emergence of phantom vibration, then, shows us how haptic media continues to fall short of its communicative purpose, as vibratory sensation once again resists being assimilated into effective and efficient communication. Vibratory sensations seem to insist on their fleeting existence, cunningly escaping being pinned down into formalized semantic meanings and standardized associations.

Summary: Data, Simulation and a Ghostly Buzzing

This chapter drew on a history of processes for creating haptic information media. I started with the *Teletactor*, a device developed in the 1920s and 1930s by psychologist Robert H. Gault and a community of people with hearing, vision, and speech impairment. While the *Teletactor* never left the laboratory to benefit the community, it became a case to spur imagination and to ground funding for further research into transmission of information through the skin. As the cybernetic theory of information transmission took shape during the mid-century, a formal theory of communication was formed, establishing information as digital patterns manifested in frictionless and standardized material substrates. Most efforts to design vibratory communication systems up until the 70's followed the same paradigm. Vibratory patterns were transmitted onto human bodies which had been standardized through selection criteria for "normal test subjects," each assumed capable of accessing an original intention beyond the felt vibration. The 80's turn to simulation, virtual reality and game arcades drew the attention of vibratory engineering efforts

from information transmission to virtualization. From this period, I chose to feature Margareth Minsky's *Sandpaper System*,as it stands out as a unique case for vibratory media and is probably one of the most overlooked stories in the history of both game development and haptic media. The *Sandpaper System* is an interactive media console that simulates material perception using a motorized gaming joystick. This setup was groundbreaking, setting a new agenda for haptic media as representational media. The commercialization of vibrotactile media, however, did not incorporate these possibilities. Vibrotactile motors were implemented in commercial media during the 90's, in particular mobile phones and game consoles, where the rumbling sensation was used to quietly notify the user about simple events such as a call or an alarm. As mobile phones saturate our contemporary lifestyle, scholars talk about a new "notification culture" that includes both mobile games and "phantom vibrations." The rumbling sensation conveniently available to mobile users has become the space that mediates the border between everyday practicalities and everything that happens on phones, including mobile gaming. Simultaneously, this mediation is proven to be a blurred space, as the phenomena of "phantom vibration" seems to point to an inability for vibratory media to function reliably within contemporary media engineering paradigms.

Chapter 5: I'll Give You My Bird If You Promise To Pass It On

This chapter describes the process of making *I'll Give You My Bird If You Promise To Pass It On*. My first Vibropixels game prototype had worn me out and I was bored with technical development. I wanted a new approach, one that was more appreciative of the pulsating technology and one that prioritized my own comfort. This process happened faster and made use of opportunities that I had around me, yielding when things did not work out easily. I chose low-tech or simple-tech solutions. This in part meant that game logic that is conventionally built into the pre-programmed game system, which had proven to be too cumbersome to program in Max/MSP, was simply transferred from the system to the players, making it part of the play.

The Game: *I'll Give You My Bird If You Promise To Pass It On*

The Vibropixel modules were arranged in a room, hidden in corners, on window sills, plants, and pots. All Vibropixel devices were programmed to loop in differently vibrating patterns and pulsating light. During a period of fifteen minutes, players were given four paper notes with the following instructions.

1. There are 18 beating electronic birds in the room. Search and pick one you like.
~~ pass this note on ~~

2. Attend to the beats of the bird in your hand. Spend as much time as you like. When you are ready, decide on a name for the beats and tell it to someone.
~~ pass this note on ~~

3. Not all birds beat the same rhythm. Ask someone to exchange with you. Before you trade, state a condition for the trade or offer a promise.
Keep exchanging until you know all the birds in the room. Make sure that you end up with one of your favourites
~~ pass this note on ~~

4. When you know all the birds and beats in the room, think about how they would like to live. Group them with their peers. Arrange them on the plastic cups provided so that you end up with a nice landscape of beating sounds.

~~ pass this note on ~~

Each time the game was played, the instructions changed slightly, creating a game with varying degrees of anthropomorphic and storytelling dynamics.

Reflections on the Task

The previous approach had drained my creativity. I had worked hard to learn new things without paying much attention to pleasure or playful comfort, and the final prototype was marred by this. This time I wanted to prioritize pleasure and comfort. Instead of working from a preplanned game idea, I began with smaller steps. My ambition this time was to feel good about the project regardless of its state. I turned my attention away from game design, mechanics, and structure, and away from communicating specifics—cues, feedback, system states, etc. I took the risk and trusted that a game would come together once I had vibrations that had a feel I liked.

In *Variation 0*, I had been assuming that I needed both an input and an output system to make a game. At this point, I was tired of working with RFID technology in the Max code, so I skipped the RFID sensors and the convention of a two-way game system. I had no clear vision of what I would do instead, but it gave me space to focus on the affective and aesthetic qualities of vibration design and look for the social and experiential potential these presented.

Technical setup

- Vibropixels in silicone casing
- Max/MSP software
- Paper notes
- Plastic cups
- Players
- Plants and corners
- Hiding places and window sills

Workflow

ZU-UK, an experimental theatre company from London, was visiting our lab. On this occasion, several of us, faculty, students and community partners alike, cleared our schedules and dedicated a week to non-writing projects. Several groups in the lab were working on playful interactive experiences or installations, many of which did not feature screens or audio as their primary modality. I enjoyed being around other makers. Although ZU-UK is a theatre company, game techniques and interactive elements are central to their work. I found their approach to games and theatre familiar, somewhat aligning with the play and games communities I had been part of in Europe. This was the backdrop to my second attempt at working with the vibrotactile motors in the context of game making.

I had brought my Vibropixel equipment and took the ambiance of communal making as an opportunity to continue my work with this project. I started making a series of vibrating rhythms with contrasting expressions. Some were calm, others erratic, some were simple while others had multiple patterns at different lengths overlapping one another to various degrees of complexity. Reflecting on the lessons learned from *Variation 0*, I was contemplating possible strategies for the vibration design. From my work journal:

> *April 4th: I am trying to make four vibrations that can communicate basic emotions. The problem is that it is hard to distinguish between them e.g., anger and happiness via the tactile sense. What we communicate is a level of energy but to decipher to what extent this energy is "happy" or "angry" is not so easy. I have to think of a different repertoire.*

While working, I paid attention to how people approached the vibrating vibrotactile devices, how they talked about them and how they picked them up as if they were birds or softly beating hearts. These observations tied themselves to some of my earlier thoughts about storytelling and vibration. Is it possible to tell stories through mechanical touch? Is it possible to compose characters, worlds, and storylines through this modality? And if so, what kind of stories can we tell?

Janet Murray has explained so beautifully how games, in particular digital games, function as procedural media (1997). Murray points out how actions and conditions are the basic building blocks of digital games. Workdays from this week in the lab ended with an invitation to share something from our projects as they were developing. One such occasion, I decided to initiate a short experiment: I passed one of the pulsating Vibropixel devices around the table. Since people

had been personifying the devices as hearts, I asked people to pass "the heart" around based on a condition: "I will give you my heart if you promise to …" The conditions people came up with were:

I will give you my heart… if you promise to
... take it to the doctor
... sleep with it next to mine
... wash your hands
... display it under a magnifying glass
... return it
... care for it
... dance in synch with its rhythm
... not bring it out into the rain
... take it for a coffee
... charge its battery

Play: A Late Afternoon Experiment

The following day, I did another experiment. I had arranged 16 Vibropixel modules in a room, making use of the room's existing features (corners, window sills, plants, and pots). There were 5 different patterns between 16 Vibropixel devices (3-4 devices with the same patterns and a couple of "odd ones"). The players entered the room with the verbal instruction to search for "birds" and to take their time to pick one they liked. After a few minutes, paper notes with a two-sentence instruction were passed around between the players.

The instructions of this first test were similar to the ones described above in the description of the game concept, although a different ending was intended.

What Worked

- Simplifying and slowing down the pace gave players time to listen, wonder and explore the technology, the vibrations, etc.
- The experiment indicated that the technology was interesting enough despite it being so simple. There was a potential for an interesting connection between the technology, players and the social situation in the room.

- The experience evoked affective or emotional responses. Some players sat for a long time after the first experience recalling and recounting childhood memories.
- The storytelling that emerged was much stronger than I had imagined, potentially due to some of the players having degrees in creative writing, while others simply enjoying storytelling as a hobby.
- I liked the atmosphere of the experience. As a prototype, I thought it had potential.

What Did Not Work

- Only one exchange took place, which means that the game was sort of stuck after the first instruction piece.
- The attachment to the Vibropixel modules were so strong that players did not want to exchange them.
- The system had no sensors to register the players activity, which meant the procedural logic was transferred from the game system to the players.
- I gave the paper notes only to some of the players. I was hoping that if some started exchanging, it would spread through the group without further explanation. Instead, this uneven level of information caused confusion and alienation.
- The paper notes system was meant as a prototyping tool and it worked well in that regard. In the long term, however, I would like a more stable and "serious"-looking technology to make the progress seem more fluid. I could not think of a technology that could replace the notes without bringing in a number of other, more complicated problems.

This playtest was different from the one for *Variation 0*. It happened more spontaneously and was more like an experiment than a well-planned playtest. This meant I had less expectations for what would and should happen. My overall evaluation was one of pleasant surprise and I enjoyed the potential I encountered. There were, however, a few things I took note of. As mentioned, the game did not make it past the first instruction and never reached phase two. After choosing a "bird," the players made themselves comfortable, some sat down on the hard concrete-floor, others sought privacy behind tables, and some rested their head on other players' bellies as they took their time with their vibrating "birds." The affinity between players and birds grew as did the resistance to engaging in exchanges. Only one exchange took place. From my work journal:

> *April 5th: Notes from Playtest of* I'll Give You My Bird If You Promise To Pass It On...
> *Player x and player y wanted to find a hiding place. Player z was also trying to find a hiding place. It was as if people were going into a meditation. But why did people want to*

hide? This game is like a space that appears temporarily and dissolves when the event is over.

I stopped the game after approximately fifteen minutes. Despite the nice surprise indicating a potential for something interesting, the first play session of the game was, according to my intentions, a failure. The only player who initiated an exchange of birds later expressed that he did so only because he felt he had to follow the instruction. He had immediately regretted it and for the rest of the game he had missed the calming rhythms of his first bird. For the following play sessions, I redesigned the beginning to allow less time and attachment in phase 1.

The decision to skip sensors for data input also meant skipping the convention that a game's procedural logic has to be implemented with the code. If the system had no sensors to register the players activity, it could not make procedural decisions based on an evaluation of these. This experiment shifted the procedural logic from being a responsibility of the pre-programmed system to the players. I enjoyed this. It was easier for me and made for more interesting gameplay.

I invited people for a couple more playtests, experimenting with a balance between the flow of exchanges and initial attachment. These following playtests showed me a potential for storytelling. Trading birds for promises and promises for birds functioned as prompts for making associations, references, conditions, personalities, names, histories, and preferences. “I think this one is about to die, can you please take good care of it?” Sometimes the hand-built technology displayed small glitches in the rhythm, which prompted strong emotional responses and conversations of birds dying or being unwell.

Thoughts on Instruction Design

The use of simple paper-based instructions was inspired by some of the Fluxus artists, in particular Yoko Ono and George Brecht. I find these two to be excellent game designers. I like the ambiguity of Yoko Ono's instructional works. One of her most famous ones is *Cut Piece*, a performance in which she sits on stage in her best black dress with a pair of scissors next to her. The audience were given a single instruction: they were welcome to come on stage and cut a piece of her clothing using the scissors. The cut-out piece of clothing was a gift they could keep. Her book *Grapefruit* is a whole collection of instructional art works like these, written like short poems, many of which are only "playable" in the imagination of the reader. George Brecht has a similar style of game design, compiling boxes where each includes a couple of items and one

instructions, not unlike the typical presentation of a board game. The instructions, however, are not always straightforward. Often the player has to bend the rules, or explore unlikely interpretations of either objects or instructions.

As I kept playtesting and tweaking, I was exploring design options with the Vibropixel devices: what if not everyone has a bird and you have to give your bird away as a gift, or you have to match a rhythm to the clothes of fellow players, to their personality, or to what you think they would like? What if you had to use your body or your voice to articulate a beat to a non-playing audience? I became interested in the mechanical sound of motors and the complex soundscapes they offered when one honed in on them. One instruction read:

> *Look for a place in the space that you think would suit your bird. Once you find it, place it on top of a plastic cup. Listen to it. Can you hear anything? Do you like the sound? Does it sound like an animal you know? Does it sound like spring? Or somewhere else, somewhere you can only access in your distant memory?*

I used questions like these to prompt the players to explore the technology. The Vibropixels became characters in a game world in which players made a strong emotional attachment to the glowing and pulsating devices. However, I also liked the poetic style of ambiguous, impossible, often unplayable instructions, requiring players to sharpen their creativity, bend rules, and/or challenge straightforward interpretations. *I'll Give You My Bird If You Promise To Pass It On* did not have the same ambiguity as the Fluxus pieces, but I experimented with the clarity of instructions. In the first session, I passed the first instruction, the one on trading, to only some of the players, hoping that those who did not get the instruction explicitly would follow when some players started exchanging devices. The result was confusion and some players expressing that they felt left out, not understanding what was happening.

In later iterations, I played with the potential for ambiguous endings. Half the players were instructed to place the birds according to principles of sameness, harmony and order, while the other half were instructed to arrange the birds in a nice selection of different vibrations to end the game with "vigour and inspiration." Again, the confusion was high. The prompt to arrange birds in a space following ambiguous principles like preferences, sameness, and harmony seemed already to be stretching what was possible within the conventions of game instructions. To some people, the prompt to decide where an item belongs in a room is straightforward, while some players seemed less comfortable with this kind of instruction. Some might tune into fantasy worlds to anthropomorphize the devices so that preferences emerge based on a story; other

people tap into metaphors that translate the expression of the tactile motors, such that a quiet motor would like to be in the corner and erratic motor expressions gather in crowds.

I found myself conflicted. On the one hand, I was using elements of storytelling to make players connect emotionally with the vibrating objects. On the other, I had an aesthetic pull towards something that was at the edge of easily relatable or easily categorical sense impressions. I found that the amount of anthropomorphization the players performed in any of the playtests was highly sensitive, easily tweaked by small word changes in the instructions. Asking people to give the device a name in the first instruction, for instance, would give a basis for anthropomorphization and storytelling later on.

Afterlife of *I'll Give You My Bird If You Promise To Pass It On*

This performance was played at a couple of smaller events. After a while, I found its development was at a standstill, and I was not sure how to move on to the next stage. Distributing the instructions on paper notes was thought of as a prototyping stand-in, but I could not think of an alternative that would really do a better job. At the same time, keeping them as paper notes felt too rough and unpolished.

Images to Chapter 5

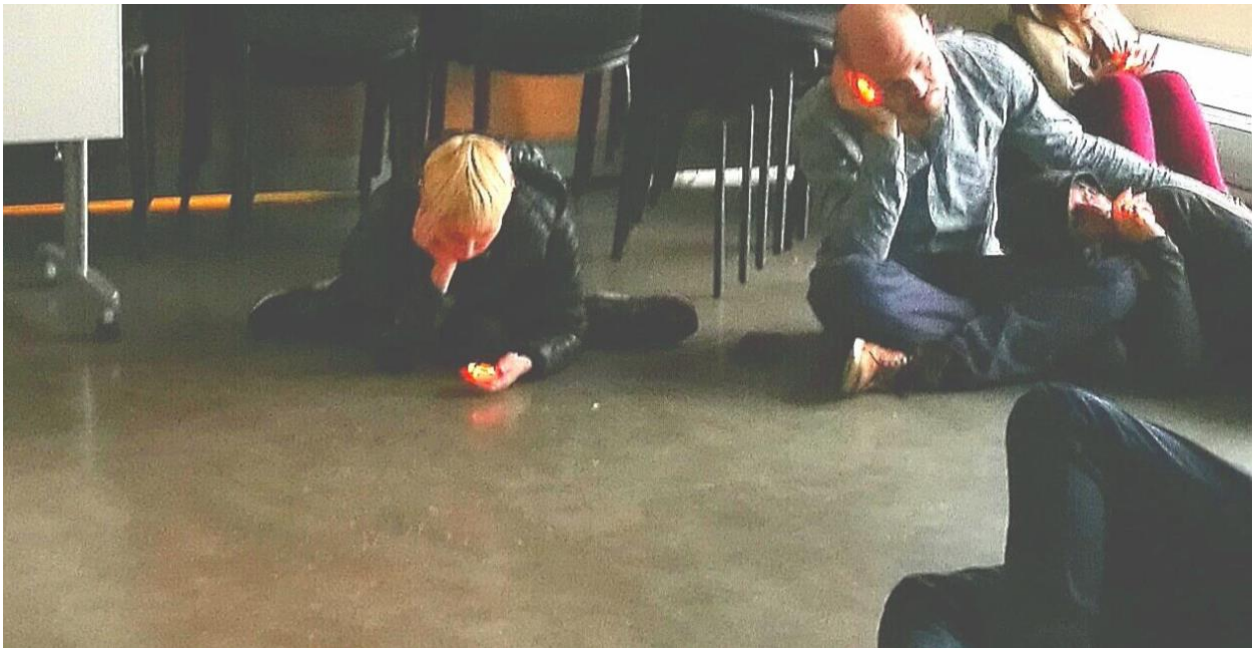

Image 5.1: First playtest of *I'll Give You My Bird If You Promise To Pass It On*

