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Algorithmyth: Revealing the Techné in Algorithms Through Devised Performance

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A Powerful (Ideological) Tool

With every click, beep, or update of your smartphone, corporations are developing a picture of your personal behaviour; algorithms are at work, swiftly organizing information left behind from your on-line activity. The data compiled and the portraits of each of us created are detailed to the point of being problematic because this activity is invasive, secret, and to most of us, obscure to the point of being a mystery. Hidden algorithms can make or ruin reputations, decide the destiny of corporations, or devastate an entire economy. Shrouded in secrecy and complexity, decisions at major Silicon Valley and Wall Street firms were long assumed to be neutral and technical, but leaks, whistleblowers, and legal disputes have shed new light on automated judgment. Self-serving and reckless behaviour is surprisingly common, and easy to hide in code protected by legal and real secrecy. An Algorithm is a powerful tool, but like other powerful tools invented over the years, it seemed to me that much of this power comes from *how* it is used and *who* gets to use it. I wondered, is it possible to de-mystify algorithms? Or, can I at least understand them enough to know how they work, and (with the help of others) decide on the limits of how I am rendered by them. I also wondered if anyone else was concerned about algorithms; did anyone else think of them as more than technology, as an ideological tool? Finally, as performance research is what I do, I wondered if I could create and use an algorithmic process to make a performance.

According to the *Oxford English Dictionary*:

In mathematics and computer science, an algorithm¹ is a self-contained step-by-step set of operations to be performed. Algorithms perform calculation, data processing, and automated reasoning.”

Also,

...An algorithm is an effective method that can be expressed within a finite amount of space and time, and in a well-defined formal language for calculating a function. Starting from an initial state and initial “input” (perhaps empty), the

¹ The word's origin: 'Algorithm' stems from the name of a Latin translation of a book written by [al-Khwārizmī](#), a [Persian](#) mathematician, astronomer and geographer. Al-Khwarizmi wrote a book titled *On the Calculation with Hindu Numerals* in about 825 AD, and was principally responsible for spreading the [Indian system of numeration](#) throughout the Middle East and Europe. It was translated into Latin as *Algoritmi de numero Indorum* (in English, "Al-Khwarizmi on the Hindu Art of Reckoning"). The term "Algoritmi" in the title of the book led to the term "algorithm".

instructions describe a **computation** that, when executed, proceeds through a finite number of well-defined successive states, eventually producing an "**output**" and terminating at a final ending state. The transition from one state to the next is not necessarily deterministic; some algorithms, known as randomized algorithms, incorporate random input.

This definition of an algorithm begs numerous questions, especially when applied to society, for example: who invents the rules (the "formal language")? Who invents the criteria for how rules are decided upon (the "well-defined successive states")? How are these sets of rules "followed"? How are these processes affected by the fact they are solved/operated by computers?

I discovered that I wasn't alone with these questions and concerns. I began working with Peter Hatch, a composer and professor of music at Wilfrid Laurier University, Paul Cegys, a designer, videographer and professor at the University of Waterloo, Adam Cowart, a writer and financial analyst, based in Vancouver, and eventually others on a project called *Algorithmyth*. A starting point was a mutual concern that we are being subsumed in corporate driven algorithms that don't serve our needs; that algorithmic methods are increasingly being integrated into our working and personal lives: from stock market high frequency trading to Amazon purchases; from Netflix film choices to Lavalife dating. Under the logic of neo-liberal capitalism, we've become familiar with the idea that algorithmically-driven machines are replacing physical labour, but a major concern for us was the evidence of how algorithms are also starting to replace intellectual, social, and even emotional labour. On the other hand, algorithms do a lot of good; they are a powerful tool for attending to a huge array of problems and complicated scenarios: they can make our traffic run smoothly, and they can track and predict the spread of epidemic disease. Unfortunately, these same tools are also used in increasingly more autocratic ways, as they funnel the resources of many for the benefit of a few. *Algorithmyth* began as an investigation of the algorithmic affect on the stock market - traditionally a place where probability, ritual, and intuition collide, but our focus soon spread to include other aspects of contemporary capitalist culture, where algorithms are having an increasingly deterministic effect, as they approach mythic status and shape all manner of relationships, notions of value, and thought.

