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THE USE OF DRONES: AN ARGUMENT AGAINST OPTIMISTIC TECHNOLOGICAL DETERMINISM FEATURING THE WORK OF ALBERT BORGMANN AND AN EXTENDED ANALOGY

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This paper applies philosopher, Albert Borgmann's, device paradigm to the use of drones in contemporary society. Such application demonstrates the accuracy of Borgmann's analysis, since a paradigm or technological pattern is described in disparate social and political areas of North American culture. The result is an analogy developed to connect drone usage to the mitigation of particular human skill sets and virtues. Such mitigation, coupled with a brief discussion of the device paradigm in the development of the American Military complex, reveals a technological determinism at work in consumer society. A conclusion suggests such technological determinism to be a dangerous ideology, which usurps democratic participation and dialogue about human values, particularly questions of war and global conflict.

Keywords: drones, Albert Borgmann, technological determinism, disburdenment

1. The burden of philosophy

Philosopher, Albert Borgmann, has been critical of his own discipline because of its failure of relevance to the questions of the everyday life of society. Though he admires the strides made in contemporary philosophy in terms of rigor and analysis, his philosophy presumes two important aspects often overlooked in academic circles. First, philosophy ought to bring its powers of analysis to the routines of everyday life. And secondly philosophy must risk an interpretation of the whole; hence Borgmann's interpretation of the pattern which impacts contemporary experience, the device paradigm. (2003, 12, 2010) A pattern that has cultural impact should be able to be seen in diverse places, say, in rural deer hunting and in top brass military decision making. Borgmann is, therefore, a philosopher of culture as much as he is a philosopher of technology, for according to his lights, technology is the reigning influence of the Western ethos; the shallow roots of our contemporary engagement with reality. Borgmann is also aware that between Continental philosophy's intuitive brilliance and Anglo-American philosophy's scrupulous rigor, there is the culture at hand, which needs to be addressed in both narrative description and analytical precision. This is because underneath the culture of technology there are moral resources to reform our collective life; to become more virtuous, indeed, more human. The following experience of a drone at sunset will intuit the moral problem with our culture of technology. The subsequent argument will attempt to give theoretical teeth to our experience by focusing on the profound moral

implications of the ubiquity of devices and technology; in both rural practices of securing food and military practices of international security.

2. The drone sunset

On their anniversary a couple went to the Lake Erie beach at the very tip of Northwestern Pennsylvania to witness the sunset, one of the most stunning in North America, in order to contemplate their relationship and the beauty of creation. As the massive orange ball, alive to the eye, descended to the horizon of a vast body of water which lapped gently along the sandy shore, children ran, grandparents giggled, the couple held hands, gazing. It was a luminous moment shared in the mystery of existence, perceived in the warmth and glow of a massive star receding in the mind's eye. Then a low humming noise came from behind the couple, and instantly above their heads, now moving like a giant humming-bird, a white gadget caught the attention of all – the children, the grandparents and the couple. All were mesmerized by this flashy white flying object suspended now above the green hued water; and then eyes turned to the drone operator, a pudgy, yet confidently focused middle-aged man in the parking lot, who quickly drew a few onlookers to his side to ask him what sounded like self-assured pertinent questions about his drone. The low humming noise suspended conversations and the people's beach was now adrift with the drone out above the water, the cell phones taking pictures of the setting sun were now pointed at the drone, which was no doubt returning thanks by taking pictures of the vastness of the landscape with vistas unseen, even by planes with

cameras. Was the drone operator going to sell his pictures? And how uncanny that the whole beach, once playfully engaged in being there, was now a bustle with the white object humming above the drowning sun. Reality seemed to be interrupted and recalibrated according to the momentous unveiling of this cheap gadget and the man-child proudly manipulating his toy; so much for the depth and duration of marital love, the beauty of creation, the mystery of being there, or the wonder of the sand-dosed children.

This descriptive account attempts to convey loss due to technological development and the ostensible progress it promises. The promise tends to interrupt and conjure an animated attention onto the gadget, whatever it may be. A tablet can present colorful pictures of rainforests or leopards, or sunsets, yet they all remain surface images unhinged from reality's manifold depth. The dynamic of that which is gained with technological optimism and that which is lost deserves careful analysis. Especially as it relates to moral philosophy since it is concerned with the development of active skill and the virtues which come with an honest struggle with the way things are. This dynamic of gain and loss has been analyzed by philosopher, Albert Borgmann, who incisively depicts our culture of technology as a device paradigm. By calling it a paradigm, Borgmann issues a call to study the resultant ethos of such a pattern in order that it might be named, understood. Once named those within the culture can begin to extricate from what is presented as a certain technological determinism, a view that technology and its use contain a future directed logic of inevitability. The person with the drone at the beach seemingly had no sense that his digital propensities and

promises were infringing upon a very real moment of what might be called a *public* aesthetic, a shared moment of high quality. This person had no sense because he is acting within the assumptions of the paradigm, unable to think about how that paradigm's application in everyday life has mitigating factors. The implications of these factors mean that collectively we lose a freedom of perception and encounter, and the inherent skill refined to recognize this essential eventfulness of being human. A pattern can be discerned in all dimensions of a culture. That is why when we discuss drone warfare, we attempt to see the paradigm at work elsewhere, in everyday life for example.