Image 5.2: Setup for *I'll Give You My Bird If You Promise To Pass It On*

Image 5.3: A player holding a Vibropixel and a paper note with instructions

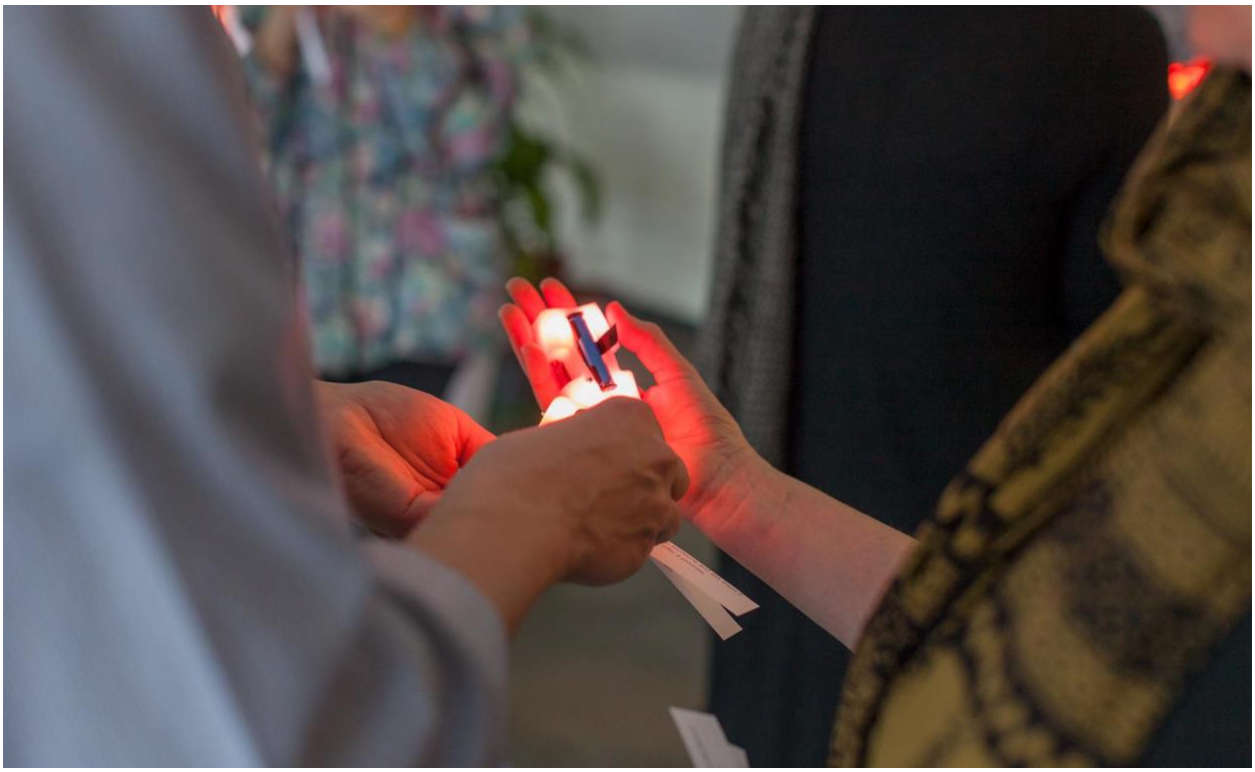

Image 5.4: Players, Vibropixels and paper instructions

Image 5.5 Players, Vibropixels and paper instructions

Image 5.6 Players, Vibropixels and paper instruction

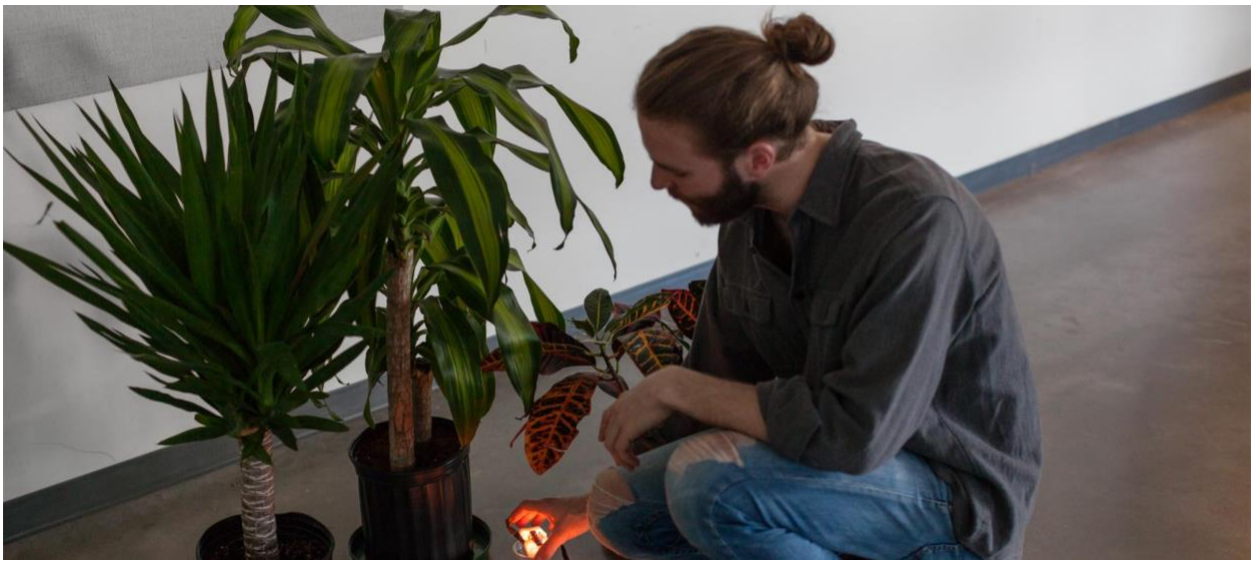

Image 5.7: Player placing the objects on plastic cups, turning the vibrating motors into a soundscape

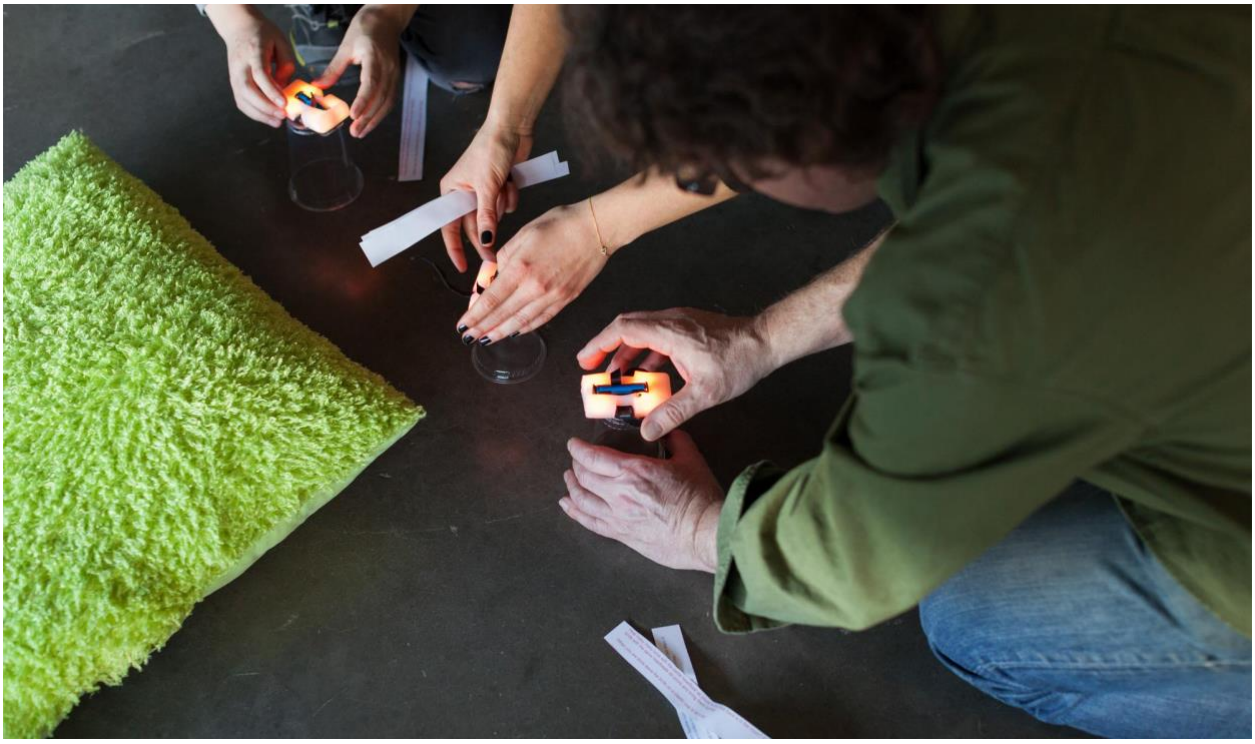

Image 5.8: Players placing the objects on plastic cups, turning the vibrating motors into a soundscape

Chapter 6: Games and Container References

The second game I made with the Vibropixels made me think about the presence of care and relationality in games. I think of games as technologies for care, but I do not mean care in a romanticized sense. I mean that games are effective technologies for compelling us to care, establishing affectively charged relations to particular outcomes—in other words, a passionate investment in particular futures over others. Player studies have produced countless reports on passionate players and play communities who debate, rewrite and modify both the parts of games they adore and the parts they dislike, including narratives (Ganzon 2014, Layne and Blackmon 2013), pets as avatars (Consalvo and Begy 2015), characters (Lauteria 2012) and interfaces and consoles (LeMieux 2014). In fact, players often pour extraordinary efforts into appropriating and interpreting games in ways that make the games fit their particular circumstances, aesthetics, and preferences (Shaw 2014). Players care about points, coins, progress, cats, and colourful flashing lights. To what extent we care varies greatly from player to player, but many of us easily come to care so much that we forget about everything else, we forget to hydrate, we put bodies into awkward positions, or we sacrifice a good night's sleep or a hearty meal.

The craft of game design includes a range of techniques that facilitate players' attachments to particular futures. Media scholar James Ash has developed a framework for understanding what he calls “an ecotechnics of care” (2015). Here we see care as something that is spatially and temporally organized within the technical system, via techniques such as statistics, quantification systems, social media, and suspension or deferral of negative affects. These are all techniques that are used to encourage players to keep playing.

This notion of care is powerful because, in mainstream discourse, it has been coded as a romanticized and depoliticized relation to the world while covering up the violence being done under the umbrella of care. Addressing a possible critical and feminist theory for care, Aryn Martin, Natasha Myers, and Ana Viseu write,“We [have] encountered fraught politics of care, which foreclosed a romantic or laudatory treatment of the theme” (2015). Here care is understood as a selective and affectively charged mode of concentration and action. To illustrate the non-innocent side of care, one of the research projects they bring up is care as means of imperial and colonial governance. Throughout our colonial history, care has had a “darker side.” Significant amounts of violence have been committed under this condensation of affective and selective modes of attention and action.

The ability to author care is not an innocent quality of game technologies either. In fact, we might attend it as a highly political aggregate of attention and action, a glue that keeps the system and procedural logics together. As much as games might be instrumentalizing relations of care as part of the craft, as an affective investment in particular futures, care is highly political, cultural and ideological.

Care is one of the relations most characteristically produced through games. In this chapter, I examine how we might understand games from a perspective of a relational ontology. With these reflections I seek out theoretical and designerly frameworks that are equipped to account for the presence and contributions of a local environment, including players. I am first of all interested in game studies' prevalence of positions and habits that continue to perform formalist modes of thinking, even as the critique of such thinking is as old as game studies itself. I consider Douglas Wilson's notion of the "broken game" a suggestion for a relational and situated strategy for game design. In studying Jason Lewis and his colleagues' articulation of Indigenous Protocols for Artificial Intelligence, I learn from their lessons for ways we might build technology that is in conscious relation to land and people. The problem of obscured relations between games and environments is not only a rhetorical or theoretical exercise. These old-school conceptual and ontological frameworks manifest in game design and game development practices, mainstream aesthetics, and default design solutions. With that in mind, I end with reconsiderations of the terminology we use for talking about games, and, as an alternative, I suggest prioritizing the use of time, history and resource-based metaphorical frameworks over spatial ones.

Games as Useful, Innocent or Political

The relation between games and society has, in game studies, been addressed from two opposing perspectives. Some talk of games as if they exist in isolated silos with no resonance, or impact to and from, their historical, cultural and material surroundings. From this position, games are devoid of politics and meaning (as elaborated by Paolo Pedercini 2015). They are developed by technicians who work without creativity or cultural values. A game designer, in this paradigm of innocence, is a humble servant of society, a vessel for rationality, expertise, and "good game" design.

The other view is a utilitarian perspective that treats games as a means to an end. This is a belief that games have a capacity to cure, improve and/or fix the world. Sabine Harrer has called this the "interactivity myth" (2018), as it is dependent on the supposedly unique quality of interaction

that games get their power for change and persuasion. The myth argues that, as consumers of other media only read, imagine or reflect about a topic, players act out a situation and thereby their power to convince is more impactful. This argument has gathered attention and funding for games intended, for instance, for education and social change applications.

I argue that both the innocent and utilitarian positions respectively assume a clear boundary. The former assumes one between game creator and society, the latter between gameplay and everyday life. Among those who subscribe to an innocent position there is a clear boundary between creator and politics; the technician is not seen as a creator that embodies politics. Although the boundary between the players as they are while they play a game and how they are otherwise has been highly debated, it continues to haunt the field. The utilitarian perspective places the creators outside the problem, part of a different world than the players, where from they can diagnose and develop a treatment strategy. Oddly enough, the gameplay–everyday separation, the one that enables the utilitarian position, also enables the belief in innocent games. This separation assumes that players leave themselves behind, including their previous experiences, culture, opinions, reflections and creativity, in order to become fully receptive to the message of the game. Miguel Sicart has elaborated this in his critique of procedural rhetoric (2011). The utilitarian perspective flattens the knowledge of players and the world and rids them of imagination, differences, and previous experiences. Due to these separations, games can be implemented in various cultures, places and times and convey the same message unaffected by these changes in the environment.

Neither the innocent nor the utilitarian claims are unique to game technologies. Cultural historian Eric Schatzberg (2018) points out that the idea that technological production expresses cultural values is a minority position both academically and beyond (p. 4). This approach is more readily applied to art-making than to technological tinkering. Art, not technology, has become the form of material production that embodies expressions of culture.

The depoliticization and deculturalization of technology has a long history. Technology as we know it today has only been around since the 1930's. In ancient European culture, Schatzberg explains, art was the operative word that referred to knowledge production, particularly with regard to knowledge production concerned with the physical world. "For centuries before 'applied science' and 'technology' emerged as keywords," as Schatzberg writes, "'art' served as a fundamental category for understanding material culture and its relationship to natural knowledge" (2012).

Historian Leo Marx explains that, after the industrial revolution, there was what he calls a "semantic void," an absence of words to describe the societal and political developments being witnessed mainly in Europe and North America (2010). Technology emerged around the turn of the century as a term to fill this void. The new term stems from the German word "technik," referring to the methods, tools, and instruments used in science labs, and more broadly to the practices that maintain and create material culture. The renaming worked to erase the term "useful arts," and its feminized roots otherwise associated with "the practices of the hand" (Marx 2010). Notably, this also worked to dissociate technological practices from the qualities of touch and tactility. This new term simultaneously savoured the instrumental qualities of the mechanical arts and tied them to the contemporary excitement surrounding science and progress. Accordingly, "technology" comes to represent the kinds of material constructions that embody values of rationality, efficiency and neutrality while art embodies creativity, spirit, and expressions of culture.

While "technology" was used during the first decade of the 20th century, it is only since the 1930's, barely a century ago, that the word has come into common usage in English-speaking communities (Schatzberg 2018). In the 1980's, the anglophone conception of technology migrated back into European languages, French and German in particular, where it now exists parallel to its original reference.

Game Studies' Container-Like Metaphors

Savouring the neutrality of the medium has not been without its difficulties. Avoiding contamination between games and "society" has required significant boundary-making work. Yet there has been much debate around said boundaries, to the point where Apperley and Jayemanne have identified a "material turn" in games studies, one which signifies a growing number of scholarly works paying attention to the contexts of play:

> *Such work exhibits an increased concern for the contexts, uses and material qualities of games technologies on the one hand, as well as attentiveness to the situated analysis of play and players on the other* (2012, p. 7).

As the quote illustrates, games studies' material turn is informed by an increased interest in context. While there are article reviews methodological tendencies within games studies that exemplify this turn, it has become clear that, in praxis, this word "contexts" refers to everything

that takes part in gameplay and enables it to unfold, including the players' bodies, fingers, hardware, play situation, etc. The word "context" is on one hand so broad that it has lost significance; on the other, it is perhaps the keyword that most impedes game scholars in moving the conversation beyond the residue of the mid-century transmission model.

The notion of contexts as "container-like" comes from HCI scholar Lucy Suchman, via a reference to what I would call a typical use of the word "context" in conversations about human action (2007 p. 19). The container-like connotations associated with the word keep us locked in a rhetoric of separation over relation. I believe that moving away from the grammar of "games" and "play" as happening within a particular "context" can help us better discuss games and gameplay as inherently relational.

In game studies, we have our own set of container-like metaphors. The magic circle has been debated with much intensity throughout the history of games studies. The concept was first introduced by cultural historian Huizinga in 1944. It had a renaissance when game designers Katie Salen and Eric Zimmerman reintroduced it via their game design textbook in 2003. It has since been criticized and debated to the point that Zimmerman himself dismissed it as a "simple concept" (Zimmerman 2012), urging those debating it to leave it behind. Still, it seemingly persists. Huizinga's original text (1944) describes the magic circle as a social agreement to accept the rules of a game as valid, creating a sacred social space apart from "the real world." Within the magic circle, rules are actively given significance by a group of players. The idea, then, is that if the rules are transgressed, if rules are put to question and if elements from "real life" enter the games, the game breaks down. When Salen and Zimmerman reintroduced the term, they reframed it as a theory of "how meaning happens," by which they meant how games are or become contexts for the creation of meaning, including how objects and actions gain significations they do not have "outside" the magic circle. "Within the magic circle, special meanings accrue and cluster around objects and behaviours" (2004, p. 96). Describing the magic circle as a theory for how meaning is established in games is an interesting twist not made explicit by Huizinga himself. However, the magic circle, as a social agreement that legitimizes certain rules, describes a conceptual social space in which rules are given authority to make differences and delegate roles, activities, responsibilities and consequences. These are all differences that matter, in the sense that they make differences. The magic circle has an analog within communication studies, an equally contested theory regarding meaning, boundaries and messy contexts. Huizinga's text on the magic circle was published just a few years before the presentation of Claude Shannon's theory of information to the Macy conference community

(1948), but the similarities are striking. Not only because of the interest in the construction of meaning but because of their parallel preoccupation with sealed boundaries and how context is framed as the cause of breakdowns in communication and play. As both models received exhaustive critique, they both received iterative revisions in which the strict division between information and noise, play and reality, was softened. During what Katherine Hayles has called the second wave of cybernetics (1999), attention shifted from information and data codes to relations, organizing principles, and energy fluctuations. Shannon's interest in how a message (a digital pattern) could be transported from one location to another without change was replaced by a search for a secular theory of life. The second wave of cybernetics wondered how organisms (biological or not) were able to maintain a coherent signature across multiple and changing environments. Maturana and Varela's theory of the autopoietic machine is possibly the most famous case in this regard (1980, orig. 1972). Here we can observe that the boundary between organism and environment is described as a porous membrane that allows just as much noise into the system as the organism is capable of handling without losing stability and consequently breaking down (p. 81). This means the porosity of the membrane is determined by the internal structures (organizing principles) in charge of how much disturbance they can withstand. The autopoietic organism, then, is the context for the organizing principles of secular life just like Salen and Zimmerman's iteration of the magic circle is the context for the structures around which players make meaning.

The magic circle has similarly been perforated. As Shannon's cybernetic theory of information faced criticism for its inability to account for culture and differences among communicators and contexts (see chapter 4), the magic circle has received the same criticism. Almost ten years after the reintroduction, Zimmerman wrote a blog post in which he explained that the boundary of the magic circle was more like a "membrane" than an airtight seal (Zimmerman 2012). Games, as context for meaning making, then have a membrane-relationship to their own context: the real or non-game world. I will return to this container ideology later.

In 2012, Zimmerman expressed both frustration and confusion about how such a "simple concept" could draw so much attention, critique and debate. Yet it seems that, in an interdisciplinary field of study like games studies, the concept of meaning and its relationship to contexts are far from simple. However, the critique of the idea has mostly remained in academic circles, in particular within the social sciences and humanities. In game design and game development practices and literature, the magic circle remains an unchallenged design aesthetic. It is almost as if the consensus is to present challenges to succeed, which stays within the

parameters of the game while keeping reflection (Khaled 2018), judgement, and appreciation frictionless. The qualities of being "drawn into" and "immersed in" a game are still strong design imperatives. Additionally, there is the notion that games ought to be a stable system that consistently brings about the same, or similar, play experiences even as place, time, and play communities change.

On Game System's Arrangement of Tasks and Responsibilities

One of the more interesting deconstructions of the magic circle is Douglas Wilson's notion of the "broken game." While I was finishing my masters degree at the IT University in Copenhagen, Wilson, at the time a PhD student in the games department, was developing the game *BUTTON*[9] together with friends and fellow students in the university's games program. *BUTTON* is a party game for two to eight players. The concept of the broken game comes out of reflections on *BUTTON*. When playing *BUTTON*, players organize themselves in a line, looking at a screen a few feet away and awaiting instructions: "do push-ups," "play dead," "sing opera," "act like a robot," etc. After a short countdown, a random win or lose condition is announced, such as, "First player to push their button 15 times wins," or "last player to push their button wins." The game is chaotic and silly; it is a festive mockery of game culture's fascination with rigid ideas of winning and losing.