In the past two decades, the Waterloo Region has become known as Canada's "Silicon Valley of the North" or as the cities of Kitchener, Waterloo, and Cambridge are sometimes called: "Canada's Technology Triangle". In our region there are over 12,000 businesses devoted to the tech. sector, including internationally known companies such as Christie, Blackberry, ComDev, and OpenText. In many ways this industry is the new industrial culture in our region, and so another reason for creating *Algorithmyth* was to engage in meaningful dialogue with this emerging culture. Over the past year, *Algorithmyth* has brought together artists with mathematicians, theoretical physicists, and economists in creative dialogue about an industry that is transforming the industrial and cultural landscape of the region where I live. In his 1985 book *Amusing Ourselves to Death*, Neil Postman writes:

To be unaware that technology comes equipped with a program for social change, to maintain that technology is

neutral, to make the assumption that technology is always a friend to culture is, at this late hour, stupidity plain and simple. [...] Introduce the alphabet to a culture and you change its cognitive habits, its social relations, its notions of community, history and religion. Introduce the printing press with movable type, and you do the same. Introduce speed-of-light transmission of images and you make a cultural revolution. Without a vote. Without polemics. Without guerrilla resistance. Here is ideology, pure if not serene. Here is ideology without words, and all the more powerful for their absence. All that is required to make it stick is a population that devoutly believes in the inevitability of progress. (Postman 157-158)

The growing technological sophistication and ubiquity of smartphones and other mobile devices are altering the way a majority in our society define themselves, communicate, see, think, and interact with the world – perhaps on a scale and with the same impact that the birth of photography or the invention of perspective drawing did, in previous eras. Neil Postman claims that these technological shifts in seeing, representing and interacting with the world are ideological; *Algorithmyth* examines the place where the technological meets with the ideological, and how this examination illuminates a reconsideration of how algorithms, at the core of technological development, are ideological constructs.

***Techné*: Technology as a Form of Revealing**

This discovery was predicted by Martin Heidegger in his seminal essay entitled “The Question Concerning Technology” (1955), so in the following examination of *Algorithmyth*, I want to draw on Heidegger’s analysis because, to refer to the theme of this year’s Congress, both the reach and effect of algorithms make them of *capital concern* for our society, and Heidegger offers an important perspective on how we might re-think our contemporary understanding of what it means to be (a thing, a person, an institution) in relation to technology. His perspective is important to a discussion of a multimedia performance about algorithms because his approach to technology is astute and far-reaching for how we may understand various ways of knowing – through innovation, craft, and interactivity, but most importantly through art.

In “The Question Concerning Technology”, Heidegger searches for the “essence” of technology in an etymological approach to the question he poses, by exploring the relationship between technology and the Greek term *techné*, which was one of the three branches of knowledge defined by Aristotle, alongside *epistémé* and *phronésis*. In their most basic formulations, *techné* relates to skill and craft in the form of practical knowledge; *epistémé* refers to theoretical or scientific knowledge; and *phronésis* connotes a practical wisdom, predicated on ethical values and comprehension. For Aristotle, *techné* describes a productive skill that involves a “reasoned state of capacity to make,” where the emphasis was on the creator and “not in the thing made” (qtd in Bouchard 24). This practical knowledge was meant to be a cultivation of the skills to copy and complete what was already in existence in the natural world. *Techné*, as a

branch of knowledge, is the practical capacity and understanding to create things from natural resources.

When considering the relationship between *techné* and technology, Heidegger specifies *techné* as the human capacity to allow things in the world to reveal themselves in their essence. *Techné* is related to *epistémé*, but they do not represent a binary, as Heidegger suggests:

[7] *techné* is the name not only for the activities and skills of the craftsman, but also for the arts of the mind and the fine arts. *Techné* belongs to bringing-forth, to *poiésis*; it is something poetic [...] From earliest times until Plato the word *techné* is linked with the word *epistémé*. Both words are names for knowing in the widest sense. (Heidegger 13)

Essentially, *techné* is a practice aimed at revealing what was concealed, rather than manufacturing or simple instrumentality, or as Susan Kozel suggests: “*Techné* is a bringing-forth, and technology is a mode of this revealing. In other words, *techné* is the broad human activity of bringing things into being, while technologies are a modality, or specific set of practices, within this wider domain” (Kozel 34). Furthermore, Heidegger aligns *techné* with *poiésis* and identifies both with a bringing-forth rather than with mere manufacture. Both are associated with arts of the mind and fine art as much as with craft. And both are ways to achieve *alétheia*, or truth in the sense of ‘revealing and unconcealment’ (Heidegger 8-13).