3. The shape of the argument

This argument in moral philosophy will describe Albert Borgmann's insight into our culture by examining the device paradigm, particularly its moral implications. In order to apply the pattern to very different dimensions of culture an analogy will consider the skills and virtues that are eclipsed by using a drone in deer hunting and in current wars and conflicts respectively. To convey the impact the paradigm has on our cultural imagination, a brief discussion of the development of drones for conflict will consider the inter-relationships between technology, war, economics, politics and corporations. This complex tends toward the perpetuation of optimistic technological determinism; often merely to fuel each component of the complex. There is an intransigent justification at work aligned with inflexible instrumental reasons for perpetuating the machinations of war. Finally, I extend the analogy between using drones in

hunting and using drones in war by pointing to the power to legislate as a way to mitigate an overwhelming tendency to presume technological determinism in global conflict.

4. Disburdenment

I would like to enter into Borgmann's philosophy by defining what he calls disburdenment. My grandfather, a dairy deliveryman, owned a tractor. If the tractor sputtered out, he no doubt would open up the engine, fiddle with it, figure out what needed to be fixed, drive into town, get the part, put the part in the tractor and get back to work. He could probably have done the same if his 1972 Oldsmobile had sputtered out. To save drivers today, and no doubt suburban lawn tractor operators too, from the burdens of careful and intimate knowledge of our machines, a little orange light flashes on the dashboard of the machine to alert the operator. There is relief (or is there?) since we are warned by the computer in the engine of impending doom. If we were to pull off to the side of the road and open up the hood, how many of us would be able to decipher the problem? We are disburdened from the generalist's concrete knowledge of the device we are using no doubt, but we are now burdened with ignorance. This exchange, convenience and comforts at the cost of understanding and concrete action, often leaves persons helpless in the face of what have always been everyday struggles. There is a lot gained with the development of devices, but invaluable aspects of human being are forgotten and ignored. The warmth of shelter, the heating system that sustains life, clean drinking water; these are all common

goods which we ought to celebrate. The problem is that the pattern of disburdenment has become all in all, leaving the ethos of society rather thin.

Borgmann's analysis of technology demonstrates that what was at first a logical development to redeem the human struggle with limitations (darkness, cold, health etc.) has become a pattern through which the expectation of convenience has replaced more austere and simple pleasures. Put succinctly, the paradigm of technology has "detached pleasures from their context of exertion" (Borgmann, 2000, 419). How does this happen and what are its moral implications? There are two essential features of this paradigm that determine its impact on human culture; one is commodities and the other is the often hidden machinery that produces the commodities, an obscure techno-magic reserved for experts alone to understand and manipulate. These essential features determine two morally charged human experiences, both involving a kind of detachment. The commodity is detached from the context of its production and that commodity in turn detaches or liberates the person from labor, discomfort, immobility. Technology liberates, as Borgmann puts it, from a "recalcitrant reality" and "attenuates human engagement with material reality" (419). This dual separation or distantiation, consistently pursued, leads to an impatience with the limitations and struggles of human being, and concurrently, leads to a receding appreciation for the exertion, connection and machinery necessary to produce such a commodity. A device will alleviate the user from engagements: engagement with machinery, engagement with the context from which the device is

wrought, and the social engagements which used to be the result of pursuing goals relative to the tasks at hand.

How does this paradigm function in warfare? Intuitively we can sense moral problems with drone warfare, but the pattern affects the very process of deliberation leaders undertake. When the attenuation the device broadens has exceeded the limits which would define the essence of the task – in this case war, inflicting harm, bloodshed, death – then the paradigm becomes the primary arbiter in the economy of deliberation. To proceed, however, it is important to appreciate that Borgmann not only analyzes and critiques, he also constructs and suggests viable alternatives. These alternatives can become the theoretical constructs against which we measure the ethos of the device paradigm.

5. Distinction: thing, device

For Borgmann, a "thing" – "is inseparable from its context, namely its world". A thing necessarily provides more than one commodity – it involves "manifold engagement" – the stove not only heats the house, it becomes central to activity; the cutting of wood, the tending of fire, the telling of stories. To become an efficient way to heat a house, the wood stove employs the cutter, the fire starter, the wood stacker, all working together, and then experiencing the warmth of their labors as community. The machinery of a device, on the other hand, makes no demand on our skill, it comes from somewhere else, it has no context excepting its utilization in the disburdenment of our struggles with darkness, cold, and food. The purpose of the device is

"relatively fixed" – the device can come in different forms, but its end purpose is always consistent and unchangeable. The television is an exemplary device in this regard (1984, 41-42). This device distances us from reality, it mediates our engagement with the way things are, and, in the words of Borgmann, "degrades the natural symmetry between humanity and reality" (2000, 420). The technological economy, once a way to liberate us from hunger, illness, cold and immobility is now a paradigm: the "initial feats of liberation appear to be continuous with the procurement of frivolous comfort" (1984, 39). Disburdenment can be good, but it comes with certain inevitable dis-engagements — most notably the context out of which the device was made, the makers, and the consumer. In sum, devices tend to alleviate the need to engage in social interactions. Things, on the other hand, provide various ways of interaction, they become the focal point for different ways of connecting with both others and nature. A community garden that provides quality food, prepared with others and eaten in celebration, integrates and connects. Unlike a grocery store with an exorbitant amount of plastic-wrapped carrots or lettuce, the garden as thing resists disengagement. Borgmann's conclusions about how to remain connected to alternative visions of human culture in a culture of technology have to do with the development and engagement in what he calls *focal practices*; active communal engagements which both rely on and guarantee human skill and participation. Moral deliberation is one of these skills, as is, perhaps, hunting deer with others. To see the pattern at work, an analogy is employed here to draw out the moral implications of the use of drones in war/conflict.