One feature that Wilson pays attention to in his analysis of *BUTTON* is the kind of play that emerges due to an imperfection in the game system. While the game orders the players to act out various scenarios, some of which might even give some players an advantage over others, there are no sensors that enable the system to know whether these instructions have been carried out. Hence, the game system fails to enforce the very rules it puts forward. The broken game is therefore characterized by deliberately refraining from checking up on how players play. This means there is a gap in the procedural logic of the game system, which leaves it to the play community to police and enact the rules. This transfer often incites collective interpretations, hefty negotiations, creative kinds of cheating, and on-the-spot redesigning. With such a design feature, the broken game foregrounds a second set of rules: the social rules we use to negotiate the game's rules (2012). Expanding on Janet Murray's point that digital media are intrinsically procedural media, Wilson adds "it is […] surprising how often we forget that human beings too

[9] I am referring to this game as *BUTTON*, instead of *B.U.T.T.O.N*, its original name, to improve its screen-reading accessibility.

can enact procedures" (2012, p. 133). Computers are not unique in their abilities to act procedurally; human players, society, and social groups are also excellent at following procedural logics, although they have a different way of doing so. Furthermore, players are not only able to enact procedures, they are also excellent at creating, changing, transgressing, and arguing about them. As the game encourages players' creative interpretation and negotiation, it can develop unexpected kinds of gameplay that exist outside what the designer had imagined.

By using the "broken game" terminology, Wilson reiterates Huzinga's idea of the magic circle. In Huizinga's description of games, they collapse if the rules are transgressed, if rules are put into question, or if elements from "real life" enter the games. In Wilson's broken game, elements of "everyday life" enter the game not because the boundary between game and not-game becomes a membrane . Instead, it is the redistribution of tasks and responsibilities within the sociotechnical material that gives broken games such characteristics. Players' "out of game" resources, play styles, opinions, and life experience are built into the way the game functions.

What I like about this concept is not so much the reference to a game as broken or not—a dichotomy I struggle to understand given his own argument that players, like computational technology, are capable of executing procedures. What I like is the destabilization of how tasks are distributed in the sociotechnical circuit of games and play, code, and flesh. When the game program abstains from checking up on player activities, it transfers such tasks and responsibilities to the players, who are then given the role of observing, policing and rewarding player actions. This task is displaced from the computational program to the player community. This means that, while computationally-facilitated games always function across two materials that each hold different capacities for enacting, policing and enforcing procedures, the broken game actively works with both to make an unusual mix-and-match procedural aesthetic. This mix-and-match aesthetic is not, as in Huizinga's text, to be avoided as undesired and dull play but rather embraced as an emergent kind of messy, unpredictable play, a game around the game. Wilson's broken game is a designerly celebration of the relation between the game and its playing community, complete with all its unpredictability and specificity. From a cybernetic perspective, the broken game is unstable, noisy and highly situated.

Indigenous Protocols for Artificial Intelligence

The fixation of boundaries and its associated systems of hierarchies, neutrality, and purity are deeply rooted in European ways of thinking. In an attempt to decolonize, scholars across

disciplines have turned to alternative models. Relational ontologies are integral to many Indigenous philosophies. The Indigenous Protocols for Artificial Intelligence (IP AI) initiated by Jason E. Lewis, Professor of Computation Arts at Concordia University in Montreal, is one of the more recent contributions to relational thinking in technology (2020). The IP AI highlights an ethic for technological development that promotes a sustainable and ethically responsible development of artificial intelligence (AI). This collection of protocols is just one of Lewis's many research initiatives facilitating conversations concerning technology and futures that include and prioritize Indigenous peoples, imaginations and perspectives. As Indigenous peoples are the hosts and custodians of the land on which many tech companies operate, it seems highly relevant that Indigenous perspectives take part in conversations on technologies, especially as AI has become one of the key spaces where big financial investments are made, futures are built and governance is imagined.

For the IP AI, Lewis gathered Indigenous scholars and practitioners from communities across the planet, including Aotearoa, Australia, North America, and the Pacific, to imagine an AI that offers a critical alternative to European anthropocentric ideologies. Via workshops, knowledge exchanges and collective tinkering, the group has authored a series of protocols, an impressive resource of perspectives, positions and guidelines, for creating artificial intelligences that align with Indigenous value systems.

This is not a univocal proposal, as there is no universal "Indigenous Perspective." Lewis and colleagues embrace the multilayered meanings associated with most things "technological." The contributions include poetry, art practices, theory making, and conversational writing. "It is our belief that anything as complex as AI requires an engagement that is as multilayered as human experience itself." (2020, p. 11). The diversity of significations fits well with the multivocal practice of imagining the future of AI from Indigenous perspectives.

Common to the perspectives, however, is a critical distance from European ideas of technology that isolate, centre and elevate the human above all else. The Indigenous protocols are "community-grounded models" that prioritize reflections on relationships, not just between AI and humans but also to animals, rocks, and wind. Can we imagine, for instance, these relationships being shaped by practices of reciprocal care and support rather than the Western institutional tropes of either subjection or mastery? The Indigenous protocols consist of guidelines, methods, suggestions of ethical procedures, and standards for behaviours concerned with how relationships materialize ethically in accordance with Indigenous knowledges.

One of IP AI's contributors is artist and doctoral student Suzanne Kite, in conversation with family members and a colleague. Together with her aunt and cousin, Kite draws on knowledge of Lakota protocols for building a sweat lodge to make a step-by-step guide to build "anything" ethically, including technology. Particular to Kite's framework is a concern for communities as well as the foundational material relations of technology. Mining practices, for instance, are at the core of contemporary technological development and its ethics are questionable. In consideration of such ethics, Kite, her colleague and family members write, "Indigenous protocols set up our relationships with the world in ethical ways, reducing harm to ourselves, our communities, and our environments" (2020 p. 75).

Lakota decision-making works within "the network of relations," such that decisions must be examined all the way through from resource gathering to transportation. The relational ethics of Kite's protocol includes a time component. From a Lakota perspective, ethically building technology, or anything else, must include the wellbeing of seven subsequent generations. This means, for instance, that we must use recyclable and compostable materials, and embody principles that support the right to repair. In a shortened form, the eight-step guide to build anything ethically starts with thorough consultation and study. Then needs and intentions must be clear, and stakeholders, human and non-human alike, must be identified. Stakeholders include creators, consumers, all raw materials, non-human environments, and all communities affected by production, transportation, use, etc.. Materials must be gathered in ethical ways, always making sure to give something back. Components must be arranged well, algorithms must be "called," and the code structures must work well together. As the program runs, electricity transforms the semiotics of the code, making it sensible to humans. At this point, the technology must be announced to make clear relationships to its stakeholders, and finally, there must be a plan for its deconstruction to ensure an ethically-healthy afterlife.

Fragile Games

Lewis, Kite and colleagues are among the many voices drawing attention to this relationship between technology and relationality. What Apperley and Jayemanne called a material turn in games studies might as well have been called a relational turn. Like Lewis, Kite and others, I am interested in thinking of games and technology in relation.

Accordingly, I am critical of the European tradition of humanism in which we, humans, have been elevated to a superior position in society, a position from which we claim freedom,

independence and ownership. I am interested in ways of thinking about games and game writing that puts players and games back in relation. Being in relation means that we cannot define ourselves, our capacities and dreams, apart from our relations, including the histories, the culture and the materials of the physical land we are on.

Four categories, nature, culture, human and technology, enact conceptual separations that have become so mainstream in Western thought that it has become difficult to think otherwise. And yet, when we start to reconsider these distinctions, they begin to dissolve.

In games studies, we habitually identify the main objects of study as game, players and context. Grammatically, players play a game within a particular context. The rhetoric seems to work as long as the magic circle is kept more or less conceptually intact. The magic circle is like a container holding the players and the system. Surrounding those is the context, an unspecified amount of everything else including infrastructure, players bodies, historical and cultural context, the game platform, the politics of labour and mining that placed this object in our living rooms, the wind, the birds noises drifting in through the window while we play, the parallel thoughts about dinner, news, and social injustice. I believe this rhetoric helps to maintain the debris of the magic circle. Labelling everything in one big container sidelines all these elements that make gameplay situational and meaningful from diverse positions.

I am interested in Kite's attention to time and resources. In a pragmatic sense, a game is a particular kind of material aggregate that has been arranged over time. *I'll Give You My Bird If You Promise To Pass It On* is a collection of materials: players' bodies, a computer, motors, batteries, transmitters, receivers, precisely shaped air waves, carbon, silicon, a longer list of rare minerals, paper notes, walls, corners, plants, and code in multiple layers of abstraction. When the code is stored and transferred, it does so as patterns in physical materials. It is this material arrangement that we, as game developers, prepare for the players when they come to play. Players, too, are a material aggregate that has been arranged in particular ways over time: body posture, muscle strength, motor skills, memories, experiences, culture, family, friends, education, shelter, food access, and spirit materialize in the body. Both games and players are entangled with so many relations that we cannot exhaustingly list them, and identifying one from the other can become impossible.

I think of Lucy Suchman's ethnographic observations on the moment when technology and humans meet (2007). Suchman has studied human meetings with a number of celebrity AI robots developed by researchers at MIT. She notes how the encounter usually incites everyone involved,

human and AI, to put effort into making the situation intelligible to one another. That is, everyone does their best to be understood by the other. From Suchman's anthropological perspective, making these encounters successful means making them meaningful. In this process, she notes how drastically people, the human component in the situation, change themselves, including their language, gestures and facial expressions, to become readable to the robotic sensory and sense-making system. We might say that making the human–technological situation meaningful requires humans to stretch themselves and engage in the fluidity of who they are or can become. While humans and machine systems are all able to engage in a situation and make it meaningful together, there is a radical asymmetry in this relation. For Suchman, action is always situated. This means that neither the users nor the robot comes with pre-defined capacity for action but rather "capacities for action are figured at the human–machine interface" (2007, p. 2). The asymmetry that Suchman observes is rooted in a difference of resources (memory, physical abilities, sense-making systems, etc) that each actor has access to in the moment. Neither humans nor robots entered the interaction with a particular kind of agency, actions, choices or investments. These emerged during the encounter. In this way, Suchman relocates the notion of agency away from what we understand to be a human, to the "possibilities generated and reiterated through specific sociomaterial assemblages and enactments" (2007, p. 242). Agency, the ability to act in unexpected ways, does not belong to entities, individuals, or systems. This is "mutual intelligibility" (2007). Actions, choice and agency belong to the relations of the moment, they are neither predetermined or random. They draw on resources available, a material arrangement given by history.

The rhetoric of games, players and context becomes difficult when we discuss it from a perspective of relation. The play moment, however, is identifiable. At the play moment, history is activated. That means the material arrangements we have prepared, as well as the ones joining "situationally," become resources for the moment. Kite poetically described the moment electricity runs through the code as transformation, as electricity transforms semiotics into a sensible experience. In the context of games, the transformation is not just semiotic. The activation of semiotics, or however one starts a game, activates the whole of the situation in a moment of gameplay.

Fragile games appreciate all the relations that take part in the play moment even as that promotes what we might call game instability. An aesthetic of game fragility treasures the fact that each time a game is played its configuration varies and not each playthrough is equally perfect.

Summary: Games and Container References

If I were to define a game, relation would be a primary concern. That particular kind of relation would be one of care, because I think excellence at authoring different forms of caring is what distinguishes game technologies from other kinds of technologies. I hope to avoid the innocent connotations related to care. Instead, I think of care as an investment in particular futures over others anchored by an affectively charged concentration of attention. This is not a neutral or inherently good relation. It is, however, highly political.

Despite repeated critique of game studies' inability to account for the ways games are situated in particular environments, the tendencies to obscure these relations persist. The rhetoric connecting games to ideals of neutrality and purity runs deep in European history and manifests not only in scholarly preoccupations but in mainstream aesthetics, play preferences and default design strategies. In this chapter I have illustrated how the grammar of "game, player and context" creates an illusion of containers with identifiable boundaries, although with varying degrees of permeability. In line with Lewis and co-authors of the Indigenous Protocols for AI, I prefer a framework that features relation as an alternative to container-like metaphors. I don't see games as circles or contexts for meaning. Games are an arranged assembly of material aggregates, which, in certain relations, including non-innocent relations of care, can engage play. Discerning which part is the game, the player, and the context is less important. The relation activates resources available in the situation, like aggregates of material culture gathered over time. A design aesthetic embodying this theory is Wilson's broken game. The broken game meets players and situations with incomplete procedural circuits. It redistributes the responsibility for policing and judgement from the system to the players, and thereby asks the play community to take part in tasks otherwise performed by the system. I elaborate this design strategy with the notion of fragile games. The fragile game is unstable, inconsistent, and highly situated. While the stable game follows an aesthetic of providing the same play experience even as the situations in which it is played changes, the fragile game is situated and in relation.

In this way, I think of games as utilities. That means that I think of games as tools for play, but I do not think of tools as either neutral or without culture. Thinking of games as tools acknowledges that what we make is not an end-product or an end-state but part of a material aggregate that circulates. My productions might become part of someone else's creative practice.

Chapter 7: *Promises*

This chapter describes the development of *Promises*, the second iteration of the previous game *I'll Give You My Bird If You Promise to Pass it On*. The chapter takes us through a pivot from material explorations in ceramics to woodwork and carpentry, a pivot that introduces its own set of vibratory qualities as electrical machines made their impact on the wood. It also considers a contrast between playtests in parks and the final exhibition space. The transition from parks, streets and cafes to the gallery at the Ars Electronica festival in Linz provokes reflections on context, the culture of spaces, and the need for strong and deliberate framing of games in gallery contexts.

The Game: *Promises*

The game *Promises* is the second iteration of *I'll Give You My Bird If You Promise to Pass it On*. The main difference was that it was made to work in the context of a gallery space. It was therefore redesigned to work asynchronously so that gallery visitors could drop in and out without the gallery having to gather a specific number of players for a game session to start. Also the visual presentation, the layout and setup, changed. Lastly, the game was also scaled down to host a maximum 9 players, instead of 16, to fit spatial parameters.

Reflections on The Task

It was while I was travelling, visiting my home city, that I was contacted by the curators of Hexagram's campus exhibition at Ars Electronica. Until this point, my work had primarily been played and shown at game events, game parties, street festivals, and outdoor gallery/art spaces. So, while I had been interested in the closed-off (indoor) white gallery space for a while, it was not a site I have much experience with. One request from the curators was to change the game from an event-based format (happening at a specific time with visitors registered as players) to an installation one that could also work when a play session was not ongoing. The second request was to make the game run asynchronously, seeing as it would then run more smoothly and create less demand on volunteer staff, scheduling, and efforts to gather players. I welcomed the challenge to work with the white cube, but it was ambitious. There were only a few months to do these redesigns and the majority of this time I was travelling. The months before leaving

Montreal, I had worked with vibrations and ceramic to explore how vibrations worked in different materials. These ceramic works could work well for the task ahead. However, I was travelling and did not have access to my usual resources, studio space, or collaborators. For reasons I will explain below, the project took a material turn from ceramics to wood.

Technical and Material Setup

- Vibropixels
- Max/MSP software
- Wood
- Players
- A Room
- Pillows
- Shelves

The technical setup was much like that of *I'll Give You My Bird If You Promise to Pass it On*. The Vibropixel modules were embedded in handmade wooden objects dyed with black pigment. The flimsy looking paper notes were replaced with a more solid deck of cards placed on a plinth. Above the plinth was a sign reading "Take a card from pile 1."

Workflow

I had been working with ceramics for a few months. I was designing for slower play experiences, a play in which a slow kind of attention was required to notice clues necessary to unlock more levels. I wanted that slowness to be embedded in the material and the spatial configuration as well.

> *January 21st: Can I make a situation that invites much slower play? Something that invited the player to casually hang out with these things. Perhaps very big round bowls or other big shapes that ppl pass around and which are not easy to steal. Perhaps made for a lounge or comfy seating. Perhaps ceramics coated in silicone. Silicone in case ppl drop it. Although, I like the smaller format because it requires the players themselves to get into this state. Bigger objects would do too much work for the player.*

January 2018, I made connections with a student in the sculpture program at the school. Kevin was known to be particularly skilled with ceramic techniques. Together we created a series of round black eggs as casings for the Vibropixel modules. For the next iteration, I was planning to try shapes less loaded with easy connotations like eggs and heart beats. These plans were interrupted first by the trip to Denmark, then by the invitation to Ars Electronica and the urgency it sparked to keep working under such different circumstances.

I decided to use the advantages that "being home" could give me. I took the train out of the city to see my childhood friend Kasper Fleng and his partner Julie Peters. Anticipating that they could give me some advice, I told them about the project. Kasper has training in cabinetmaking and Julie studies sculpture. To prepare, I prototyped objects in polyurethane foam (PU foam), a foam that comes in a bottle, most commonly used to insulate houses. Once it is dry it is possible to sculpt and cut using a sharp knife. I made a series of ambiguous-looking shapes and cut them open to carve out a spot for the technology. I then covered the objects in plaster and painted them black. These objects were initially made for playtesting, but now they were suited for mediating a conversation about physical shapes and materials.

During my research I had noticed that vibration needs materials to convey its expression. The choice of material matters not only for the quality of vibration but also for how much players will invest in and care about the objects and, by extension, the game. Therefore, investing in the quality of the game objects was an investment into both game robustness and material durability. At the end of the visit, we had a concrete plan. We planned to start producing 16 black wooden objects with embedded vibration technology the following Wednesday. We arranged a production setup in their garden (a Danish Kolonihavehus) located north of Copenhagen, pulled electricity from a neighbour, enjoyed a mild sunburn, and gathered everything in the little house every time the rain started falling. Kasper and Julie bounced in and out of the production, interlaced with daily obligations, construction of a new bathroom, cooking, family visits, and coffee breaks.

Wood Work

Working in wood is different from working in a digital or algorithmic material. It is also very different from prefabricated materials, which have successfully passed through filters of standardization procedures and quality assurance. When working with wood you encounter the particularities of each piece. It pays off to select the wood carefully, inspecting tension, twists and knots. How the tree grew, including how much sun it received and how crowded its spatial

conditions were, is inscribed in the structure of the wood, affects the way the wood behaves once cut, shaped, painted and treated.

The wood I chose for the objects was pine. This is a cheaper sort of wood, soft and likely to warp. To remove some of the tension, we split the planks in half and glued them together again. Once the wood was dry, we cut the planks into smaller pieces, routed a hollow space for the Vibropixel modules to rest in, sawed some rough cuts, and attached a belt sander to a table in the garden. A couple of days of meditative wood sanding were ahead of us. From my work journal:

> *June 20th: I am pressing the wood against the machine, feeling its brute mechanical motor activity, tuning the pressure of my hands to match the pressure of the machine. The sanding paper is looping more than a thousand spins per minute. The machine shakes my hand, through my arms, elbows and shoulders. I have to keep focus because a slip in concentration can cause the wood to slip between my hands, making a dent or machine marks in the wood. Sometimes the oscillation gets out of control. When that happens I must counteract it with steady control of my whole body. I have to keep turning the wood at a well-paced slow speed with a gentle push in two directions (outwards and left) to create the soft round curves that I am aiming for. The wood changes density. It is harder around the knots and softer the further the veins are away from each other. I have to pay attention. The sanding goes much quicker where the wood is soft. In the process, I become enthralled by the structures of the wood; bending, turning, "smiles" that turn towards and against each other. I develop preferences for some of the objects because of how the veins turn towards each other. Within the ear muffs protecting my ears I am in a bubble in which a soft monotonous machine noise accompanies this calm yet highly focused activity.*

The wooden blocks went through three levels of sanding. The belt-sanding was the most hefty level. For the second phase, we used an orbital sander for a lighter touch, and lastly, all the wooden blocks were sanded by hand with a finely-grained sandpaper and a wet cloth. Over the next couple of days the objects were stained with black pigment and treated with linseed oil. Next, the vibration patterns I had designed first in the context of silicone casing, and then in the context of ceramics, needed attention. The wood was softer than the porcelain and therefore absorbed some of the more subtle and short buzzes. I made the vibration patterns a bit slower and stronger to better fit the characteristics of the wood.