As the poetic heart of *techné* expands into the function and utility of modern technology, this sense of revealing and unconcealment is less aligned with *poiésis* and more in keeping with the revelation of potential, or “a challenging-forth to presence as standing-reserve” (Wallis 2). As Mick Wallis explains,

[T]he Rhine is not seen by modern technology for what it is, but as a standing reserve of energy. Further, that energy is itself challenged-forth simply as one term in an endless chain of standing-reserves. Exploited through dams, the Rhine serves up motive energy, which turbines convert to electricity, itself converted to light, which illuminates people’s way to work ... and in which world those people are themselves mere standing-reserves to be exploited in similar chains. This challenging-forth is at the behest of the principle of *gestell*, or enframing. Both modern physics and modern technology are challenged-forth by the rule of enframing and so insist that things bring themselves forth as calculable and as orderable in systems of information. The chief characteristics of enframing are ‘regulating and securing.’ (Wallis 2).

Both *techné* and *gestell* are, as ways of revealing, means to *alétheia*, or revealed truth. Wallis adds that, “[i]t is because the essence of technology can now only reveal itself as enframing that the essence of technology is now fundamentally ambiguous” (Wallis 3).

Indeed, this is the problem, and it is at the root of Neil Postman's concern expressed above: as technology gives way to *gestell*, to calculable and ordered systems of information, and forms that regulate and secure exponential reproduction of all manner of cultural phenomena, perhaps what is revealed is not the potential for free and truthful expression, as Heidegger had hoped, but instead the manifestation of a banal ideology of progress.

At the close of "The Question Concerning Technology," Heidegger asks might the essence of (modern) technology "harbour in itself the growth of [a] saving power"? (Heidegger 28). With a profound sense of the horrors of the Second World War fresh in memory, he wonders what might bring about a different world with respect to technology. He articulates two possibilities. First, while human activity can never directly counter the danger of *gestell*, there is the possibility of the rediscovery of *techné*, the poetry and vision at the heart of technology. Or, second, "the frenziedness of technology may entrench itself everywhere to such an extent that someday, throughout everything technological, the essence of technology may come to presence in the coming-to-pass of truth" (Heidegger 35). I think this second possibility is close to the anxiety expressed by Postman; so, in *Algorithmyth* we worked toward realizing the first.

Algorithmyth as Applied Techné

Algorithmyth is the first phase – of three – in the creation of a work that will premiere in 2016, as part of the Open Ears Festival in Kitchener-Waterloo. Peter Hatch, Paul Cegys, Adam Cowart, and I were eventually joined by several talented, multi-disciplinary artists,² and Mukul Agarwai (**show slide**), a unique collaborator in that as a Post Doctorate Fellow in Math and Engineering at the University of Waterloo, he provided the kind of conceptual wisdom and understanding of the *techné / gestell* dimension of algorithms needed to explore our subject matter in sufficient depth. In the remaining time, I want to provide examples of the performance we staged for an invited audience on Sept. 3, 2014, at the Institute for Quantum Computing, University of Waterloo. This performance took the form of an algorithmically-inspired system of events that provided an intersection of physical / rhythmic / musical scores based on myths (ideologies and other frameworks of power and value), that were 'lived' through the ritual of performance.

Due to a lack of funds, the workshop process of devising this first phase of *Algorithmyth* was only about ten days; however, Peter, Adam, and I had been working on this project informally for many months. The performance was drawn from three resources: 1) site, 2) text, and 3) video (these were the key conceptual resources in the work; a specific approach to music and action were also significant in this performance, but were manifested more as layers of animation to the three resources. Briefly, the site was the main lecture hall (room 0101) of the Mike and Ophelia Lazardis Quantum-Nano Centre, at the University of Waterloo. In our exploration of the meaning of this site, we wondered what is the governing myth of this place that houses a particular form of education; we wondered how is this myth 'lived' through rituals of learning. We began

² Collaborators in this project include: Adam Cowart (writer), Pam Patel (performer), Margaret Bardos (performer), Richard Burrows (performer), Daniel Morphy (performer), Mukul Agarwai (performer), Kathryn Ladano (performer), Colin Labadie (performer and soundscaping).

with the ritual of a lecture, and then Adam Cowart created four scenes that offered speculative departures from a three-part lecture about algorithms given by Mukul. The foundational text of *Algorithmyth* is a lecture on the theme of how algorithms are mathematical poetry; Mukul illustrates this lecture in formulas depicted and drawn across a large white board that spans the space; near the end of the performance his formulas turn into Sanskrit poetry (**show slide**). Adam's texts speculate on Mukul's lecture in the way they bring to life how the algorithms that seem beautiful and elegant to a mathematician, are also used to create a capitalist infrastructure designed to produce massive wealth in a split-second. Revealed here is an energy flow that is at once beautiful and terrifying both for its scale, and its impact on humanity. The video, as resource, echoes the exponential impact of algorithms on our world. Here we see nature through a particular lens, and at certain tempos that allow us to consider humanity's relationship with our surroundings as a series of 'standing-reserves'; revealed and then exploited through dams, turbines, and stock prices.