6. Consider the deer drone

To proceed, consider the more mundane side of the analogy, an outdoorsman's moral economy. The Northwestern Pennsylvania deer hunter looks for the "clean kill" – efficient because instantaneous, wrought of precision, better tasting venison because the deer's frame did not sustain prolonged crisis. The clean kill is not always made. When not clean and the deer darts away harmed, the responsible hunter will quickly chase down the suffering animal in order that it not suffer for what would be considered a cruel duration. Let us say the hunter, due to our free market system, was able to buy a drone made specifically to trace the injured deer's movements via the air. With the drone's camera the whole landscape could be seen in the palm of the hunter's hand, providing easy access to the unpredictable patterns of the wounded deer's movements. If consistently utilized, one of the results of this technology may be the eventual laxity of skill and precision necessary for the "clean kill". Since the deer can be tracked and monitored without limitation, the skill of sharp shooting could decrease. A deer drone may increase *the amount* of venison chili in northwestern Pennsylvania Church potlucks, but something of the essential nature of the hunt as quest and conquest is taken away. The development of ever-new technologies has that inevitable impact, something seems to be gained when a new technology is introduced, but we slowly realize that something is lost. Generally speaking a quantitative gain can result in a qualitative loss. This creeping sense of loss is felt in the ordinary, everyday

life of this culture; a nagging sense that one is always catching up, missing something fresh and learning perpetually new technological processes.

7. The pattern's implications at the point of war

The deer which runs off after being shot at is the object of the hunt, which often involves more than one person, and a determination to alleviate the beast's suffering. Something of the essential nature of hunting is engaged here. But a deer drone, made by who knows who, in a place that is of no consequence to the operator, makes collaborative hunting less engaging because the skills and essence of the hunt are superseded by the device. A tradition of hunting, rooted as it is in the struggle to win food for kith and kin, retains its essential meaning by virtue of that struggle itself. Otherwise, we might define it merely as a technologically enhanced sport thereby reducing what it once was. A fighter pilot attacking bases or people is still in the theatre of war. He/she remains in danger, and, the possibility of an accidental tragedy makes the flight itself a risk, initiating that very real sense that one is a part of an action against an enemy. Is it possible that, given the attenuation between the drone operator and the field of death and destruction, the use of drones cannot be considered fighting and war? Something else is going on, and should we examine it carefully, a conclusion may be that the U.S. carries out a kind of technological tyranny, which strengthens the illusion that global conflict can be managed and certainly held at bay. The use of drones - convenient, efficient, safe for the U.S. military - contains a kind of logic which does not quash conflict but seems

to perpetuate it mimetically. This repetition is fueled both by the abiding connection of the arms industry with the U.S. government and the latter's paradigmatic response to the quagmires of global conflict. This efficient, detached, technologically driven system is also incited to action by an enemy which demonstrates grotesque dimensions of what are opposite extremes of digital/instrumental reason - public beheadings and calculated rape. These extremes might give us pause.

Given the great problems of American democracy and the political tension and intensity that impacts every move a president, senator and congressman might make, the option of the drone in both warfare and other areas of contemporary life may be perceived as a precisely logical conclusion to an unbearable problem. In sum "this dual detachment" in the technological paradigm described above means that we become detached from burdens. In the case of the deer drone, the hunter is disburdened both from the eluding hunted animal, and, should he not get a clean kill, the burden of the arduous search for the wounded animal. The commander who has the drone as an option in wartime is disburdened from collateral damage, military casualties, and weighing the balance of the lives of pilots in air. That disburdenment results in a political victory, a win-win for the commander who appeases both those who are for an aggressive attack and those who are calling for an end to casualties and deaths of 18 to 20 year old American soldiers. So there seems to be a moral intonation to the paradigm in the sense that a tension is resolved, at least the tension of opposing political ideologies; then too, the prospect of a clean and efficient assassination is a convincing inducement to

violent action. The paradigm takes over where the moral deliberation hits what some might call an inevitable abutment. There is, therefore, a somewhat disturbing disburdenment that technology brings.