Play: Testing in Copenhagen

In a parallel process I was running playtests of the game in the inner city. It seemed like an advantage of being in my hometown where I knew the features of the city, its locations, as well as many different kinds of people. I invited playtesters from my collective of experimental game designers, I invited families, and other intergenerational groups of people, people with different interests and experiences with games. The playtests often took place outside because I did not have access to a gallery-like location on such a short notice. It was a nice summer and parks, bars and cafes were easily accessible sites for the playtests. It was not before installing the piece in the gallery in Linz that I realized the white gallery cube is a particular kind of space, with a particular kind of soundscape, sense of time, and social conventions.

Several of the playtests took place in Assistenskirkegården, one of the prestigious cemeteries in Copenhagen. Assistenskirkegården is not only a place for the dead and the grieving. It is also a beautiful park in which visitors of the city relax, host picnics and enjoy the sun.

This was my childhood landscape. Trees, paths, grave markers, and clusters of human bodies tucked away between graves, bushes, shades and sunlit patches of grass. I had chosen a somewhat deserted corner, an area the size of a small square in a small European town. The grassy area was framed by graves on two sides and trees on the two others. Half of the area had some soft patches of grass. I placed a blanket with a few snacks and carbonated beverages on the sunny side. Nine black objects made of PU foam were placed on rocks, tree branches and grave edges throughout the space. The other half of the area had trees covering the ground in shade, leaving it harsh-feeling and cold. There was a big tree and a tilted stone beneath. It seemed like an old gravestone on which we could no longer see the engravings—a perfect platform for the four cards with instructions for the game.

Despite the pleasant landscape I was not comfortable in this space. It was as if the promise of a nest for rest and relaxation made by the green park, the soft grass, and the warm sun was broken right here. I noticed that the ground was hard, and the grass was sparse, filled with moss and spiky brown needles from the pine trees. The trees were tall and dense and the shadows felt threatening. It was as if the sun only occasionally passed by here, like no one cared for this piece of the garden.

I was aware it was not a generally uncomfortable space. A couple was enjoying a relaxed afternoon just five meters from me. But I was carrying pent-up anxiety inside of me, a dark and eerie substance. My face was smiling, welcoming the family I had invited as the second round of

playtesters this week. The mom and the son were eager gamers, the father, a musician and sound technician, had a more mellow character. The daughter was nine years old, the youngest in the group. She liked to dance and started the meeting by showing us some moves she had just learned.

After a bit of socializing, enjoying a drink and a showcase of the daughter's dance, the playtest began. I told the family that there were cards on the tilted stone beneath the apple tree that would guide them through the game. They began by taking a card from the first pile. The first card asked them to pick one of the objects and "spend as much time as they wanted" with it. This initial phase initiated an introverted and slow kind of play in which players tuned into the beats of the objects. The second card initiated a more socially-oriented phase. Players were asked to start an exchange, but to do so on the basis of a promise. The third card asked players to continue exchanging until they found an object they liked, and the last card "reset" the game by asking the players to "place the object where they would have liked to find it when they arrived." The game included both an introverted and an extroverted kind of play. These were two kinds of play I wanted to coexist and, at the same time, I had created a progression with a transition from one phase to the other. The transition over different phases was a challenge that was accentuated by how I wanted the game to be flexible in relation to how people arrived and left and how long they were staying. The pace of all the players was therefore not necessarily synchronized.

I was still tweaking the wording of the first card. I wanted to find a solution that balanced two scenarios: players becoming invested in, and curious about, the object they picked; and yet not so invested that they did not want to give them away. Part of this was a careful fine tuning of how much consideration the players paid to which object they chose. If they spent time touching all the objects before picking one there was little chance that they would engage in the exchange. The formulation for this playtest worked perfectly. Everyone picked an object without considering that they could be different. This further meant the storytelling aspect had moved to the background, making the core mechanic a game of exchanges. I contemplated this shift and decided I liked it.

It felt good to watch the family play. The dark magnetic void inside me withdrew. The enthusiasm for the game and the concept of playing from the mother and son was contagious, extending to the other family members and to me as an observer. "It is so cool" was the initial comment from the son when the game ended and we sat down to talk. During the game, the dad had retreated to the paths between the graves as a way to find time and a calm space to tune into the vibration of the object, while the rest of the group were in frequent verbal and non-verbal

contact with one another. The daughter was quick to find her favourite. The three of them all agreed that it was the best one, and it became an object in high demand. Her brother tried trading with his sister several times without success. Somehow, the mother managed to get it from the daughter. "*Hah!"* the mother exclaimed. *"Now I have the good one, how big of a promise do you want to make to get it back?"*

The under-defined quality of the word "promises" was taken full advantage of, a kind of playfulness the dad emphasized in the conversation afterwards. The family played eloquently with a combination of in-game and out-of-game promises, with most of the out-of-game promises being about food. The mom promised the son he could get a durum wrap from a nearby Turkish restaurant. The brother and sister promised each other they would eat pizza together soon, and the mother and father promised each other to share a glass of wine later that evening.

The sister, the youngest of the playtesters, found the game more challenging than the others. The four instruction cards were in English, so either her mom or brother translated for her. "I don't understand it," she told her brother. When I later asked what it was she did not understand, she replied "I don't know," and ran off to do some more cartwheels. There was another point of unproductive misunderstandings. On the second card, a sentence read, "Stay curious about the object: associations, its histories and its promises?" It was an attempt to accommodate a situation from an earlier playtest. Here two players had agreed to not evict a tiny spider who had inhabited the surface of the vibrating object. The player agreeing to this promise found themselves in a dilemma: how could they make sure the promise was kept as the object was passed on to another player? When adding this prompt, the promises were no longer between two people but belonged to the object, a feature that was not coherent throughout the rest of the game concept.

The request was interpreted differently by all family members. The son made an effort to keep track of all nine objects, whose hands they had been in and, if he could get close enough to hear it, which promises had been agreed to. The mom chose to ignore it. When explaining the reason for the prompt, she elaborated that she considered the promises as belonging to them as a family, not to the respective objects. The dad did not understand it, but decided that it was just him who "didn't get it."

Designing Instruction Cards

Back in Montreal, my friend and media artist Liane Décary-Chen helped me make a design for the cards. My anxiety was draining my energy, work felt heavy. It was as if the air was denser

than usual, like moving through oil. It was hard. I worked very little every day. I usually worked in collaborations because having someone to share it all with—the decisions, thoughts, questions, responsibility, workload—makes it all feel a bit lighter. I appreciated Liane's positive energy and constructive approach. It felt good to have someone to share thoughts and decisions with. From my work journal:

> *July 16th: I can print laminated cards of 16 pt. Liane is making a design suggestion. I am grateful that she is available to help. I really like working with her. It takes a lot of stress off my shoulders. I need to check the Pantone color, find an additional color, test-print the cards, playtest one last time, translate text to German, print the final version.*

After a final playtest in Montreal, I packed the wooden objects, the Vibropixels system, ten cushions I had made, and an "emergency kit" in case anything broke and sent it all back to Europe.

Play: The Show

In Linz, *Promises* was part of the Campus Exhibition curated by the Hexagram network. The exhibition was set in the gallery space of Kunstuniversität Linz, located in the Bridgehead building next to a bridge crossing the Donau. The gallery was spacious, neoclassical architecture built during the Second World War. *Promises* was set up in a separate room measuring approximately nine square meters, with grey carpet, white walls, and grey pillars at the entrance.

What Worked

- From a technical standpoint, everything went well and the installation was smooth.
- The objects were beautiful and the space was beautiful.
- It was a calming space for visitors to relax, breathe and decompress.
- The exhibit turned into an exhibition of looping vibrotactile expressions.
- Visitors made it work with the conditions as they were. Instead of playing the game I had imagined and planned for, they explored the space much like a walking simulator.

What Did Not Work

- Visitors did not engage in the game mechanics as intended.
- One visitor expressed a strong "no" to following the instructions.
- It was unclear to visitors that they had stepped into a game or playful zone.

- It lacked a framing of a game that would create commitment, anticipation and community safety.
- Although the installation was presented beautifully, I found that there was too much focus on smoothness and cleanliness over play and community.

Installation of the game went well despite the Vibropixel modules beginning to show wear. A couple had broken, some only worked occasionally, some had recently started making strange noises coming from the rotating motors, and the button for reprogramming the devices individually had fallen off. I had saved the best devices for the exhibition and included a couple of extras just in case. Only one needed a replacement, which was a quick fix. We placed shelves on the walls, one shelf for each object and placed the objects on velvet pillows. The pillows added some colour to the room and also muffled the sound of wood vibrating against the shelf. The objects were beautiful and the space was charming. Visitors explored the objects and their individual vibrations, some took their time to decompress from a hectic festival program, sitting down and resting with the objects. Imagining myself as someone who just came into the room without any introduction, I can see how it was a little mysterious and not easy to get an idea of what was intended. In addition, the space was small and the acoustics a bit too intimate for the kind of play that I had planned via playtests in Copenhagen. Visitors made the most of it, however—they made it into something that made sense to them. Many visitors entered the space interpreting it as an invitation to explore, listening, touching one object, then another, some holding each object for long periods of time, listening and feeling. Some sat down, resting, breathing, and receiving at a slower pace.

I was concerned that the piece had become more a display of a beautiful setup and beautiful vibration and that the interactive elements did not work. Philip Ehman, a curator I earlier had the pleasure to work with, came to see it. “This is an exhibition space, not a play space” was his first comment to me. Curators like Ehman have developed the craft of how to successfully show works like mine to the public, and I realized how invisible such work had been to me until that moment.

Exhibiting games is not like exhibiting other kinds of art objects—video installations, bio art, sculptures, and paintings. Each discipline has particular needs to succeed in a gallery setting and I realized how much knowledge I was missing with regards to properly framing my work for an audience in such a setting.

Until this point, I had exhibited work at game events or at events in which visitors were explicitly invited to an event that included games. This meant people came with an expectation of and readiness for their involvement. Their commitment was already established before their arrival. Also, when games include multiple people who start at the same time, people turn up at a specific time. Then anticipation builds up as the waiting time draws to an end, as the rules and gameworld is being explained. Being there is a choice and an investment, not a situation they suddenly find themselves in inadvertently. Creating a play space that is consensual and safe for the players is crucial for multiplayer games.

It also occurred to me that there is a default time that gallery visitors expect to commit to each piece in an exhibition. If this default time principle is broken, that breaking must be careful and deliberate. Ironically, I think this is precisely one of the things games are good at; authoring time. What would it take to transform this default temporality of a crowded tech-festival? It seems then the game had to extend into the larger exhibition and festival space to prepare the visitors for the expectation of a different time investment.

While I thought I had taken the performance aspects out of the game by delegating the tasks of the game master to instruction cards and a sign on the wall, the game was still much like a performance piece. This time the visitors, not the game master, were the main performers. This transition from the previous game, *I'll Give You My Bird If You Promise To Pass It On*, to *Promises* can be framed as a transition from performance to installation. It is also a shift from trained performers (game master as performer) to audience members as performers. This is not a simple shift. In many ways, it was more difficult than I thought. I was not just creating a performance piece; I was asking unprepared and untrained visitors in the gallery to perform it.

In comparison to games that invite players to execute more clearly defined procedures, I think of games like *Promises* as "fragile." Fragile games need a frame that creates the right anticipation, commitment and conditions for a sense of community safety to arise among players. Fragile games, then, seem to have a lot to learn from the discipline of performance art.

The Afterlife of *Promises*

I was lucky that Philipp Ehmann came by the exhibition space where *Promises* was shown. Philipp is a curator of urban games, and in finding *Promises* among the many other works presented at the festival, he invited it to Time Machine, an urban games festival he was curating

in Plovdiv, Bulgaria. Due to work obligations, and PhD writing, I was unable to attend myself. Stories and photos from the event tell me that it went well, that Philipp had brought the game into a setting that seemed more like its natural habitat: the raw, smelly, ornamented landscape of the urban space.[10]

[10] Parts of this chapter were published on the TAG Research Centre blog, in the context of a blog post titled "Promises: Tales From The Making" (2018).

Images to Chapter 7

Image 7.1: My desk in the X-Modal lab in Montreal with experiments in clay, porcelain, 3D printing, etc.

Image 7.2: The production setup in Kasper and Julie's garden north of Copenhagen.

Image 7.3: Sanding and shaping the game objects

Image 7.4: Sealing cracks and preparing for staining

Image 7.5: Still from *Promises* installed at Ars Electronica, Hexagram's Campus Exhibition

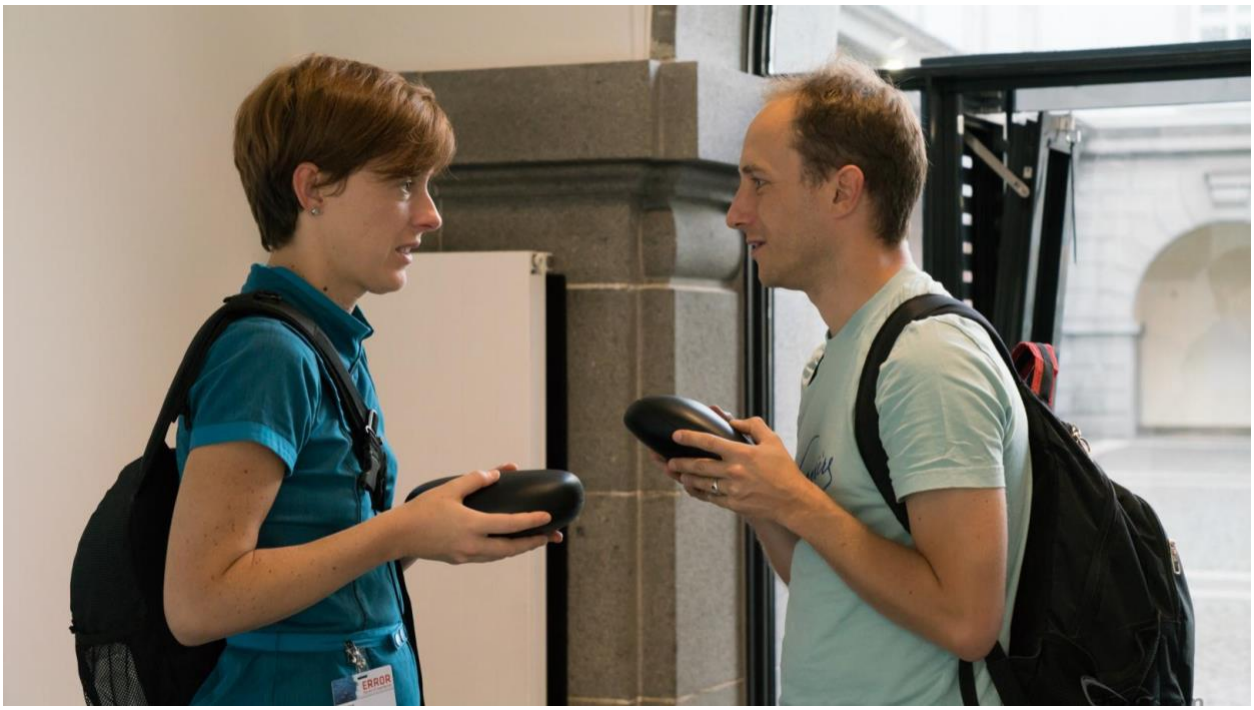

Image 7.6: Still from *Promises* installed at Ars Electronica, Hexagram's Campus Exhibition

Image 7.7: Still from *Promises* played in Plovdiv at the Urban Games Festival Time Machine

Image 7.8: Still from *Promises* played in Plovdiv at the Urban Games Festival Time Machine

Chapter 8: Vibratory Storytelling

Can you tell stories with vibratory media only? I found different versions of this question throughout my notebooks—a question I have wondered about and never found a definitive answer to. The answer depends on what we mean by stories. As I alluded to towards the end of chapter 4, I am not interested in the typical stable loops of signifier and signified; I am interested in the possibility of vibratory patterns as open signifiers, hosting memories, speculation, imagination, poetry, and inquisitive thinking. In this chapter, I elaborate on the question of these potentials. I begin by exploring touch and difference, and what it means that we all have different historically-situated relations to both touch and felt vibration. I explore vibratory poetics, non-verbal and non-human communication and a series of alien robotics. Next, I examine the lessons learned, working with vibrotactile motors, about the ways haptic media has a particular kind of pace, as vibratory sensation takes its time. In the context of expectations for action and excitement, I suggest that *Promises* embraces the qualities of what I call calm games, a concept reclaimed from the tech-philosophical imagination of mid-90's Human Computer Interaction literature. I finish with reflections on what the vibrotactile technology tells us about the surface/depth dichotomy that saturates the field of game studies. Here, I consider how when signifiers that tie games to external references—stories, politics, and memories—are embedded not in-screen technologies but in felt mechanical vibrations, we see depth and surface metaphors falling apart as productive analytical concepts.

Skin Politics

In the absence of critical cultural investigations into the specifics of vibratory sensation, I turn to touch, the umbrella term for the cutaneous senses. The argument in the following section is one that has been most thoroughly articulated by cultural historian Hortense Spillers (2016, 2018a, 2018b). Drawing on Spillers' work, I point to touch, constructed through layers of a cultural history, as following the lines of structural, social and political power. In North American contexts, this means that touch, more than any of the other senses, is shaped by our relation to the social-political distribution of freedom and power. This is a story of touch and enslaved people on plantations. Please read this section with consideration for your own capacity and history.

Most history and theorizing I have found about touch assumes it to operate under conditions of mutuality and consent. In European history, for instance, touch has been presented as a source of

healing and protection, and as providing connection to the divine. Churches and sacred buildings throughout Europe housed objects believed to have the ability to provide supernatural healing for visitors who touched, even kissed, them. Similarly, a monarch's touch was used as a healing modality. For instance, in the 16th century, the King of England touched several thousand people every year, practicing this curing trait of the royal touch (Classen 2017, p. 14).

I was curious about what happens to touch as it operates in a systemically differentiated world, where consent and mutuality is not a given. What happens to touch when we acknowledge it as a relation that operates across relations of race, class, disability, gender, etc.?

Hortense Spillers' cultural history of touch does not assume either consent or mutuality. It investigates how touch functioned within a regime of ownership and capitalism. I want to talk about this history for a couple of reasons. For one, African-American history has too often been glossed over despite its foundational contribution to North American society as a whole. Furthermore, the experiences and histories of enslaved Black North Americans and their descendants, to the extent that said histories haunt our contemporary culture of touch, matter in art spaces, in game culture, and beyond. More generally, however, Spillers stories of touch are noticeably different from any other historical and cultural investigations of touch I have come across, and her conclusions are relevant to understanding touch more generally in a systemically differentiated world with varying degrees of possible mutuality.

Spillers' earlier work on North American history, most famously her essay "Mama's Baby Papa's Maybe: An American Grammar Book" (1987), outlines the production of a new human value system for the "New World." This work has made critical contributions to Black feminist literature and to what is often referred to as intersectional feminism (Creenshaw 1989, Collins 2016), a feminism that is based on an understanding of difference rather than defining and essentializing notions of womanhood and femininity. Spillers cultural history of touch contributes to this work by thinking through a series of intimate relationships between slaveholders and enslaved women, relationships that happened in parallel to the legal family life enjoyed by the former (Spillers 2018a, 2018b, 2016[11]).