Both music and action were governed by the following algorithmically-inspired system: **Rule One**: the performance is based on a few simple sets of actions, some overtly musical and some overtly spatial. **Rule Two**: These actions convey different meanings depending on the following dynamics: *speed*, *distance*, *intensity*, and *repetition*. In addition to our desire to create a devising structure that resembled an algorithm, we wanted to explore the physical gestures of stock traders; to examine the meaning-making in this physical score of trading value that pre-dates as well as co-exists with algorithmic trading. Our vocabulary was sourced from the CME Group's *Trader's Guide to Open Outcry Hand Signals* (**show slide**); in our devising process this language of evaluation (e.g.: how much to buy, sell, at what price, and at what quantity) was used to convey love, hope, competition, anger, humiliation, and also wonder. (**show video example**)

Music and sound in *Algorithmyth* were produced both live and through pre-recorded means; musicians doubled as actors in the work, sometimes blending these identities, and sometimes not. An almost-constant pulse is heard through the performance, changing from a water drop to a heartbeat to a drumbeat. Simple number sequences ("One, One, two, One, two, three" shouted by men, and "Two, three, two, three, five" sung lyrically by women) comprise the lyrics for some sections; these simple algorithms outline durational portions of the music played. These sequences are the basis for much of the movement of the work as well as for the visual imagery. In terms of music composition, more complex algorithms were also composed using computer software and realized in both human and computer performance. The use of weighted probability³ was a key compositional concept throughout the work and mirrored by the use of structured improvisation both during, and separately from, composed sections in the performance. (In both cases, sets of instructions allow for random elements controlled by given parameters.)

³ Probabilities represent the chances that different events will occur. For example, if you were rolling a single six-sided die, you would have the same probability of rolling a one as rolling any other number because each number will come up one out of six times. However, not all scenarios have each outcome equally weighted. For example, if you add a second die to the mix, the odds of the dice adding up to two are significantly less than adding up to seven. This is because there is only one die combination (1,1) that results in two, while there are numerous die combinations--such as (3,4), (4,3), (2,5) and (5,2)--that results in seven. Read more : http://www.ehow.com/how_5959518_calculate-weighted-probabilities.html

Algorithmyth: Improvisation and Essence in Techné

In the short time we had to devise this performance, improvisation was an important part of our process. Following Heidegger, artistic researcher, Susan Kozel suggests that improvisation, like technology, is a mode of revealing within *techné*.

[I]t is technology that makes the demand on us to think in another way what is usually understood by 'essence'. But in what way? (Heidegger 30)

Thinking essence in another way refers to re-examining how things are, in the light of how they unfold. Essence for Heidegger does not refer to a generic type but to the ways in which something 'endures', it is a changing active designation. He uses a set of verbs to convey the essence of things: how things "hold sway, administer themselves, develop and decay" (Heidegger 30). Kozel suggests that it is impossible to emphasize enough the importance of the verb in Heidegger's thought, the importance of the dynamic, shifting ever-changing quality of what makes us who we are. Fundamental to verbs is a sense of temporality, and a concerted attempt to let something new emerge requires questioning standard registers of temporality, or rhythm. Improvisation can be used to address questions of rhythm by breaking the flow and pacing of daily existence, by creating a slow deliberate space, or a disrupted space, or a quick and rapidly changing space. Improvisatory techniques are techniques of revealing. (Kozel 38).

Heidegger's "Question Concerning Technology" charts the dangerous side of 'modern' technology, which reduces people and nature to raw materials and produces the delusion that we only ever encounter ourselves. He has also been interpreted as indicating that 'technology cannot concern itself with what is unique and therefore unpredictable and unmanageable. Hence, an approach to technologies in performance that elevates the unpredictability associated with improvisation and interdisciplinarity can counterbalance these observations of our human use of technologies and, in turn, call them into question. In *Algorithmyth* we have tried to create an interdisciplinary performance project that may move us beyond the dilemma of being confined either "to a stultified compulsion to push on blindly with technology" or "to rebel helplessly against it and curse it as the work of the devil [... or Bill Gates, Citi Corp, or some other person or corporation]" (Heidegger 26). *Techné* comes to the rescue of technologies. If we are no longer doomed to be trapped within the codes and conventions of a narrowly constructed technological existence, nor forced to become Luddites and reject it, then there is scope for finding new ways to work with existing technologies and, in turn, for designing different interfaces, platforms for play, and so on, for future generations of technological 'devising partners' and models in the creation of performance. Out of these can emerge new knowledges and practices, as well as new ways of valuing art.

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