Chaplain Major Robert C. Gesser of the U.S. army echoes these concerns, suggesting that the use of drones will "atrophy our strategic judgment". Perhaps reductive, though nonetheless alarming given Gesser's role, he suggests that technology seems to replace moral character, and further, that the military may become nothing more than "button pushers" (2014, 78). What about strategic aims and the moral center of that strategy? The use of drones alleviates the commander from the rough and thorny ambit of moral reasoning, including the engagement with conscience. In addition the commander is alleviated from the harsh realities of war. And, more to our point, the ordinary citizen makes no sacrifice, explores no ideological prospect, senses no collusions of tyranny. Just as, perhaps, the skill of the marksman can become compromised due to the use of the deer drone, the skill in moral reasoning and deliberation can become compromised due to the ubiquity of disburdenment the technological pattern insures. It seems as though the prolongation of war is as durable and longstanding as the presumption of technological progress. Disburdenment is beneficial when the technological paradigm can keep us warm in the face of cold or bring nourishment where food is scarce. But its ubiquity in all dimensions of life means that the conscience, the depth and quality of deliberation and the stark horrors of war are kept apart from the discussion, the paradigm itself shapes the moral task. The violent drone as technological pattern presents

democracy with a subtle erosion of the moral sense; a disburdenment from the fact that drone usage results in a violent form that is most akin to assassination. The difference being that the blood and guts, suffering and death of the assassinated are an afterthought at best, or reduced to the easy satisfaction we may get when we press "delete" on our computer device at worst. Assassins kill human targets after all. They do not press buttons in response to images they receive from a video prompt. Each time we utilize devices we are disburdened in some way, but there may be human capacities that are then mitigated at the point of technological usage.

8. The technological paradigm and disburdement: the drone analogy

Deer Drone	War Drone
Disburdenment : • from the difficulty of the chase of the wounded deer • from boredom • from the patient skill of baiting and waiting or the team work of pushing deer, understanding	Disburdenment: • from risking American soldiers lives • from strenuous diplomatic efforts with allies • from American political conflict between anti-war and pro-war constituents • from existential weight of war's

deer behavior	brutality and trauma • from ambiguous and thorny moral quandries
Skills or virtues eclipsed: • understanding deer behavior • sharp-shooting • working with others • patience	Skills or virtues eclipsed: • moral deliberation about use of force • thinking through unintended consequences • creative consideration of alternatives • engaging in ongoing discussion with allies who critique use of drones.

9. Disburdenment, determinism and the American complex

I have proposed that the use of technology retains the good of disburdenment, but also, that this good, when assumed and habitually pursued, compromises the goods of human skills and virtue. Borgmann has helped to clarify how this happens. He also helps us to appreciate the underlying ideology, which prompts what has become a chronic disposition to reality. This he calls optimistic technological determinism. Drone marketing done by Amazon promotes and uses an optimistic-

determinist view of technology.[1] While governmental and military deliberators tend to take an instrumentalist view, Borgmann's analysis critiques both.

In the determinist view, there are two opposite poles, the optimistic and the pessimistic (Borgmann, 2006, 453). The determinist view sees technological development as inevitable. According to this view the future will be determined by the ongoing development and forms of technological design and devices, and these designs and devices will continue to envelop and shape human culture. The optimistic determinist wants to welcome the developments, accentuating their benefits — benefits that cannot be stopped. The pessimistic determinist wants to suggest that technology has taken over and is destroying both human capacities and treasures of tradition. Both types of determinists are wrong. We do have a choice — we have individual choices and we have a collective possibility to have a say in the shape of the technological future. We have chosen the highway system, yet we also are developing environments and cities for bikes and pedestrians. We can develop alternative transportation systems or decide to live by our workplace and abandon cars and the fossil fuels that go with them. We have developed nuclear warheads but we can agree internationally that we will attempt to dismantle these weapons and perhaps transform these machinations and systems into "power plants". And we can, collectively, limit the military use

[1]http://www.amazon.com/b?ie=UTF8&node=8037720011. The "advertisement" is really a lobbying platform through which Amazon saturates the drone conversation with optimistic determinism predicated upon disburdenment; the securing of packages in thirty minutes or less.

of drones — should the national and international communities develop the collective will to do so.

However, according to Borgmann, the instrumentalist view is also in error. This view argues that technology is neither good nor bad; it depends on the users and their values. Clearly, though we can choose wisely our use of technology, it is wrong to assume that its use does not shape our moral imagination and the scope of our actions. Just because we express the moral value of decreasing collateral damage and the use of drones confirms that value, we are neither relieved from other moral deliberations about war, nor guaranteed projected precision in targeting the enemy. The American drone, despite the overall efficiency and accuracy of drones, can do collateral damage when and if the operator fails to perceive correctly the target through the camera lens connected via satellite to his computer screen. Furthermore, the hunter's quest is shaped differently by use of bow, rifle and drone respectively. The actions of hunting, and the actions of war, change their moral shape when the technology utilized to attain the goal is changed. So, certainly, the use of the technology affects the user — we would not call the drone operator a hero in the same sense that we would use that term to describe the feats of a foot soldier. There *is* a formative aspect to technology that shapes us. A contemporary analysis of this shape, an analysis including consumption, detachment and disburdenment, yields a pattern. To acknowledge the device paradigm is to understand that our choices to use various technologies are accompanied by degrees of constraint. Or, to repeat, there are dimensions of experience lost, but there are certainly gains; the loss

points clearly to the constraints new technological developments bring. The choice of commodities conditions the activity, and, by degrees, can form and limit it as well. Optimistic technological determinism and the instrumentalist view of technology have a history in the development of drones. I think it important to draw out the implications of this device pattern by applying it to the formative development of disburdenment in conflict/war and its subsequent application in the complexion of American society.