These relationships became what Spillers calls a "shadow family." One such shadow family was that of Sally Hemmings, Thomas Jefferson, the third president of the United States, and their six children. Although the story of Hemmings and Jefferson's relationship has often been told as a

[11] Spillers' cultural history of touch has not (yet) been published. My understanding of her ideas come from three lectures given on the topic from 2016 and 2018

romantic love story, the former was never freed. The intimate touch of this shadow family is not archived, and there are no recorded firsthand accounts of it from Hemmings herself. Without sources, we cannot know to what extent the relationship involved feelings of love and affection. However, considering the fluctuating quality of such feelings, it is unlikely that emotional and physical proximity between slaveholders and the enslaved guaranteed protection. In this context, learning to distinguish a healing touch from a violating one seems to have been crucial for enslaved people navigating life on the plantation.

> *"Touch is probably the single sensual realm that most defined the difference between enslaved and free […] when I can declare my body as my own space and when you have to gain permission from me implicitly to put your hands on me, I think that makes a difference"* (2016, min 18:50).

In Spiller's American grammar book (1987), the distinction between having a body and being flesh is the distinction between being able to self-define and being named by others, a distinction that further signifies the separation between the free and the unfree. Within the grammar of touch, the distinction between a right to not be touched and being susceptible to touch marks a similar line between the free and the unfree (2018b).

I am not in a position to fully trace the implications of this history, not for contemporary life nor for game culture specifically. There are obvious ways that this history translates to contemporary forms of social life. State and police institutions' brutal touch directed at Black and Indigenous people, the way White people consider themselves entitled to touch black hair without permission (e.g. Ijeoma Oluo 2018), and the well-documented ways men in power regard themselves as entitled to touch without invitation or consent are just a few examples.

Has this history that Spillers investigates created a foundation for a culture of touch that is specific to North America? Growing up as a White person in a socially-segregated society like Denmark, I initially found myself foreign to the tension that seems to surround touch and proximity in North American public spaces. It was only when I came across Spillers' research that I began to understand and respect it. The racial segregation in Europe has done much to shelter White people's existence. The touch culture I know from Denmark is predominantly one of White-to-White contexts, affectively devoid of racial tensions and colonial history. But it is likely that a European culture of touch functions differently from a racialized perspective. It is likely that there are many subcultures of touch within its different classes and ethnic groups. Parts of Spiller's history are also familiar to me, perhaps because the differentiated structure of touch

relations, in particular how the right to not be touched and the right to touch, aligns with proximity to freedom and power more generally.

These differentiated relationships to touch create challenging conditions for haptic media at large to shape a standardized system of information transmission. The history of touch seems to live in the cracks and wrinkles of our skin, resurfacing as we move about our life. Jay Prosser's notion of "skinscapes," for instance, evokes the relation between skin, memory, imagination and meanings. He suggests that the skin is a thick and multilayered autobiography, loaded with memory and dreams, including personal and intergenerational trauma (2004). These skinscapes are not stored in a system of signifiers and codes as the more conservative model of memory suggests. Rather skin memories are often less articulate, and "burdened with the unconscious" (2004).

The *Sonic Chair*

Spillers history of touch is not specifically about vibrotactile sensation. Neither is Spillers' work the only history of touch that accounts for some of the many possible meanings that surround touch in contemporary society. Take, for instance, Audre Lorde's erotic lesbian touch (1982), adrienne maree brown's empowering and healing touch (brown 2018, p. 620) or Constance Classen's history of touch in museums and collections (2017). Similarly, vibrotactile sensation has multiple parallel histories, including earthquakes, trains (Trower 2008, 2013), and teledildonics (Pozo 2016).

Vibratory technologies used as means for governance, mobilization, and war is what Steve Goodman has called a "politics of frequency" (2010). This includes the low frequency "sound bombs" used by the Israeli military against Palestinians, as well as the use of high-frequency signals, in the Netherlands, for instance, to discourage certain age groups from frequenting certain areas, such as shopping malls in low-income neighbourhoods. When vibratory signals are used to target specific populations in the name of power, warfare, and compliance, a differentiated relationship to vibratory sensation is created, not unlike what Spillers described. In these cases, I believe it becomes possible to use Spillers theoretical work on touch in general to engage the vibratory senses. At least part of our referential relationship to touch and vibratory sensation follows the lines of social hierarchies, including proximity to freedom and power. I cannot account fully for our associative relationship to vibratory sensation, but my experiences

working with the Vibropixel system tell me there seems to be no pattern to go by when intending to convey particular cues or messages with vibrations.

If we cannot delineate one set of standard significations that works for everyone who plays a game, vibrotactile motors are not an easy technology for a game designer to reliably author stories with. Especially not if we think of storytelling dynamics in the traditional author–-audience sense.

One precedent for exploring vibratory storytelling was exhibited in 2003 at the first DiGRA conference taking place at Utrecht University (the Netherlands). This exhibition, situated in the halls of the University building, accompanied the primarily verbal modalities of conference expressions—talks, panels, keynotes, along with shared lunch, beer and dinner conversations. The sculptural expression and unconventional mix of quirky DIY cabinets, art installations, a site-specific multiplayer virtual world, and a hybrid, videogame and performance work not only contrasted the primarily verbal conference gathering. It also established these unique kinds of game formats as an essential part of the game studies tradition. The DiGRA 2003 exhibition also featured an installation called the *Sonic Chair* (Dutch title "Geluierstoel" 1998), a vibrating chair attached to an unusual looking arcade cabinet. The arcade included a sports-car seat with vibrotactile technology implemented, built-in game controller, and two loudspeakers providing a full-body vibrational submersion. The exhibition catalogue of the small gallery explains:

> *"... the* Sonic Chair *does not take you through a simulated world of computer generated images [….] Instead, you travel through a world of sound waves. The purpose of your journey is to explore that world and to discover what the various sounds mean to you. Do you recognize any of the sounds? If so, can you change them into something totally new? What sounds belong together? Can you use them to make music? Are the sounds you hear different to those someone else hears? Can you picture what the sounds represent? Do they speak to you?*" (DiGRA Exhibition catalogue 2003, curator's sample).

The chair was developed by a team of artists from STEIM, a local media studio specialized in instrument building for electronic music. Building game arcades is not STEIM's typical mode of artistic production. STEIM was established in the late 1960s as a response to an increasing virtualization of tools for electronic music production (Ryan 1991). It has since functioned as a hub for the creation of instruments that facilitate spontaneity and immediacy, especially tending toward the qualities of performance in the production of live electronic art. The *Sonic Chair*, however, is not described by the artists as a musical instrument but as an arcade machine

(DiGRA Exhibition catalogue 2003). From an instrument building perspective, the arcade is interesting, as play machines like arcades are built for and used by users that are simultaneously the performer and the audience.

Sonic Chair is not the first or the only vibrotactile arcade machine. *The Love Teller*, for instance, can be played at Musée Mécanique in San Francisco. However, the *Sonic Chair's* explicit focus on a poetic kind of vibrotactile play is rather unique. Sally Jane Norman and colleagues said in the first "Touch manifestation" at STEIM in 1998 that they were inspired by artists who were moving away from "desktop culture," building and hijacking machines in ways that subvert the "machines to poetic ends." The *Sonic Chair* stands out not only because it offers a screenless play experience but also because it does not try to simulate or signify something external to the experience. Stimuli are less direct pointers than would be expected under normal circumstances, as the work creates a setting for exploring the vibratory landscape in relation to the players' own memories and imaginations.

As musicians and experimental instrument builders, the developers behind the *Sonic Chair* were skilled at these modes of explorations. Its touch interface provided a physicality that engages a thinking in the flesh, somewhere between various levels of knowing and different types of thinking. Here there is a relation between creative exploration and friction, a "sweaty" and "effortful" material engagement (Ryan 1991, Norman et.al 1998). Thinking as a musician, they claim, is a way of moving the body in time (Norman et.al. 1998). There are different ways of thinking, fast and slow. The interface affords certain types of thinking, awareness, musical abilities, sensitivity to time, rhythm and precision. The slow kind of thinking "is reflective, anticipatory and poetic but couldn't get you across the street," while decisiveness and timing is immediate and spontaneous, and as such, using our bodies in time, thinking is "anchored in our human flesh" (1998).

The *Sonic Chair* is an unusual arcade machine designed as an intensely visceral poetic experience. A felt sensation of the oscillating air waves were transmitted through the loudspeakers on either side of the "sitter's" head, and felt through the oscillating back panel and seat. The vibration was felt not just in the outer layers of the skin, or localized parts of the body; it was a full-body sensation reverberating through the guts, bones, tissues, and through all the layers of the skin.

A Relentlessly Unfixed Signifier

I sometimes wonder, along with Spillers, if the inadequate vocabulary we have for touch experiences has something to do with its relation to systemic power. During the Q&A session of one of her talks, Spillers reflects on the topic, describing touch as dangerous knowledge because it is through touch that we know danger, pain, and violation (Spillers 2018b, min. 1:10:30 - 1:18:00). Could it really be a coincidence that we do not have a nuanced language to share and reflect on our experiences of touch? The claims that touch, under the right conditions, is a source of things as significant as healing and empowerment only strengthens this suspicion.

The *Sonic Chair* embodies a different relation between meaning, memory and imagination than the cases I described in chapter 4. As discussed in chapter 4, the formalist notions of information found in the transmission model of communication have proven difficult to apply when encoding information in vibratory patterns, and the dream of using vibratory patterns to convey information in a classical sender-transmitter-receiver model has yet to be realized. The ambiguous referent–reference relations featured in the *Sonic Chair* presume less stable connections between sensation and meaning-making processes. Instead of assuming a closed world in which meanings are known and predetermined, the *Sonic Chair* accommodates more fertile connections between meaning, perception, memory and imagination. Similarly, storytelling in *Promises* happened in an open space where players could explore their own layers of associations, imaginaries and physical effects in relation to vibrotactile play objects. The second instruction for a minimal social interaction provided a nudge for players to put words to felt tactile sensations. Musicologist Veit Erlmann talks about the dichotomy between hearing and listening (2010), a distinction that pairs well with the difference between attention and distraction. Hearing and attention is associated with a rational, present and sense-making mind while listening is associated with the resonating, non-intellectual body. When I try to describe the kind of bodily listening I experience with *Promises*, my mind floats between these two states. The distinction collapses when thoughts attach themselves to memories, associations, dreaming and daydreaming. In the context of felt vibration, it seems difficult to tell whether one is "reading" the vibration and what it means, or one is "distracted" by it and floating off into other realms.

Vibratory sensation is interesting from a storytelling perspective because it is not only referential. Vibratory associations represent memory-based, fictive and causal effects, and it can be difficult

to decipher one from the other. To me, this delicate space of sense-making, in which meaning is not predefined, was the most interesting space of play provided by the mechanical vibratory sensations. Yet the lack of stability between signifier and signified is not an easy fit for mainstream game culture. The instability stands in contrast to game cultures' expectations for stable and reliable technologically-mediated experiences. When digital games are expected to facilitate the same experience despite changes in players, play culture, time, and location, we define stability as a characteristic of good game design. However, vibratory storytelling in games highlights a confrontation between these expectations for stable replayability and a drifting of semiotic stability.

In a keynote presentation at the Queerness and Games Conference (2015), merritt k and Naomi Clark reflected on the relationship between queerness and game design. Can there be such a thing as game qualities that are inherently queer? Queerness, they say, is "a relentlessly unfixed signifier," floating and unstable, "like trying to hold a soap bubble" (2015). Echoing this definition, Teddy Pozo connects the haptic dimension of games to the experience of their own queer gender identity. They describe the experience of gender as something almost within grasp yet ungraspable, "so close yet so distant, seemingly able to be touched yet slipping away" (2018). Interestingly, my own experience of gender is not one of instability. I locate the knowledge in the bones of my body, although my sense of a non-binary gender is more than three times older than any cell in my body, including its bones. On the other hand, just like the feeling of the vibratory motors, its relationship to language is uncertain, unfit and unstable. "Not a woman" was how my clearheaded teenage self formulated this experience in conversations with friends. Twenty years later, that negation still seems most fitting.

Communication in the Compost Pile

Parallel to the design and development work outlined throughout this dissertation, I was listening to scholars, artists and thinkers who worked with non-human life and non-human sentience. I found myself easily worn out by the default of humans-only conceptions of socialization, at least in terms of the specific cultural context I found myself in. I was exhausted by assumptions, and the way assumptions brush over and seal off nuances that do not fit. In the context of game studies, I took plants and plant organisms as my fellow players, investigating what play, avatars

and identification would look like if the player was a plant[12]. I took plant bodies as a case for thinking through the literature and drawing focus to the ways that game studies, in general terms, was unable to think about difference—different bodies, lives, senses, cultures, times, and paces.

Similarly, deciding to work with vibrations rather than an easier technology like screen-based media was a way to change the conversation, a way to create a foundation where the usual assumptions were revealed as unfit as they always seemed to me. How could we configure our social connections if words and pop-culture references were less reliable? Is it possible to listen together, even when what we listen to is not loud, easy to hear, grasp, or immediately align with ready-made categories like words? I became invested in finding stories about ways of relating and articulating non-human relationships that went beyond easy relations of anthropomorphism, cuteness, or disassociation. I turned to plant and animal studies—to better representations of a social life that assumes difference over sameness.

Biologist and philosopher Donna Haraway uses the image of the compost pile to talk about social life beyond homogenous and human-exclusive domains (2016). Compost is a collection of relations, a myriad of ways of being together, despite and across differences. Difference is a question of species, bodies, senses and organisms. Inquiry into the compost is inquiry into the array of possible togetherness in a world of radical relationality and interdependence. These are ways of being together that foreground modes of communication other than those involved in semiotic language, the typical narrative arcs, and default sense making. In the compost pile, we are all together, trying and often failing to work it all out through processes of rot, decay and transformations.

As with my work with plants and play, the relation between players in *Promises* and the Vibropixel modules was a non-verbal one, existing across difference. I found, however, that players often dealt with the tension of relating to different bodies, plants and vibration motors by relying on anthropomorphism. It seemed that players used the Vibropixel objects as canvases for projecting characters and stories, names and feelings, that had little connection to the objects' actual material conditions.

Elizabeth Povinelli has offered a compelling critique of the practice of anthropomorphism (2016, p. 53ff). Povinelli argues that with a strategic animist approach like anthropomorphism, we

[12] See my *Cross Species Game Design Workshop* (2016) http://idatoft.com/projects/PlantWorkshop.html and the installation *Earth Plays…* (2016) http://idatoft.com/projects/EarthPlays.html

extend the qualities of the living, of life as we define it, to all forms of being. Thus we evade a confrontation with that which is different, the "terror of the non-living." In this way, we avoid relating across differences by "saturating" all forms of being with familiar and comforting qualities of being alive. We refuse to acknowledge that any other forms of existence than our own is possible. Povinelli's project is to complicate the life–nonlife binary. However, I find the critique illuminating with regard to not just a life-nonlife binary but describing my own discomfort with how anthropomorphism appeared in my game. Using anthropomorphism as a method for relating renders the relation in our own image, and refuses to respectfully recognize the life of electrically-driven motor expressions as different from ourselves. Perhaps these were ungrounded worries as it is possible the apparent anthropomorphism was merely a question of language. Perhaps the actual relation is not one of anthropomorphism initially. In the challenge of articulating this relation within the limited vocabulary of the everyday English language, players simply used the language most readily available to them.

As mentioned in chapter 5, I had already been reflecting on this dilemma for some time before working on *Promises*, and that reflection persisted. I kept tweaking the wording of the instructions in attempts to achieve different relational outcomes. Changes were made after each playtest and each time a different relation was made. It is of course true that each situation and each play community had their particular styles. There was a trend, however: asking them to "choose," "pick," or "take" an object occasioned the establishment of different relations of care. The word "take" prompted players to take one without much consideration, while "choose" made players examine every single one before settling on one. Asking players to "pick" an object created an effect somewhere in between: some players took an object right away while others took time to examine the options. How players made the initial connection impacted their willingness to pass the object on as well as the way they talked about it—seemingly causing an increase or decrease in the use of humanizing terms. Not surprisingly, instructions such as "give it a name," and "listen to it" prompted more anthropomorphizing talk. My own position was undecided. On the one hand, I enjoyed watching how players developed care and the storytelling they produced. On the other, I wanted the relation to the game to have a bit of friction; I wanted it to be ambiguous and challenging. This was a fine line because, if players stopped caring, if the relation to the objects was too difficult to establish and people gave up on trying, I myself would lose sight of the point of the game. Care relations, afterall, seems to be one of the characterizing features of game media (see chapter 6).

This aesthetic aim is not unlike that of artist Sofian Audry's doctoral research (2016). *Vessels* is a series of expressive autonomous agents. Using machine-learning algorithms, Audry creates robotic agents with a distinct alien aesthetic. The alien quality of the autonomous agents refers to an expression that evokes some kind of lifelike-ness that is not, however, readily recognizable as living. We understand these robots to be like us and yet strange, partly the same and partly different.

These agents of Audry's *Vessels* learn their behaviours from the environment, but do not process the information following a clean procedure. The machine-learning algorithms ensure the agents' relationship to their environment is dynamic, continuously evolving, while noise and random generators are added so that the motivation behind their behaviour can be mysterious to track. During my work with the Vibropixel system I experimented with similar machine-learning methods, as well as more simple techniques of adding random generators to the vibration code. It was clear, however, that the vibratory expression in itself, together with cracks and mechanical noise in the hand-built technology, were already sufficiently alien without the artificial noise added from the learning algorithms. What I learned is that the space between what can be interpreted as comprehensible vibration patterns and what seems simply random is narrow when working with vibrotactile technologies.

This alien computational expression sits somewhere in the midst of, or across, what Elizabeth Povenelli called the life–nonlife binary. It evokes lifelike-ness, and yet its behavior is not recognizable or comprehensible as anything known. The experience of others as alien is not a new social phenomena. They ask for respect regardless of comprehensibility, and the challenge of getting along, regardless of whether intent and experience of the other is available to us, is exactly what social justice, founded on a respect for difference, is about—a big reason this aesthetic is interesting to me.

Game design scholar Naomi Clark together with fellow designer and critic merritt k talks about games as exercise machines, training "our capacity to select, adapt, and discard goals" (2015). Thinking of them this way points to the ways our being social is shaped by the habitual, ritualistic and repetitive aspects of the technology we engage with on a regular basis. Their use of a fitness metaphor emphasizes that our social capacities can be exercised; we can develop literacies, sensibilities, urgencies and shared imaginations. We also ought to be careful to avoid working "the same muscle groups over and over, like an isotonic exercise machine that only works out one part of the body at a time" (2015). At the moment, we are well trained at specific skills, such as efficiency, fast reflexes, and problem-solving when goals are clear and resource management

in a world of scarcity. From a broader, more queer perspective, games can function as technologies to practice queer utopias. They can be places to imagine alternative futures, including different ways of being and living together. In particular, Clark and k call for games that practice our capacity for introspection, community engagement, and communication. I second this call. I developed *Promises* as a space for being together introspectively, a social space for thinking and associating not necessarily through words.

If Audry's *Vessels* were akin to one of Clark and k's exercise machines, it would be exercising habits of withholding assumptions, normalizing assumed difference, and embracing partial knowledge over certainty and complete stories.

Calm Games

I learned early on that vibratory sensation takes time. If I incorporated game techniques such as time-based competition or time limits, players did not actually stay present enough to notice the quality of the vibratory technology. I became interested in making a space where it was possible to be together, resting in this kind of introverted silence. I wanted to make a social space that includes the materials of motors, metals, circuitry, and the electricity running through them. At the same time, I found myself concerned with certain expectations. It seems that creative making in the context of "games" comes with expectations for action, fast pace, and excitement, not stillness and calm.