10. The pattern in the complex

Like email and the SUV Hummer (derived from the Humvee military vehicle) the drone seems to be another corporate option suspended before consumer America adapted from what Dwight D. Eisenhower called the *Military Industrial Complex*. The most recent example awaiting "regulatory support" is Amazon's drone "prime air", a way for you to get your package in thirty minutes or less. The pervasive assumption of technological progress and its ability to disburden us from ostensible exertions is Amazon's guiding orientation. This demonstrates a cultural tendency shared between governmental, economic and technological realms. Market consumerism tends to drive the ethos and a prevailing technological determinism seems to be at work. And its historical development and present impact is sustained by the relation between industries whose primary aim is to produce the weapons for war. One of the sources of income for these arms companies is the tax-based funding from American citizens, which can stabilize this

billion-dollar industry. Economists and philosophers have analyzed what have become normative inter-relationships in the development of technology and warfare revealing a presumption, which conflates technical expertise and the moral progression and justification for military strikes. This conflation has a moral logic and a long history. The early and noble intentions of the technological development involved a desire to become more efficient strategically while saving the lives of pilots (disburdenment). Experimentation with unmanned aircraft began as early as WWI and the Navy used radio-controlled aircraft in attacks in WWII. The strategic revolution, not in attacks, but in detection of enemy missiles happened in 1982 when Israel's electronics and communications firm Tadiran developed UAVs, which successfully found and destroyed Soviet surface to air missiles in Lebanon (Polmar, 2014, 14-15). Today there is no question that drones are used effectively in more benign ways and even for morally sound purposes. In fact drones can begin a process of de-bombing a place like Laos, where there have been 12,000 explosions since 1973 due to extensive American bombing during the Vietnam war. Cluster bombs there are still a threat and Arch Aerial, an aerial imaging company, wants to develop a program using a drone with sensor technology that would be able to detect live bombs so that farmers do not die ploughing their fields (MacGregor, 2014).

Yet at the same time these normative moral efficiencies are taken up by the consumptive market in order that drones become commodious, and one wonders if they are really necessary in everyday life. Educators are using drones in research and consequently the

education policy training and resource company, Paper Clip Communications, recently held a $999 webinar outlining the finer points and policy knots of using drones on campus or dealing with drones on campus. One of the finer points of the seminar involves learning about the timeline for regulation for using drones on campuses, an indication that there is an unquestioned optimistic technological determinism at work (2015). We see here what seems to be an evolving and ostensibly inevitable development – drone usage becoming normative according to the prevailing technological structure of culture, a structure at once economic, political and global.

Hall and Coyne (2014) delineate the initial relation between drone technologies and the U.S. economy by pointing out the strong and permanent relationship between the U.S. government and the private defense industry. By tracing the historical development of the now permanent symbiosis of the weapons industry and the U.S. government, these economists cite the millions spent by Lockheed Martin, Northrop, Boeing, General Dynamics and General Atomics on lobbyists after 9/11 (454). Their conclusion is that these "entanglements" deep historical roots make them difficult to dismantle. Yet, they warn of how it is almost inevitable that the manufacturers impact moral decisions about the use of drones and the reliance on "strikes" (457).

Kaag and Kaufman (2001) provide critical insight into the relationship between a confident reliance on the technical precision of military strikes and a morally self-satisfied tactical pride. This combination means that the quantity of collateral damage is measured

with the goal of precise strikes. By analyzing the governmental/decision-making side of the economic/military tactical symbiosis, their findings demonstrate that moral complexity and ambiguity in war cannot be assuaged, tempered or clarified by the use of "smart" weapons. They conclude that technical precision cannot replace human judgment — human judgment and moral knots always precede the programmatic precision of technology (604). But this complex guesswork in ethics gets smothered or even distracted by the consistent lure of technical precision, to say nothing of the convenience, of drones. Such an allure has a powerful impact on culture, a culture beholden to conveniences and the superstructure, which makes them available. Economists and philosophers can strengthen their arguments simply by reflecting on disburdenment. And for leaders to acknowledge disburdenment's moral layers in the device paradigm, may be a step in the direction of critical realism or cultural self-understanding. Of course the private defense industry will pursue technology that seems to take the messiness out of war, since that is the prevailing thrust of modern technology. Robotic warfare is the latest version of this, but its absurdity will never occur to corporations; my sense is that the ideology of technological determinism will never allow that kind of question into this system's frame of reference. But every day people do sense overwhelming forces at work, which affect every day existence.