Inspired by artist Natalie Jeremijenko's installation *Live Wire* from 1995, Mark Weiser and John Seely Brown suggested a design philosophy they called "calm technology" (1995). The way they proposed this philosophy, games were singled out as an exception—an example of a technology that marks the limits of their philosophy. The rationale is that games need to be exciting and fun, the antithesis of calm. Much has happened aesthetically since 1995 in game design cultures, and there have since been plenty of examples of calm and relaxing games.

Self-playing games, sometimes referred to as idle, incremental, clicker or passive games, have emerged as a popular genre. In self-playing games, the game plays itself while the human either watches passively or occasionally contributes an action, a button press or a click. In some cases, the human player's participation is redundant, sometimes optional, other times required but only infrequently so.

David O'Reilly's game *Mountain* (2014) and his later game *Everything* (2017) are games that do not require player input, although they do allow for it. *Mountain* features a mountain as the main character. The mountain is floating in space and lives through cycles of day and night, spring, summer, fall and winter. Plants grow and wither away, snow comes and melts, while wind, clouds and rain come and go, and everyday objects pepper the mountain as trash and stay there till the mountain one day is destroyed by crashing into a star. Players can follow or play along with various levels of engagement. They can join the action by listening to the mountain's thoughts and feelings. The only interactivity offered are the options zooming in and out, and pinching around to change viewing angles. As O'Reilly describes the game, it is really a game that lets you "coexist with a procedurally generated mountain." *Mountain* does not engender feelings of control for the player, nor ones related to making choices or having agency; it is about coexisting, relaxing and dreaming.

Kara Stone has developed a series of games with similar slow and meditative interaction. *Ritual of the Moon* (2019), for instance, is a game one plays over a moon cycle—28 days exactly. Unlike *Mountain*, in which player interaction is optional, *Ritual of the Moon* requires players' engagement once a day. The game is set in space, where three women astronauts are piloting a spaceship, either steering it towards earth or elsewhere. Every day, they (the player) receive mantras to think about and make one small decision. These small decisions are with regards to either protecting the earth, destroying the earth, or players destroying themselves. A sequence of 28 decisions made over 28 days add up to this final decision. The visual style is black and white. Stone describes (2018) how she and her team created a special visual texture by working with analogue materials; paper cuts, clay, embroidery, wood burning, quilting, solder, deconstructed computer chips, and other found objects. These analog crafts were scanned and processed digitally. This process meant that all text, including the narrative, is originally either embroidered or burned into wood. The theme of time and its slowly and steadily passing is reflected not just in the gameplay, and short deliberate moments in which it is open to player input, but also in the making of the game. The process of embroidering, stitching and burning in wood established a space for these developers to reflect, relax and meditate—to stay with the work throughout changing mental, physical, and bodily circumstances. Commitment to goals in both work and play is a contentious concept often used to push ourselves, colleagues, and employees to the edge of, and even past, our limits. With a playtime of less than 5 minutes everyday for 28 days, *Ritual of the Moon* is a different kind of commitment. Without giving answers, the concept of "reparative game design" hints at both the potential for healing in both the making of a game, and the ritual of playing it.

Adrienne Shaw's ethnographic player studies presents yet another interesting take on calm games. Although most mainstream games do not seem to be created with calmness in mind, Adrienne Shaw's observations of how players actually play games tell us that many players indeed often use games as a daily ritual for relaxation (2014, 103ff.). Shaw tells stories of players who power up the game console in order to "wind down" after more intense, stressful, or "exciting" parts of the day. As Shaw visits the home of Sara, for instance, Sara is playing a sports game on the Wii-Remote console. This is her "regular after-work ritual." Lazily shifting between bowling and golf, Sara plays for two hours straight, fully absorbed by the game but making only tiny movements with the controller. Sara knows exactly how little effort is needed for each move and plays accordingly. Similarly, Janet, another player in Shaw's studies, explains that she enjoys just "moving squares around in a box" as a way to relax after work. There is not a lot of emotional engagement or identification going on in these accounts of game play. Renee, another player in Shaw's research, explains "You've got thirty seconds to not screw it up too bad [laughs]. There's not a whole lot of backstory involved" (p. 107). In contrast to *Ritual of the Moon*—which prompted little action from the players, leaving plenty of time and space for reflections—Shaw's players depend on games with excessive demands for action to provide them with mental and emotional calm.

These examples are not primarily about action or excitement. Rather, they point to reparation, relaxation, breathing, and slowing down as activity, themes, and content all at once. These are meaningful effects, coded into the pace and rhythm of the games' algorithms.

For my own work, calmness was similarly not an effect communicated through a top-layer interface of signifiers. The very first experiments with *Variation 0* (see chapter 3) taught me that I needed to take lessons from the material to understand what kinds of systems, exchanges, care investments, and meaning-making relationships were possible. It was not a pre-defined quality I decided on prior to the design work itself, but rather a quality and theme that emerged as I became familiar with the possibilities of the vibrotactile motors. Accordingly, the theme of calmness and relaxation is very closely connected to the computational and material expressions of the motors, across depth and surface. Working with these connections, I learned that the motor expressions allowed for certain kinds of playful interactive flows, giving way to actions such as simply slowing down and letting the frequencies make their marks on the body. The technology itself was telling a story, making space for certain ways of connecting to emerge, memories to appear, and imaginations to take form.

Vibratory Effects Across Surface/Depth Divisions

In games studies and game design literature, it is common practice to separate games into two layers: a system layer that represents the "core" (Mäyrä 2008) or the heart (Adams and Doris 2012); and a representational layer where elements such as story, semiotics and politics are located. Often cited game design scholars Adams and Doris, for instance, introduce their foundational text book on game mechanics by writing "(t)his is a book about games at their deepest level. No matter how good a game looks, it won't be fun if its mechanics are boring or unbalanced." (Adams and Doris 2012, p. xi). This analytic division of games is further explained by game scholar Frans Mäyrä in what he calls "the first introductory textbook for students of game studies" published a few years earlier. Here he explains that games consist of a "core," where the gameplay is located, and it contains "everything a player can do while playing the game." Secondly, the game has a "shell" that is made up of the interface, the graphics, and the story, the semiotic richness modifying, containing and adding significance to that basic interaction" (Mäyrä 2008, p. 17). Gameplay is "what doesn't change when you change the surface" (p. 16). It is, according to Mäyrä, at the core that a game stores its identity as a particular game. Myärä points out that it is still possible to experience pleasure from the "secondary" part of the game, even if the core lacks originality or appeal (Mäyrä 2008, 18). The interface elements, however, remain secondary and non-essential to the game.

Possibly the most debated example of this devaluation of the interface is game scholar Esben Aarseth's claim that, when he plays *Tomb Raider* (Uthaug 1996), he does not see the body of Lara Croft, the main character. He sees "through it and past it." (Aarseth quoted by Harrer 2018, p. 13). The visual elements of the game are, according to Aarseth, irrelevant to both the gameplay and understanding what the game really is about. Sabine Harrer has called this the ergodic myth, a common belief in game studies that the only relevant parts of a game are the ergodic (usable) elements. Analytically dividing games into two kinds of elements, the "parts which the player can use and parts which the player can read" (Harrer 2018, p. 12), habituates game studies scholars to putting aside elements that can merely be "read" in favour of a more "real" understanding of a game.

While the examples referenced here have become somewhat dated and game studies has, for the most part, moved away from overt distinctions like these, Anable eloquently illustrated how these texts, and the debates that engendered them, formed a foundation for games studies that remains difficult to evade (Anable 2018). The binary of surface and depth associates systems thinking with depth and complexity. This is where we find, according to this rhetoric, the "real" game.

The screen, the interface, the audio-visual, and the surface are lumped together as the places to sequester elements such as representation, meaning, politics, the superficial and the "secondary." Amanda Phillips has addressed the effects this had on the research practices of scholars who are often politicized by default, including women, queers and racialized scholars: "Many of us worked in seeming isolation or within small supportive communities to develop approaches to studying games that met the demands of ludology [systems thinking, eds] while remaining compatible with the political exigencies of the various identity knowledges in which we were being trained" (Phillips 2020b). These stories of how feminist, queer and intersectional scholars huddled together in private spaces, trying to make their research questions, interests and concerns fit into the agenda of systems thinking, emphasize what Soraya Murray talks about when she points out how effectively cultural studies have been, and continue to be, excluded or pushed aside in hegemonic game studies discussions (Murray 2019). Consequently, Philips, among others, has called not only for new and different stories in game studies but also for new ways of telling these (2020b). I believe this research-creation work with felt mechanical vibration represents one such different way of crafting academic knowledge.

If we take the claims of systems thinking's primacy seriously, game design using vibrotactile motors as the only actuator might seem an easy task. In such a context, it would be reasonable to assume that if we replace interface elements such as the screen and the audio with vibratory patterns, the game would remain unchanged, and the character of the playful experience would remain unaltered. In hindsight, it sounds almost comical to think that felt vibration could convey the same information, within the same time spans, while keeping the experience and entertainment quality unchanged. Yet this is not particularly removed from my thinking behind *Variation 0* (see chapter 3), where I believed I could make a game that was suitable for the technology before I had made myself familiar with the motors' expressive qualities. I think it is often the case that the common practices of a hegemonic game design culture lay the foundation of our assumptions even as we think we stand in critical relation to them.

Once I had begun to grapple with designing games with felt mechanical vibration, it became clear that the metaphor of a surface area and a deeper system complexity was no longer appropriate. For one, because vibratory frequencies travel through and across materials, from binary digits in wireless data packages to the fluctuating electronic currents of the batteries, pressing into our bodies and past the skin. But also, because the idea that elements like meaning, politics and representation are located in a superficial layer also seems to fall apart. With vibrotactile motors, there is no outer shell that holds the pretty, political and representational content. As my first

experiment taught me, and as the history of vibratory communication systems demonstrates (see chapter 4), encoding vibratory patterns with semiotic codes that exist independent of the sensations themselves is hardly ever successful. With this first experiment, I did not know how to design so that a player could "look past" the Vibropixels' vibrating movements in order to see the actions and choices that mattered for the game because a division between content and form had never been established. The possible actions—relaxation, relating, remembering, recognizing, listening, and daydreaming—were enabled by the motors' vibratory expressions. This also means that the surface/depth dichotomy, and its associated representations/systems dichotomy, is unfit for thinking about these activities as an intentional political effect, with both analytical and designerly motivations.

Summary: Vibratory Storytelling

It is possible to author stories with vibratory media if we move from conventional ideas of stories, audience and authorship to one of mutual configuration (chapter 6). As David Parisi points out (see chapter 4), while haptic media is becoming so widespread that it is possible that universal and stable signifiers could emerge, the case of phantom vibrations shows us how this media continues to evade a stable signifier–signified relation. Vibratory storytelling refuses the traditional author–receiver model, perhaps because of its proximity to politics and social differentiation. Stories, memories and imagination emerge unbound by relations, whether they be between the game developer and player, or any relation making up the particularities of the situation. Following the ideas behind a fragile game aesthetic, this means that each play-through may not provide the same, or even similar, stories. Like fragile games, vibratory storytelling in games is at odds with expectations for stability and replayability, at odds with demands for immutability through changing environments, time, place, and play communities. My design strategy for vibratory storytelling therefore had to become one that embraces an abhorrently unstable game technology.

The alien, familiar, unintelligible, comforting, and distressing expressions of the Vibropixel modules are properties of code, unintended system noise, and variations in the hand-built technology. Likewise, the vibratory technology asks for a kind of play that is slowed down, representing a pace proportional to the time it takes for patterns to reveal themselves. I think of the expressive qualities of the alien, the familiar, the unintelligible, the comforting and the distressing as well as the topics of calm, relaxation and slowness as components of the

storytelling at play in *Promises*. Yet none of these are a property of the interface, or a layer of signifiers added onto a "core" of game mechanics and systems.

I cannot testify to what extent these demands are respectively attributable to the technology, my personal play preferences, or the particular circumstances of art or game making in academia. None of these could be isolated and none of these were constants, like ideal setups in a science lab. The games are the outcomes of collaborative compromises affected by all these factors.

Chapter 9: Where Stillness Breaks

This chapter narrates the process of making the game that came after *Promises*. This write-up's chronology has been streamlined for improved readability. During the summer 2018, I had the opportunity to be an artist in residence at the Centre of Foundation in OBRAS, Portugal. The final iteration of this game, *Where Stillness Breaks*, was completed a month before the *Promises* was presented in Linz, whereas my work on the latter predates parts of my work on the former.

The Game: *Where Stillness Breaks*[13]

Vibrotactile motors are attached to small pieces of waste gathered from one of the many abandoned marble quarries in Portugal's Alentejo region. A chalk drawing on the floor functions as a chart for players to organize vibrations and words in relation. The instructions on the drawing read:

Choose a marble piece
Place it somewhere in the chart
If this is next to a word, cross out the word and add your own

Players each pick up a waste-adorned marble piece on the floor, feel its pulsating rhythm, carry it around the enclosed space, and wonder which words best describe its particular loop of pulsating motion. Some players take their marble piece to a corner to think in private, others discuss the matter together and find words through collaborative thinking.

Marble stones are placed and replaced, words are written, cancelled, and often debated. *Where Stillness Breaks* explores memories, associations, and speculative connections between felt vibration and words.

Reflections on the Task

I was already expecting discordance between the game *Promises* and the setting it was to be shown in. The original format of *Promises* had a fixed start and fixed ending, a live event format

[13] This work has changed names frequently and was exhibited under different names, including *Unstable Analogies* and *Talk Pieces*. For this dissertation I have settled on the title *Where Stillness Breaks*.

in tune with the way games are shown at play festivals. In conversation with the curators in Linz, I had agreed to adapt the game so that it would have a continuous presence in the gallery, open for asynchronous play with flexible entrance and exit points. It was an interesting challenge, but I was unsure how successful this transition would be. One of my goals for my stay at OBRAS was to make a gallery piece that would work better with these conditions.

Furthermore, I had been working with vibrotactile motors as an interface for game structures for a while. The question of how to design for players with different personal, historical, cultural and bodily contexts was still on my mind. I had been trying to compose vibrations that could communicate specific messages, cues that would make it likely for a game to unfold in certain ways. Well-meaning colleagues had suggested that I package my messages in metaphors, such as a gentle tapping on the back. Following my study of Hortense Spillers's and Steve Goodman's work, respectively (see chapter 8), I was wondering to what extent we can assume that one vibrational pattern has the same set of associations across bodies, cultures and geographies. I do not want to suggest that felt vibration lives outside of culture and cultural references. At the same time, I think that the way both personal and cultural history lives on our skin differs depending on who we are, our position in society, and the kinds of experiences these give us. Which metaphors are shared among wider communities and which are more private is not easy to know?

Technical and Material Setup

- Vibropixels
- Max/MSP
- Marble scraps or big rocks
- Nine vibration patterns
- Zip ties
- Chalk and a chalk drawing

Workflow

"Here everything looks like a contemporary art gallery," said residency director Carolien van der Laan, in response to my astonished look. I was not expecting the bus shelter in a remote Estremoz, Portugal, to be made out of sparkling white marble. "In this region," she continued, "marble is cheaper than wood."

Marble is an abundant resource in the Alentejo region. There are more than 400 marble quarries, of which around 350 have been abandoned since marble went out of fashion in the late 90's. Around Estremoz, marble is stacked in large piles of what locals think of as trash, as no one knows what to do with all of it. As my eyes took it all in, I started noticing the smaller details; the ground was littered with marble waste, smaller pieces covering it like seashells do the beach.

I had been invited to OBRAS by Sabine Harrer. The last couple of years Sabine and I lived on different continents, and as friends, we missed each other. Professionally, we had worked creatively together before, both of us finding it equally challenging and interesting. Our materials of preference can, when we succeed, complement one another. Sabine is skilled at working with words—the aesthetic, creative and playful possibilities of linguistic communication. My interests tend toward the non-verbal, causal qualities of technologies. As this doctoral research had directed my attention towards the gaps and tensions between felt mechanical vibrations on one hand and words on the other, I was thrilled when Sabine casually mentioned the idea of a collaboration. With this tension between vibratory expressions and words in mind, linguistic coding becomes material in itself. Katherine Hayles has explained that it was a cybernetic idea of the mid-century to categorically separate information from material (1999). This conceptual redefinition allowed information to circulate in disparate materials without being impacted by the transfer. The distinction allows information to circulate frictionlessly. Our collaboration between linguistic codes and material vibratory expression was not about this kind of extraction for circulation. We were interested in how these two materials, linguistic relations and physical causal relations, can enrich or transform one another.

We started the residency with an OWL workshop, a workshop format developed by Kristina Andersen and Danielle Wilde (Wilde and Andersen 2009). The format introduces a method that connects emotions, materials, sensations, and body parts through a process of making. Over the following days, we iterated this workshop format. We alternated the initiative-taking roles so that one day one of us proposed an activity and the following day the other did, as if taking turns preparing gifts for one another.

This was not a collaboration like our usual ones, in which there was equal investment in both the process and the result. Nor did we spend equal time on the project. In addition to this project, Sabine worked on other projects, spent time playing the violin, finishing their book, and writing a hobby project, a piece of fiction about food and family. I spent most of my time reflecting on my research, refining the code in the software and testing how vibration worked with the materials I found in the local environment, including marble rocks and cork from the oak trees surrounding

us. We spent the first week settling into the structure of the collaboration, and kept revisiting it throughout. We eventually relaxed into a schedule of working on our own projects complemented by afternoon consultation and conversations.

My collaboration with Sabine and unyielding rock materials had an antecedent. A couple of years prior, during the Lyst Symposium in Norway, Sabine and I had already made a game together exploring movement, touch, and shared touch using rocks as a medium (Toft and Harrer 2020). It turns out that the hardness of rock makes it a good transmitter of movements—with high precision and little reverberation or transformation. However, we had not yet worked with rocks in the context of technology. From my work journal:

> *Monday August 6th: We have to think about finding the right proportions between the power of the Vibropixel motors and the mass and size of marble. We might have most success if we work with gravel instead of big pieces.*

Despite initial apprehension, we discovered that the motors were able to move surprisingly large pieces of marble. Simply tying a motor to a marble piece with a string or a zip tie would make the whole piece rumble with whatever rhythm we transmitted from the computer.

I wanted to spend more time in silence with the wind, the landscape and the marble itself. Whenever there was a free moment, I snuck out to a canopy on the West side of the house, where there was equipment for marble sculpting. Although I was isolated in the mountains of rural Portugal, I found myself overwhelmed with words and linguistic syntax. Chipping away at marble with a chisel gave me the type of respite I needed. It was obvious that I am not a marble sculptor, although I had some training sculpting granite during my teen years. Back then I had found the granite too hard and very bothersome. Marble, though, is soft and slightly more accessible to me. I wanted to create small square dips in the stone so that I could embed the Vibropixel technology in the stones, but with my limited skills, I kept breaking the stones in half.

At this point, all the materials featured an unsettling contrast to how we commonly think of digital games—vibrotactile interface and marble, and in the absence of screens, keyboards, and game controllers. Throughout history, game media has existed in many different forms and material conditions; for instance, there are not many material similarities between videogames, board games, and traditional party games like folk games or schoolyard games. While I was using computers and software that in some ways were similar to mainstream video games, the particular software I was using was not typically used for game creation. Max/MSP is a software developed for live performances and thus has few features for saving conditions, points, and

game states (see chapter 3)—all features that make it possible to author "deep system complexity," "agency" and "choice." I cannot say if the system simplicity of what I was making was rooted in the structure of the software or in a preference to steer clear of these overdone game aesthetics.

As much as I enjoyed chipping away at the marble, I was unsure if the manual labour going into reshaping pieces of stone had value in the context of game production. How can one make value judgments without a norm or a system? Current definitions of games did not work for me. At this point I had completely distanced my practice from everything I knew about games. I tried to define games as a "technology that formalizes play so that it can be shared across time and location," a definition that sends me into a never-ending spiral of defining play. Play is what we do when we play games? Shooting and collecting points? Play is what children do when not following orders from adults? Play is an activity that brings pleasure and joy? Play is a protected space giving safety to otherwise dangerous activity? Play is a non-serious activity? Play is healthy? I do not subscribe to any of these.

I found myself disoriented whenever I turned to the work. It felt like "sculpting in the clouds," I wrote in my journal. A couple of days later I followed up: "like drowning in jello or suffocating in milky air, not knowing when one breath is replaced with the next." Apart from a few obvious references like a heartbeat, a purring cat, a mobile phone, and my own associations with textures and colours, I had no anchor. I was missing some grounding reference points within the pulsating vibrotactile sensations. How does one talk about these rhythmical, repetitive movements that are so inarticulate and indefinable?

Had I finally succeeded in critical theory's praxis of "undoing"? The premise is that when fixed ideas of truth and common sense are destabilized, we get a moment of freedom, and a point of intervention where we can shape the conditions and ideologies that we live by opens up. We can then take the opportunity to create ideologies more livable and just. At this point, I had successfully dismantled for myself a good number of the ideals that shape common game culture. From my work journal:

> *An afternoon conversation August 15th:*
> *-Can you tell a joke with vibrations only?*
> *-Hmm… You mean apart from sex-toys?*
> *-… Yeah.*

Sabine and I were convinced that pleasures, like humour and laughter, are rooted in culture, a complex mix of the mainstream and a particular localized standpoint (Collins 1990). This means we might simultaneously understand sexist humour and not understand it (as pleasurable) because it lacks resonance with the knowledge we have from our locatized position. Accordingly, it seems that humour is intertwined with politics, with how resources, justice, wealth, entitlements and violence is distributed in our society. In some ways, I found it difficult to be relocated from the city of Montreal and its upbeat social and political life to the arid mountain landscape of Alentejo. With dry hay in every direction, as well as ruins allegedly from the old Roman Empire, spongy oak trees, peace of mind and a castle on a mountaintop in the distance, we were far from the conversations of injustice and politics I was familiar with. The ease seemed deceiving. I wrote a lot about this affective innocence in my journal. How does one make something that is socially and politically relevant from here? I wondered about the marble quarries, the politics of this material.

> *Monday August 6th: What does the earth think about this industry, and the way it was abandoned? What about working conditions? And what is the aesthetic class I am associating my work with when using this material?*

I was suddenly yearning for the colour orange, preferably orange plastic, with its traces of toxic globalism, consumer culture, contemporary lifestyle, chemicals, underpaid work, and detached consumption.

> *Sunday August 12th: I bought orange rubber bands at the market yesterday. I couldn't believe my luck. They are everything I desired in one piece. They are orange, rubber and extremely artificially looking—and they are flexible in use. They can get me a long way in getting along with this place. I can wrap them on almost anything.*

In some ways it was a strange need. In the moment, I could not identify the reason for this particular need for orange. My experience of creative making tells me that I ought to take these unjustifiable and slightly mysterious needs seriously as I am rarely satisfied with what I make when every decision has been preplanned or justified in advance. However, I felt guilty for investing in this piece of toxic production processes. Moreover, in the context of the academic institution, an institution built on the premise of knowledge and reason, it seemed unsettling to go ahead with such an unjustified need. The lack of clarity even challenged my own feminist guidelines for responsiblity and accountability: If I cannot know what I am making, expressing,

and why, am I unsubscribing from responsibility? I might understand it later, but until then, am I suspending accountability?

I recalled Jackie Orr's notion of symptomatic research methodology (2006). From a trauma theoretical perspective, there is no coherent subject who remembers with conscious confidence, and "the social" materializes in connections that are often invisible and contagious. Both the social and the bodies performing it are oddly secrets to each other.

> *I don't know why this all seems so important to me.* (Orr, 2006, p. 86)

Orr notes that trauma is not caused by any single event or a particular object. Trauma is the effect of alienation, a continuous subject–object split. This turn to trauma theory to understand my delight to find orange rubber bands at the market might seem dramatic. Surely the rubber bands do not represent a deep-rooted trauma, panic disorder, or paranoia. And yet, the grip that this particular colour–material combination had on me was not trivial, it was obsessive and repetitive. Whatever its relevance was, it was pulling at me. I wonder if my tendency to discount this gripping sense of relevance due to my inability to see its connections is a symptom of trauma in itself. The trauma of a Eurocentric knowledge paradigm that demands clarity and reason for validity encourages us to discard everything that seems incoherent. However, that it is obscure to reason does not justify discarding it. In fact, it might be quite the contrary. If everything really is connected, and no gripping sense of relevance exists outside our shared ways of navigating a mundane everyday, it is likely gripping other people too. Articulation of relevance when it is known only in obscure form like this has turned out to be my most reliable starting point for learning, discovery, and for doing the "research" part of research-creation. To paraphrase Amanda Phillips, this is my method for telling different stories in games studies (Phillips 2020b).

We continued exploring ideas and material combinations, and we continued our afternoon conversations. I tried to make another dent for a Vibropixel module in one of the sparkling marble blocks. It probably broke again.

The Idea

Throughout my work on *I'll Give You My Bird If You Promise To Pass It On*, *Promises*, and a few other projects not described here, I had narrowed the vibrotactile component down to a set of nine vibration patterns. These nine vibrations were repeated throughout the various works and experiments I was doing. They were composed with variation to appeal to different moods and personalities. Some were simple patterns that evoked calm and comfort for some and boredom or

disappointment for others. Other patterns were more complex, expressive, chaotic, evoking satisfaction for some and discomfort for others.

Sabine continued to ask candid questions about my research and I was without answers for most of them. “How will you talk about these vibrations in your dissertation,” Sabine asked in one of our afternoon sessions. I considered simply pasting the Max/MSP codes, leaving it to the software to translate. And yet, the space between vibration patterns, words, and meaning-making processes was occupied by the research I was doing.

I told them about a research design I had in mind. I was in the process of preparing the application for the office for ethical conduct of research. The research involved conducting a series of interviews through which I would gather a word cloud describing each vibration pattern. Together with the software descriptions, and my development annotations, I would make a dictionary for each vibration pattern.

The research I was proposing included a series of semi-structured interviews through which I would investigate how people attached words to the sensation of the receptive motorized sensations of the Vibropixel modules. I would introduce each vibration pattern separately and ask people to write down adjectives, associations, feelings, and memories evoked. In preparation for the next interview, I would gather these words to create a growing collection of labels describing each vibration pattern. In the second half of the interview, I planned to ask people to match these labels with vibrational sensation to see if some associations were more common or stable than others.

I was excited about this research design, and I think it was in the process of describing it that it turned into the next game.

Play: A Show-and-Tell

The residency was coming to a close and we were expected to show our work. We found some firm ground between two houses, drew a chart on it and wrote words (parameters) at the end of each line. The chart suggested that the words were somehow related to a spectrum, although one needed to activate a rather creative mind to make such connections. There were 12 parameters in total. We then gathered the marble blocks from the sculpting site and strapped a Vibropixel module to each. While we did this, I realized that I like the visual aesthetic of the technology showing, not hiding it as I had been planning with all my chisel work. I liked the contrast

between the high-art aesthetic of both earthy and sparkling marble and the sophisticated haptic technology attached with the classic DIY technique of zip ties. We gave our fellow artist and new friends the following instructions:

You are welcome to take a piece and move it to somewhere else on the chart.
If you place it where there is already another word, please strike through that word and add one you think fits better

We presented two other games as well. This one was the least "gamey," and as always, I was nervous that it would be boring, not have enough interaction or enough excitement. This inaugural presentation proved me wrong. The simplicity of the piece made space for interactions, and moments I had not even imagined. I liked the raw, earthy aesthetic, yet it was somehow simple and light. Although there were multiple age groups represented amongst the players, and there were varying levels of confidence in relation to technology and videogames, everyone understood the instructions, enough at least to get started. For those who were unsure, there was time for people to discuss and interpret. It was flexible for various group sizes, it was possible to join or leave at any time, and there were options for different levels of engagement. There was space for everyone to approach the piece in different ways. Some people approached it collaboratively, discussing possible words and feeling each other's marble block, while others went to a corner to think, relax or listen. People approached the work as if it was a puzzle, although there was no given end-state. In general, there was a lot more conversation and engagement than I had imagined. One person showed frustration. Some Vibropixel modules had stopped working. The wear and tear of the fragile technology was becoming more noticable, causing some motors to turn on and off randomly. The motor power was weak on some of the modules, and the strength varied depending on angles and other physical factors. This one person was frustrated. He did not understand what he did wrong nor what he was missing out on.

Afterlife of *Where Stillness Breaks*

I was asked to show my work at an exhibition a few months later. It was at a student showcase at the Milieux Institute, Concordia University. However, the game, as it was, did not fit easily with demands for light travel and relocation and I had left most of the marble in Alentejo. In any case, I did not need to create the exact same piece and since I had abandoned the necessity to embed the Vibropixel modules inside the rock, it made it more flexible in terms of localization. Just as the marble was native to the Alentejo land, I sought to find some of the granite rock material native to Tiohtià:ke (Montreal).

My friend, Katie Jung, joined me driving north to the beach at Cap-Saint-Jacques. Together we selected rocks of different sizes and different shapes. I wanted the sizes that made the rocks liftablet without fear of back injury yet heavy enough that one would perhaps hold them against the body, so that the motor rotations were not just felt in the hands but also in the bones, the hips and the abdomen.

I replaced the floor drawing with a more complex abstract line drawing. At strategic locations, I placed the first words to give direction to the directions associations could take: pink, fleshy, juicy, boring, too wild, etc. I enjoyed this piece more than the other ones I had made with the Vibropixel technology. I especially liked the textures, including the dirt left on the rocks from Cap-Saint-Jacques. I enjoyed the rocks against the polished concrete floor in the university building, the white lines, people taking rocks in their hands, holding them close to their bodies in order to bolster their weight, then feeling the vibrotactile motors through their torso. I liked the simplicity.

The rocks connected the game to the land, the history, relations and something outside of human time and reason, bringing all of it into the university space. This relocation is not without tensions. *Where Stillness Breaks* was developed as a response to the environment in Portugal. It was made in the ruins of an industry, in the land of one of the most powerful nations driving the European colonial expansion. The marble pieces so readily available to me had been cut from their environment by cranes and large scale machinery, industrial organizations with dubious agendas.

In the words of Damien Lee, an Anishinaabe and Fort William First Nation member, knowledge is an expression of a nations' relation to the land (2012). As I relocated this work to Tiohtià:ke (Montreal) I was on colonized land, a land I myself came to recently and still barely know. To the Kanienkehá꞉ka nation, however, this land is ancient, dense and layered through centuries. As I

took the rocks from the beach, I gave them a new environment: a concrete floor, glass, aluminium frames, motor technology, research agendas and questions fitting the imaginary of Western academia. This new environment, the university, is an institution housing the tasks of producing and policing knowledge from colonial perspectives. Historically, this included the task of separating Indigenous populations from the knowledge of their land and ancestors. Separations, from land, environment, family and kin, is a practice that has a long colonial history. In that light, this relocation of *Where Stillness Breaks* deserves more attentive consideration than what I, in the moment, afforded the rocks at Point-Saint-Jacques.

*

On the floor in the university building, Vibropixel modules kept breaking; I was nursing the motor technology throughout the show. I did my best to fix them on the spot, I replaced the ones that were completely failing. Towards the end, I took a break and visited the rest of the exhibition. When I came back, all the modules had stopped working. A creative visitor had placed them all in a pile written “dead” next to them. I restarted the code and revived the buzzing vibrations.

Images to Chapter 9

Image 9.1: View of the Alentejo region from OBRAS art residencies

Image 9.2: One of the few quarries that are still active

Image 9.3: Abandoned marble scraps at a vacated quarry

Image 9.4: Experimenting with vibrations and marble

Image 9.5: A workbench from the sculpting site

Image 9.6: Detail from the show-and-tell, OBRAS 2018

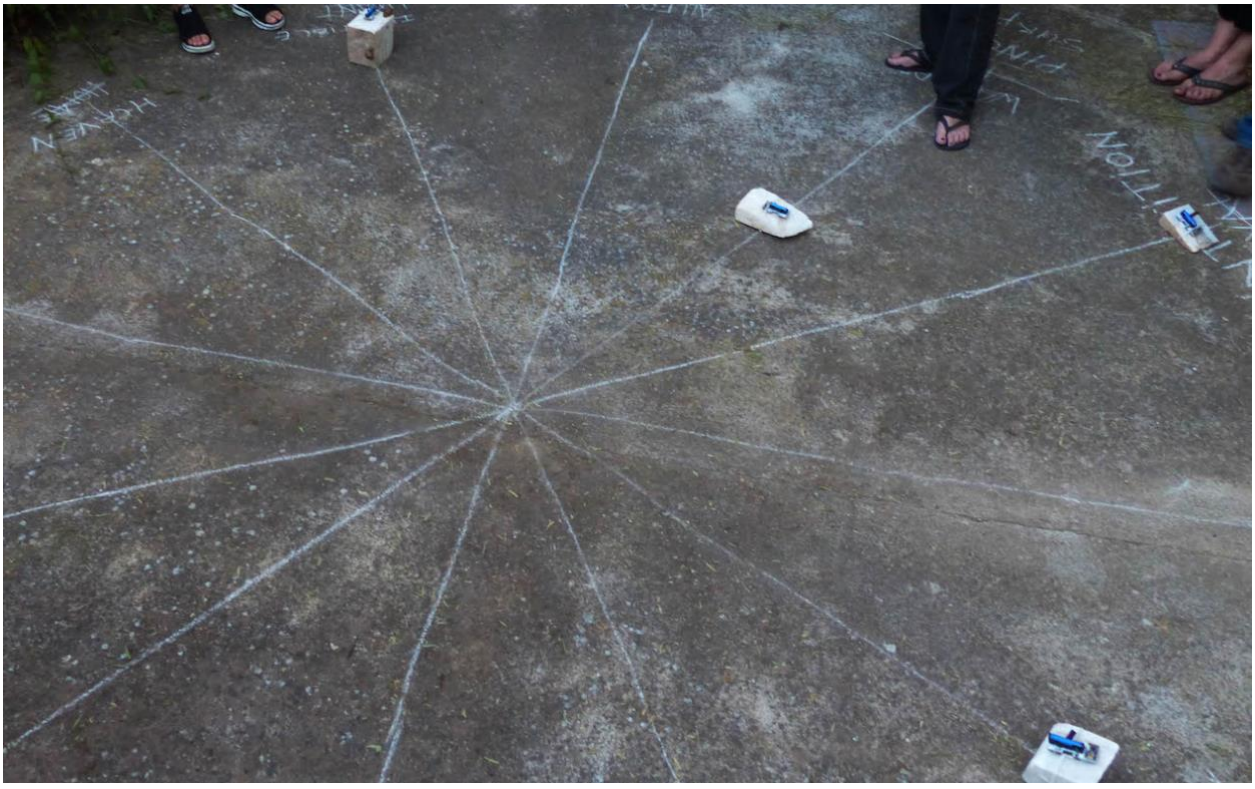

Image 9.7: Floor diagram from the show-and-tell, OBRAS 2018

Image 9.8: Detail from the show-and-tell, OBRAS 2018

Image 9.9: Detail from the show-and-tell, OBRAS 2018

Image 9.10: Collecting rocks from Cap-Saint-Jacques

Image 9.11: The chosen rocks for the Milieux Showcase, annotated with motor ID numbers

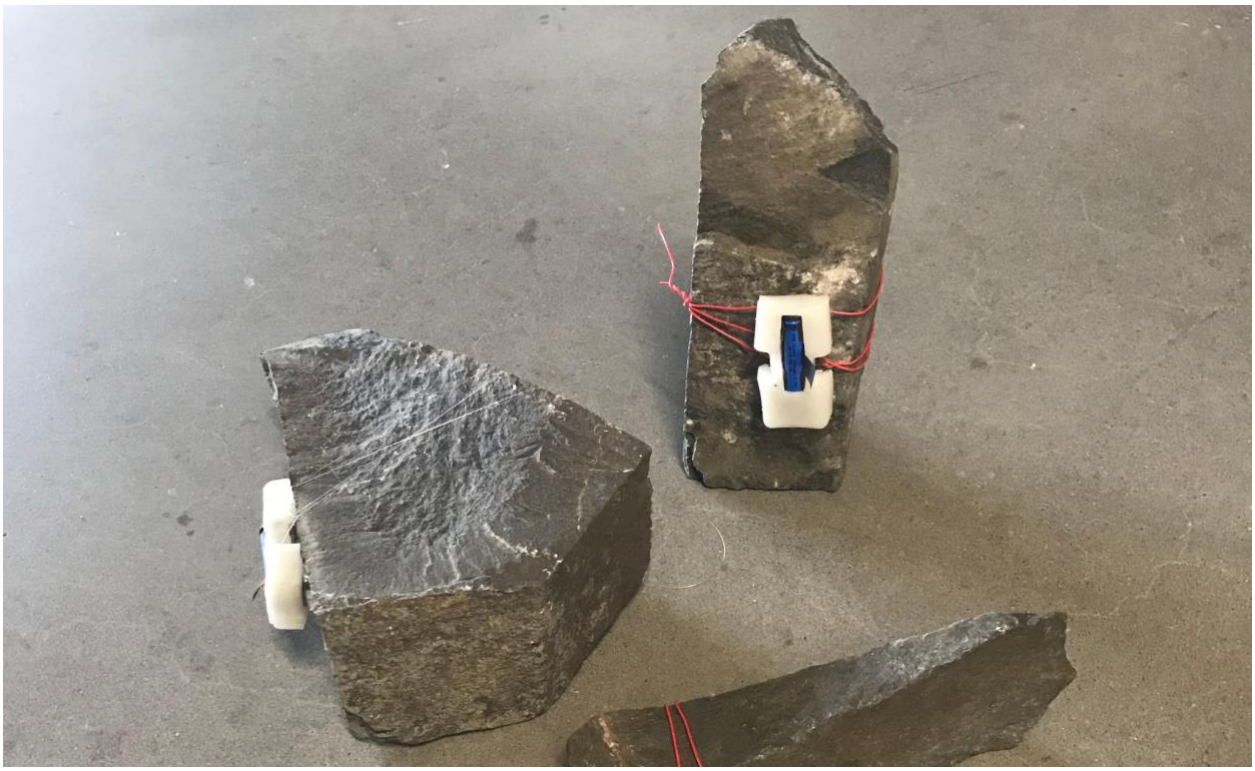

Image 9.12: Detail from the showcase at Milieux, Montreal 2018

Image 9.13: Detail from the showcase at Milieux, Montreal 2018

Image 9.14: Players at the showcase at Milieux, Montreal 2018

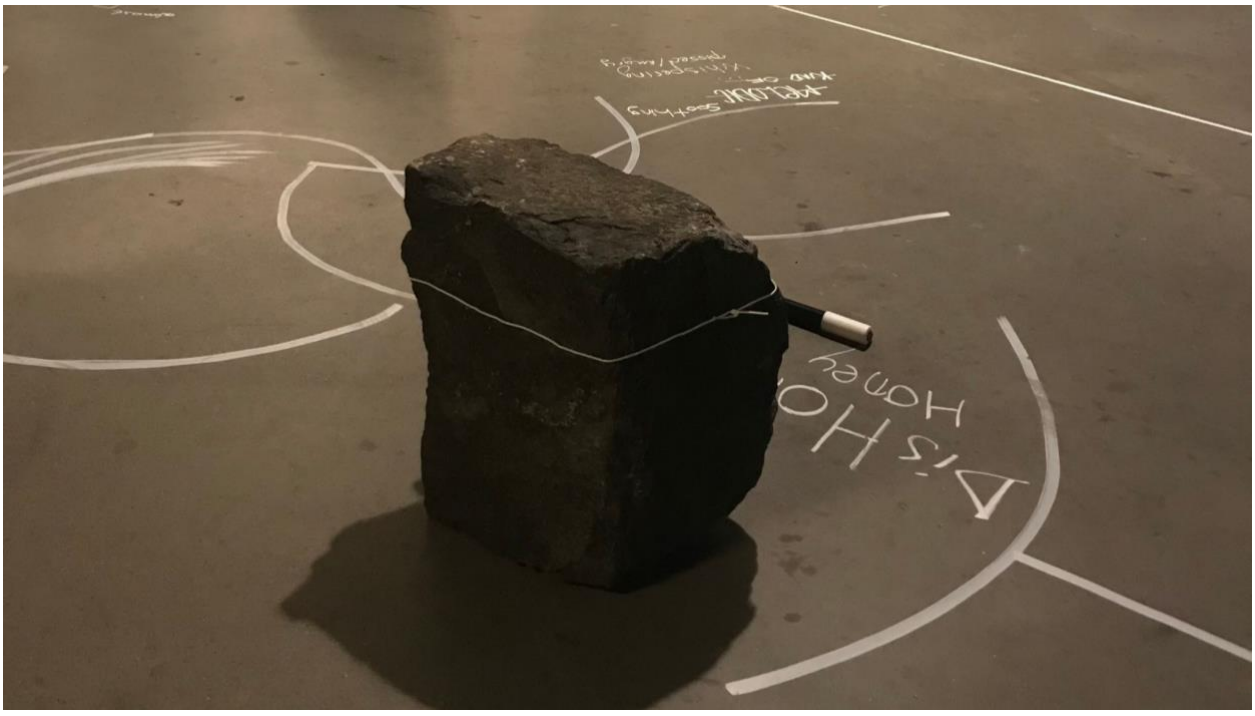

Image 9.15: Players at the showcase at Milieux, Montreal 2018

Chapter 10: Creation and Deconstruction

It has occurred to me that my creative making practice has taken the format of a critical theoretical research project. A main component of critical theory is the practice of deconstruction through reflection. By attending paradoxes, we can glimpse the otherwise invisible ideologies that structure social life. Considering my academic training in the European tradition of critical theory,[14] it is not surprising to observe that my research-creation practice follows such an approach.