Often we find an ordinary citizen intoning the plural pronoun "they" in an obscure reference to some awareness of these dealings between corporations, defense and government. "They will figure it out",

"They are coming up with a way to control the weather!" What do we mean in everyday life when we employ the term "they"? Citing Heidegger, Gabriel Marcel considered this Western tendency of modernity, a tendency of degraded thinking; he wrote: "Most of the time our opinions are nothing but a reflection of the 'one' ('they') in an 'I' who doesn't know that he is being a reflector. Thus this 'one' or 'they' is by definition beyond our grasp and impossible to pin down" (Marcel, 86).[2] In this way our thought is lifeless and surface. Our discussions, say, of information technology, or iPhones or drones are merely reflections of a prevailing "they". Or, these superficial conversations are a way to talk about our culture, a culture riven with technological and consumptive banality. By naming the device paradigm we can begin a constructive discussion about this system. Borgmann's analysis gives us language through which we can begin to name the way geo-politics, consumption and technology assert themselves today in a hurried conflagration of disburdenment, efficiency and precision. The device paradigm can give us a realistic picture of how "they" work. And our analysis and understanding of this prevailing ethos can begin to refine and name aspects of this complex giving us the power to resist our being determined by these forces.

[2] Like his student Paul Ricoeur, Marcel's thought often takes a linguistic turn. Here the French *on* is an indeterminate for "people". This usage is rendered in the text by Marcel as similar to the English indefinite "they". Quite to our point, western societies have this tendency to de-personalize, ironically, the ordinary citizen who consumes whatever technological/political promises "they" dole out.

11. Beneath the technological pattern

The Pennsylvania Game Commission understands its role to be the management of wildlife and the preservation of the tradition of hunting game in the state of Pennsylvania. Much of the role of this governmental institution is to regulate and monitor hunting practices. In the regulation code we find the following general statement regarding the use of devices in hunting. "The use of electronic communication devices to alert hunters to live game is not only a violation of the Game and Wildlife code, but violates the concept of fair chase" (Pennsylvania Game Commission). This regulation recognizes that to utilize the particular technology of cell phones mitigates or even ruins the central meaning of a "hunt", i.e., that it should be fair. The game commission recognizes that hunting has an essential meaning, which is compromised by the culture of technology. There is no question that technology always shifts the emphasis in warfare. But drones may be that technology that so strongly condition reflection about the use of violence and war that we fail to consider, reflect and tremble at the moral significance of actions taken by democratic governments, our elected leaders. Why is there not a more intentional mechanism of deliberation in place in a democracy like the United States? We ought not let the culture of technology, the very surface of our culture, to smother the deeper culture of moral contemplation and deliberation, a quality of American culture that has been superseded by the cultural enchantment of, and the guiding orientation toward, optimistic technological determinism. This supersession means that the governing ideas, which

ground the ethos of the culture, are constrained by the paradigm analyzed and described by Albert Borgmann.

The historical tendency of cultural supersession can be accompanied by a renewal of interest in the very ground of the culture, bringing it breadth and depth. We see a rather banal example in the Pennsylvania Game Commission's regulatory insistence outlawing the use of devices in hunting. Such a response is strengthened when there is an established culture at work firming up social capital in particular places. In the global sphere, neither the so called enemy, nor the ideological frame of the technological paradigm, have a particular place or roots which would enable social capital, and the conversation that accompanies it, to take place. But just as the Pennsylvania State Game Commission can develop a collective regulation based upon its perceived moral obligation to preserve the essence of hunting is there not an obligation on the part of the United States government to pursue the question of drone strikes in relation to international law and the meaning of war and the use of force? And is there not some mechanism called the FAA, which might curtail and deflate the technological determinism that clouds both consumer and moral culture? Or do the determinists of Amazon, Northrop Grumman or even the religious fundamentalists who are the recipients of these precise determinations of violence, know something that most of us educated, democratically-minded Americans in this culture of technology do not? A pattern or paradigm of culture takes hold in all dimensions of society. This is why the particular analogy was employed. Philosophy has long involved such analogies, and it has long involved dialogue in order to demonstrate and dramatize

the fundamental problem at hand. I close this essay, therefore, with Marty and Al, two Northwestern Pennsylvania deer hunters who are out there, living the best they can in a culture of consumption. Marty and Al speak of "they" a lot in order to forge their own orientation in culture, but Marty and Al also have a wisdom about skills and virtues which transcends what some might consider a provincial existence.

Marty: If they would develop a drone silencer I think I might get me one.
Al: Why? A silencer may not scare the deer but it would still be cheatin'.
Marty: Sam George got him a drone last year for use on his farm; he spotted a bear, remember?
Al: That bear was on the move cause of the sound of that drone; big deal, bears been wandering around these parts for ages, they gonna take credit for calculatin' the bear population now?
Marty: Just last week Sam George used his drone and he scored an 8 point Buck!
Al: You kidding me, he ain't no hunter, that rascal affordin' some drone.
Marty: Yeah, but his downstairs bar will look good with that eight-point hanging there.
Al: Problem is, it don't mean the same thing. It's like giving every kid a blue ribbon. He's not a hunter. He's a spoiled kid with a toy; a spoiled kid who also happened to break the law; now what do you suppose we ought to do with Sam George? Huh, Marty?

References

Borgmann, A. (1984). *Technology and the character of contemporary life*: *a philosophical inquiry***.** Chicago: University of Chicago Press.

(1992). *Crossing the postmodern divide***.** Chicago: University of Chicago Press.