The prospect of deconstruction, in this tradition, is the opening of new possibilities. Sara Ahmed, for instance, in her critical studies of happiness, examines how promises and expectations of happiness govern Western society. She articulates her method as an exploration of the "kind of world [that] takes shape when happiness provides a horizon" (2010, p. 14). This metaphor of exploring worlds within particular horizons focuses the analytical gaze on myths about right and wrong, natural and good. Admitting that this method might frame happiness as a problem and thereby "kill" it, she writes:

> *"To kill joy […] is to open a life, to make room for life, to make room for possibility, for change"* (p. 20)

This is what I mean by deconstruction. When the playground has been cleared, when all has been taken apart and we have time to rest, what then might we build in its place? What might we build in this newly opened void?

Critical theory as it is most typically practiced does not consider itself as engaging with the creative production of new worlds and new ideologies. Ahmed, for one, does not produce a new concept of happiness nor does she suggest that we should think differently about happiness. She does not offer solutions for what kind of worlds could exist if happiness is not a horizon governing social life.

This is not critical design as formulated by either design scholars Dunne and Raby (2008) or Bardzell et. al. (2012) because it is not intended to provoke and it does not seek to "disrupt or transgress […] constructions of need" (Bardzell et.al. 2012). Most importantly, the critical deconstructive approach I think of does not intend to provoke for the sake of provoking without

[14] With core texts from authors such as Theodor Adorno, Max Horkheimer, Jürgen Habermas, Axel Honneth, and Oskar Negt.

being grounded in the politics of who provokes, who bears the trouble, and who experiences the freedom.

Rather, I'm thinking of Tricia Hersey's work with the Nap Ministry. Her work is rooted in Black and racial justice, liberation and resistance. As she says "sleep deprivation as a racial and social justice issue" (Hersey 2021, website). Hersey instrumentalizes performance art, installations, and community organizing to create spaces for rest. From our contemporary point of view, it might seem peculiar to think of resting as a social and collective activity, but this is exactly what Hersey's work is. Hersey's art and rest practice is community work. Collective napping, storytelling, daydreaming, discussion, and disruption of grind culture are all elements of her artistic production. Through the collective resting these elements stage, she believes we can start imagining a new world built on mutual respect and more just principles.

Hersey's work comes out of different racial and social conditions than my own. The urgency of the need for rest for Black and Indigenous groups is of a different magnitude. I do, however, share her vision of collective rest, in particular as a political agenda. Rest, like critical theory's agenda of deconstruction, is not so interested in the productive engagement of making but rather in a practice of making space for ways of living that lie beyond our current imagination.

It might seem contradictory that I present my research-creation, a practice engaged in making things, as deconstructive. Yet it seems the games I have designed have done away with expectations that games should package opportunities for action, agency, thrill and excitement, or at least a screen and a controller. Similarly, opportunities to show one's skill, to win, to lose, to receive clear guidelines, to receive a prewritten story with interactive moments, and to have one's actions quantitatively evaluated were all absent from my games. The playground had been cleared and what was left was a particular space with particular affordances and suggestions. It seems that, in some cases, making and destruction are two aspects of the same thing. As Ahmed says, to kill joy is *"to make room for life*" (2010, p. 20). In the context of game making, perhaps to kill excitement and the imperative of action is also to make room for something playful and unexpected to emerge.

Chapter 11: Conclusion

This dissertation is my contribution to refiguring a game studies that establishes difference and variety as a foundational condition. This dissertation is a series of suggestions for how we might study and design games in ways that are not just open to differences amongst players but actively celebrate it. Beginning with the work of Aubrey Anable (2018) and Lucy Suchman (2007), I defined games as relational situations in which both the game technology and players make themselves intelligible to one another. Creating games using vibrotactile motors as the only actuator interface made the question of intelligibility a central topic throughout this dissertation. I started with the question:

> *[H]ow might vibratory signals function as the primary carrier of information and meaning? Consequently, what might digital games look like if they feature vibrotactile motors as the main expressive technology?*

In consideration of this line of inquiry, this dissertation has addressed the gap between vibratory sensation, game structures, information, and meaning making.

I worked to address the above questions through what Annakaisa Kultima calls a praxeology of game making (2018). This involves a commitment to transparency of the concerns, networks, and resources that take part in the making of particular entertainment technologies. In documenting the making of four games featuring vibrotactile technology, this dissertation has offered a glimpse into these processes. I did not follow prescriptive methods such as recommendations, design principles, or best practices. Rather this dissertation shows a creative making process with conditional, unpredictable and pragmatic turns.

I further reflected on the relation between research-creation, knowledge production, and knowledge articulation in academia. I navigated this research-creation project with an epistemological foundation that views knowledge as situated and incomplete. I called it an epistemological compass because, looking back, these reflections helped me make decisions when I had lost sense of which directions to head into. This compass was not made of guidelines that were clearly formulated from the beginning. Rather, it was formed from methodological conclusions I came to at various times throughout the making process.

Brittle Configurations

The first design experiment focused on learning technical skills and troubleshooting equipment. Preoccupied with these challenges, I implemented a game idea that I imagined at the beginning of the development process and pushed critical reflections and design thinking to the background. The resulting game design was not grounded in observations about the actual relation to, or potentials of, felt mechanical vibration. Vibrations were crafted to carry small bits of information indicating system statuses, game cues and feedback. The vibrotactile patterns, however, were difficult to load with messages. This early experiment echoes a longer history of vibratory media. Chapter 4 describes a series of historical examples of coupling information to vibrotactile signals. In different ways, these examples point to the way vibrotactile media tends to break a paradigm of information formalized in the mid 20th-century's transmission model of communication (Shannon 1948). As David Parisi and Jason Farman have observed, the 20th century's ambitions for developing a haptic communication system keep finding their limits, as touch and vibratory sensation apparently resist being disciplined into a communicative channel (20018). The most recent emergence of the haptic phenomena often referred to as phantom vibrations points to how the lines between fiction, speculation and reality warp where the felt perception of mechanical vibration is concerned.

Margareth Minsky's work with virtual touch and simulated textures points to a relationship between vibration, texture and simulated materiality. This relation resonates with my personal experience of perceiving and making sense of vibrations, in which felt vibration, textures and materials are connected in a metaphorical and associative relation. Such vibratory textural materials are conducive to host memories, dreams, and speculative thinking. Accordingly, the sensation of motorized vibration invites my body into a space in which distinctions between hearing and listening, attention and distraction, and presence and dream collapse. For instance, I might initially intend to "read" the vibration, or to identify the algorithmic structure behind it, I suddenly find myself tending to memories and investigatory speculations. Amidst a state of vibratory sensation, thoughts attach themselves to textures and material properties, imagined or not.

Grounded in this experience, I knew I did not want to work within the purified paradigm of information and transmission. I wanted to work in that delicate space of sense-making, in which meaning is not predefined, and I wanted to work in a way that honored variety and differences among players. In other words, I wanted to find a game design that was able to acknowledge the diversity of meaning-making practices related to vibrotactile stimuli.

Researching this relationship between vibratory sense-making and difference, I became interested in Hortense Spillers' history of touch (2016, 2018a, 2018b) and Steve Goodman's politics of frequency (2010). With this foundation, I place vibratory sense-making as one of the sense modalities in which differences matter in particular. Touch and vibratory sensation follow the lines of structural power and proximity to freedom. This history and its effects has been cached in the textures of our bodies, the wrinkles of our body tissue, throughout our bones, fat, skin and inner organs.

The exact references, however, can be difficult to track. Vibratory signifiers are open in a way that much contemporary game theory fails to acknowledge. Stories, memories and imagination emerge unbound in relation, not just between the game developer and player but in all the relations that make up the particularities of the given situation. As attention drifts through awareness of technical details, childhood memories, music references, speculation and daydreams, it becomes difficult to distinguish different modes of perception—decoding from listening, attention from distraction, and in-game speculation from out-of-game thoughts.

It is not only the body of the players that matter in the attempt at making the game a mutually intelligible situation. Like all media, vibration needs materials to express itself, and it matters what kind of materials are present. The quality and character of the vibratory expression was a result not only of aesthetic, algorithmic and compositional choices but also of material features of the hand-built motor technologies, including battery power levels and irregularities in the sometimes fragile technology. Also, the surrounding environment, including the material of the casing protecting the motors, mattered. Wood and silicone are soft in comparison to ceramics and stone, and the composed vibrations had to be adjusted for each material I worked in.

As I became more attuned to working with vibrotactile motors, I learned that there is a noteworthy relation between vibratory signals and time. Vibrotactile signals take time and require a relaxed mind and body to be received. I related to the slowness in contrast to mainstream game culture's expectations for action and excitement. I describe my vibrotactile games within a trend I call "calm games," a concept that, in the mid-nineties, was considered an impossibility in the context of late 20th century game culture's demands of thrill and excitement. Within the calm games aesthetic, game actions such as relaxation, remembering, recognizing, listening, daydreaming and emergent storytelling becomes both action and content. The actions direct the theme and the story while also being a result of the technology's material, energetic and algorithmic vibratory conditions.

On multiple levels, motorized vibratory expressions traverse boundaries. The vibratory signifier breaks apart as vibratory sense-making fails to stay bound in stable signifier–signified relationships. Vibratory signals trespasses material boundaries as they move through silicone, wood, rocks, clothes, skin, tissues, and inner organs. A vibratory history, and its political ramifications, is stored in our fleshy bodies. The references retreats and resurfaces as we move about our life, transgressing distinctions between fiction, reality and desire, action and representation.

Game studies' binary of surface and depth associates depth with complexity and authenticity and locates representation, stories, meaning-making, and politics in a secondary surface layer (Anable 2018). Gameplay is said to be rooted in the depth and is therefore the part of the experience that does not change when you change the surface elements. This has effectively pushed aside the expertise of academic traditions such as cultural studies and gender, race and queer studies, and created an overwhelmingly hegemonic field in terms of scholars represented, methodologies deployed, and questions asked or even imagined (Phillips 2020b). Conversations about surface and depth in games place the identity of the game in the relations that are predefined, whether by code or rules. In this way, it is not just that the game can stay unaffected by the representational layer it has been "wrapped" in. The game also stays unaffected by whatever environment it is played in, by whoever plays it, and whatever players might bring to the moment. The real game is not only what does not change when the surface layer changes, it also stays unchanged by its environment. These ideas resonate with game studies' highly debated concept of the magic circle (Huizinga 1944), a sibling concept to communication studies' equally disputed theory of information transmission (Shannon 1948). These two models were formulated in the 1940s and both elevate purity as a virtue and quality of proper play and effective communication. In both models, purity is attained by encircling the activity with imagined boundaries within which it is shielded from the unpredictability of diverse and changing surroundings and actors. Although both concepts have been criticized probably more than any other concepts within their respective fields, they persist in game studies, manifested as easy design solutions and mainstream entertainment desires. In the case of this research-creation work, it was the strange choice of software that gave way to a different design strategy.

When I chose to work in Max/MSP I had no foresight of how the structure of the software would influence the various design decisions I would need to consider. In particular, I had not expected that it was the software's inability to cater to the conventional game logic of conditional processes that would give me a design strategy more suitable for vibrotactile game technologies.

While it was possible to make game logic within the structure of Max/MSP, it was more complicated than I had originally imagined possible. In my second design attempt, *I'll Give You My Bird If You Promise To Pass It On* (see chapter 5), I gave up on system complexity and the ambition to implement the conditional structure of the game via the code. I migrated responsibility for the conditional procedures from the code to the players. This shifted players' attention away from trying to understand an underlying logic of a game system through cues in the vibratory patterns, and allowed them to focus on more interesting features of vibrotactile expressions. Without the expectation that there was an intended message "behind" the vibratory pattern, a new kind of game emerged. Players relaxed into the vibratory material and allowed their own memories and imaginations to manifest, their own storylines and attachments to develop.

As players allowed memories, imaginations, and storylines into the game, players also invested more care in their relationships with the vibrating motors, or perhaps it was an increased level of care that produced more lively stories. It seems that vibrotactile signals are especially conducive not just to associative thinking but also to stimulating people's care. As I observed this relationship, I was contemplating a good balance between storytelling and ambiguity. The affective investment was, on the one hand, what gave the game character. On the other, in line with Elisabeth Povinelli's concerns (2016), I wanted some degree of friction in the relationships players developed with the technology in order to disrupt anthropomorphic projection. Inspired by Audry's alien robotics (2016), I experimented with adding artificial noise to the composition of vibratory patterns. Vibratory expressions, however, seem to already be living on that awkward boundary between the familiar and the non-sensible. The small irregularities in the hardware and instability in the wireless connection gave the vibrations a lifelike expression, and the expressions changed over time as the technology was wearing down.

In understanding this different kind of game and storytelling that emerged, I drew on Lucy Suchman's idea that, in the attempt to establish mutual intelligibility, all parties involved, both users and machine systems, draw on resources available to them in the situation (2007). There is an asymmetry, however, as both players and machines have access to different kinds of resources: memories, skills, and decision-making practices. In a game context, this asymmetry means that it matters how tasks and responsibilities are distributed within the circuit of play. Reallocating the task of conditional procedures from the precoded machinic elements to the players creates a kind of play that is notably different. These observations led me to consider game culture's grammar for game, players, and context. These concepts exemplify what

Suchman (2007) has called a "container-like" metaphor. The grammar, I argue, reiterates the aforementioned two models mentioned above, the transmission model of communication and the magic circle. The notion of context flattens the features of the environment and insinuates that the value of a game is not to be found in how it engages with the resources already present in the situation.

I developed a design strategy for vibratory games in which there is no cultural or material "context." As attention drifts through different states of awareness, these boundary-trespassing explorations become the point—both action and story, form and content. This design strategy actively has an aesthetic of fragility. Fragile games work with the situation, which puts it at odds with game culture's ideas of stability and replayability—that games ought to give similar play experiences across changing situations, location, times, and communities of players.

Instead of making demarcations between games, players and contexts, I suggest including concepts of time and resources in order to move the discussions about games beyond boundary metaphors like circles and contexts. Any situation holds particular potential by virtue of having resources gathered through time. Resources include material compositions, procedural codes, body and motor skills, intellectual references, memories, dreams, and associative capacities that often cannot be fully traced. Practically, advocating for the elaboration of concepts for time and resources means that I advocate for shifting the way we talk about games so that game technology becomes a part of the situation that has been prepared and pre-coded by the developer. In this model, the game technology becomes akin to a tool, although not a neutral and depoliticized tool but a tool with affordances intended to shift situations in particular ways. Thinking of games as tools also means thinking of games not so much as an end-products in themselves but rather as part of circulating material aggregates that might contribute to someone else's creative practice.

Relevance: An Epistemological Compass

What I call my epistemological compass was not a set of guidelines clearly formulated from the beginning but rather methodological reflections and conclusions that helped me make decisions when I had lost my sense of which directions to head in. Central to these guidelines was the practice of prioritizing what felt relevant over, for instance, what seemed rational or logical. This practice to prioritize relevance—the relevance of orange rubber bands, for instance—even when it pointed only towards what I did not know, was often unsettling. This irksome sense of needing

to ground decisions in rational knowledge seems particular to the academy's founding principles of universal knowledge and rationality. Feminist conversations on epistemology functioned as guides directing me to a different foundation with other resources for verifying decision-making within academic settings.

Patricia Hill Collins' afro-feminist take on standpoint theory (1990) combined with Donna Haraway's notion of "double vision" (1988) and Harding's notion of "strong objectivity" (1992) illustrate how there are multiple kinds of knowledge existing in different forms. These include what is often branded as universal knowledge, along with the often more suppressed and less articulated knowledge that comes with navigating the effects of universal knowledge's dominance from particular positions in society. The need for further articulation of knowledges associated with experiences phnot part of the centered privileged is pressing. Self-articulation from marginalized positions, then, whether within the field of poetry, storytelling, academic publishing or creative game creation, becomes a crucial and relevant form of knowledge articulation. As always, proximity to privilege and power is relative. Further research and research-creation from non-dominant positions will have much to contribute that bears relevance across groups and divisions.

In some ways, Haraway's notion of a "double vision" is an understatement. This dissertation recounts multiple, even countless, knowledge domains and considers their vantage points. To mention just a few, these include common game design practices, contemporary game culture aesthetics, vibratory communication within the paradigm of information transmission, material textures, my own sense of relevance, play and playful needs, as well as technological and circumstantial limitations for meeting said needs. This dissertation reports on a navigation through these multiple domains of knowledge, each providing its own perspective.

Additionally, my epistemological compass draws on Jacki Orr's practice of symptomatic research (2006). Symptomatic research is a practice that honours partial knowledge. This means that knowledge is not discarded simply because it is incomplete. In the context of art or creative game making, I pay particular attention to what I call the knowledge of relevance: a gripping sense of something being important even as one cannot identify reasons for that feeling or connections that explain it. In an ontology where everything is connected, these connections ought to be there, whether perceptible or not.

In a didactic sense, the hyphen between research and creation is then not so much about a relationship between creative making and disembodied objectivity. Rather it is about the

relationship between articulating the knowledge of relevance, even when the connections are unknown, and searching for these obscured connections and how they have been both constituted and concealed through history. Answering Amanda Phillips' call for new forms of storytelling in game studies (2020b), a dynamic between modes of creation and inquiry is my methodology for scholarly storytelling in game studies.

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