(1999). *Holding onto reality: the nature of information at the turn of the millennium***.** Chicago: University of Chicago Press.

(2000). The moral complexion of consumption. *Journal of Consumer Research,* 26, 418-422.

(2003). *Power failure: christianity in the culture of technology*. Grand Rapids, MI: Brazos Press.

(2006). Technology as a cultural force: for alena and griffin. *Canadian Journal of Sociology,* 31, 351-360.

(2010). "…or is the question of being at once the most basic and the most concrete?" on the ambitions and responsibilities of contemporary american philosophy. *AI & Society*, 25, 19-26.

Gresser, R. (2014). Macro-ethics and tactical decision making. *Military Review*, September-October

2014, 72-80.

Hall, A. R & Coyne, C. J. (2014). The political economy of drones. *Defense and Peace Economics,* 25 (5), 445-460.

Kaag, J. & Kaufman, W. (2009). Military frameworks: technological know-how and the legitimization of warfare. *Cambridge Review of International Affairs,* 22 (4), 585-606.

MacGregor, A. (2015). Laser imaging drone to hunt out unexploded bombs in war torn nations. *The Stack*. Retrieved from http://thestack.com.

Marcel, G. (1973). *Tragic wisdom and beyond.* Evanston: Northwestern University Press.

Polmar, N. (2013). The pioneering pioneer. *Naval History* 27 (5), 14-15.

Pennsylvania Game Commission. (2015). Hunting regulations. Retrieved from http://www.nxtbook.com/nxtbooks/pgc/pa_huntingdigest1415/#/17.

Paper Clip Communications. (2015). Drones on campus: 10 challenges to consider - March 10, 2015 webinar cd. Retrieved from https://www.paper-clip.com/Main/Product-Catalog/2381.aspx, 63-75.

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LIVING BY ALGORITHM: SMART SURVEILLANCE AND THE SOCIETY OF CONTROL

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Foucault's disciplinary society and his notion of panopticism are often invoked in discussions regarding electronic surveillance. Against this use of Foucault, I argue that contemporary trends in surveillance technology abstract human bodies from their territorial settings, separating them into a series of discrete flows through what Deleuze will term, the *surveillant assemblage.* The surveillant assemblage and its product, the socially sorted body, aim less at molding, punishing and controlling the body and more at triggering events of in- and ex-clusion from life opportunities. The meaning of the body as monitored by latest generation vision technologies formed from machine only surveillance has been transformed. Such a body is no longer disciplinary in the Foucauldian sense. It is a virtual/flesh interface broken into discrete data flows whose comparison and breakage generate bodies as both legible and eligible (or illegible and ineligible).

Keywords: Deleuze, Foucault, panopticon, surveillance, control society

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1. Introduction

Contemporary discussions on surveillance frequently invoke Foucault's disciplinary society based on his analyses of Bentham's panoptic architecture in, *Surveiller et punir*.[1] Whether through street-mounted CCTV cameras or cookies that track search histories, contemporary electronic surveillance would logically seem to intensify the possibilities of the disciplinary society described by Foucault in the 1970s. In fact, many technology commentators take for granted that his conceptual tools provide a sound basis for analyzing contemporary surveillance systems.[2]

However, other analysts hold that coding biases inherent to contemporary surveillance technologies have long called for a re-evaluation of the application of Foucault's logic of discipline in electronic surveillance contexts. They argue that texts like, *Surveiller et punir*, were important because they focused suspicions on the effect of institutional structures that homogenize social behavior through the feedback set up between the corrective gaze and behavior within the architecture of disciplinary systems.[3] On the other hand, as scholars like Kevin Haggerty (2006, 27) argue digital surveillance technologies do not simply multiply the

[1] Foucault (2004).

[2] See for instance, Bousquet (1998); Butchart (1996); Cohen and Scull (1983); Cohen (1985); Gordon (1987 and 1990, 438-451); Horne and Maley (2014); Koskela (2003); Mann, Nolan and Wellman (2003); Marx (1988); Mathiesen (1980); Poster (1990).

[3] See Baumann (1992); Bogard (1996); Galloway (2004); Haggerty And Ericson (2000) especially 606-607; Haggerty (2006); Lianos (2003); Lyon (1993); Lyon (2003); Mathiesen (1997); Newman (2009) 105; Yar (2003).

optics in the panopticon. Driven by software, all electronic surveillance technologies *are programmed.* Scholars like Haggerty point to this fact and claim that changes in surveillance technology have arrived at the point where the panoptic model obstructs progress in understanding of the changes currently taking place; as he states: "…surveillance processes and practices are progressively undermining the relevance of the panoptic model for understanding contemporary surveillance. Foucault continues to reign supreme in surveillance studies and it is perhaps time to cut off the head of the king".[4]

In this paper, I argue that contemporary, post-2000, software-driven surveillance systems are not panoptic in character but distributive, sorting individual bodies into flows through events of in- and exclusion. I also agree with the turn toward Deleuze exhibited by many surveillance commentators critical of Foucault. The analysis Deleuze gives of the shift from disciplinary societies to societies of control in his 1992 essay, *Post-scriptum sur les sociétés de contrôle*, explains how the interconnectedness of rhizomatic surveillance environments alter the traditional closed panoptic spaces of school, factory, asylum and prison described by Foucault. However, Deleuze and those who champion his paradigm as a replacement to panopticism for theories of surveillance do not fully weigh how surprisingly prone to error these systems are. Surveillant assemblages may appear to extend disciplinary spaces and even to depend on disciplined bodies in order to function but neither the panoptic paradigm attributed to Foucault or the control paradigm

[4] Haggerty (2006) 27.

attributed to Deleuze address the biopolitical implications of smart surveillance technologies doing the right operations to the wrong things.[5]

2. Foucault and discipline

Panopticism describes a kind of architectural design put forward by Jeremy Bentham in the late 1700s that operates as a machinery of discipline for students, workers, prisoners and the insane. Diffused throughout the social fabric, the panoptic design aims, as Foucault states, "to induce in the detained a state of conscious and permanent visibility that assures the automatic functioning of power".[6]

Simply by dwelling within panoptic space, inmates internalize the rhythm of movements framed by the prison timetable. In a similar way, schoolchildren in the instructor-monitored classroom rehearse the succession of gestures that pattern competent writing to the point where they come to reproduce them without conscious effort on their part. As a general principle, panopticism distributes power automatically through the

[5] It is important to note here that Foucault himself expanded beyond his analyses of Bentham's panoptic architecture. In his 1978 lectures, *Sécurité Territoire Population* (Foucault, 2004) Foucault described the effect of security mechanisms like vaccination campaigns on disciplinary regimes. In the history he tells here Foucault is clear that the security apparatus does not replace disciplinary power. Rather, in the same way that educational apps depend on the classroom, security mechanisms depend on and modify disciplinary power by circumscribing and overlapping with it. See Deleuze's own acknowledgement of this in Deleuze (2003b) 229-240 and note 45 below.

[6] Foucault (1975) 234.

arrangement of the space and through explicitly articulated behavioral norms in order to change the behavior of those within the space.[7] The panopticon then functions as a device for conducting conduct. Because the mechanism produces homogenous effects for those within the space, the motive of those responsible for its deployment in a particular context does not matter.[8] Power is exercised with a light touch within such structures, since, in the end, the detained will subject themselves to the directives embedded in the disciplinary structure.[9]

However, current surveillance techniques, though a far cry from an Orwellian Big Brother, set modes of contemporary surveillance apart. Elementary students practicing cursive writing with pen and paper are only monitored by the teacher in the room. Students engaging in the same writing skills using an app downloaded to a tablet may not even need monitoring by a watchful adult, since the app allows proctors to evaluate student engagement without being physically present either during or after the lesson.

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[7] The machinery of panopticism is such that even in the complete absence of the sovereign or her representatives, the design of the mechanism itself generates dissymmetry, disequilibrium and difference.

[8] "Whatever individual, taken almost at random, can make the machine function: in the absence of the director, his family, his entourage, his friends, his visitors, even his servants". Foucault (1975) 236.

[9] Note that the very design of the architecture, regardless of the actions of the detained within the cells, has *de-massifying* effects and, therefore, individualizing consequences for any inmate whether student, worker, convict or mad. See Foucault (1975) 234.

Yet the function of these apps is not only to manage student behavior – or at least not their behavior in the classrooms. Their interactions with the app generate data useful to both app designers and marketers. When the traditional student has completed the exercise the paper goes in the trash. What students enter in educational apps have their inputs stored in databases, which form part of their growing, mostly unregulated, digital histories controlled for the most part by private vendors.[10] As they advance through the educational system, these same students may one day respond to polls posted by professors in large university lecture courses on apps downloaded to cell phones. Doing so will add yet another layer of data points for marketers to mine, indicating preferences such as hobbies, career aspirations, diet, voting inclinations, sexual preferences, transportation and housing needs along with assessing their potential tendencies, given a lifetime of inputs, to develop vendor-targeted lifestyle choices.[11]

Surveillance techniques such as big data collection and predictive algorithmic analysis alter the

[10] See Lord (2015).

[11] As Glogster EDU's privacy policy states, this educational app vendor collects a vast amount of information on its young users: "name, address, email ... date of birth, gender, country, interests, hobbies, lifestyle choices, groups with whom they are affiliated (schools, companies), videos and/or pictures, private messages, bulletins or personal statements". The policy states that it regularly shares information with vendors developing, "consumer products, telecom, financial, military, market research, entertainment, and educational services companies", Lord (2015).

logic of the panopticon[12] by opening it up to the marketplace and the demands of today's data brokers. However today's surveillance data far exceeds the kind of information retrievable from classrooms. It routinely includes video, biometric, geo-demographic and genetic inputs routinely stored by scores of agencies, private and public, in order to track real and virtual behaviors.[13]

Though digital surveillance systems claim to have outsourced Foucault and Bentham's tower guards, studies have shown that these systems exhibit both bias

[12] "It is, however, crucial to take that nuance into account because in current conditions *the majority of what one can call control does not focus on practices of constraint, nor on oppressing behaviour and expression, but on the organization and the contextualization of what is often intended or even desired by a sovereign subject*…This inversion is not neutral; it calls for the construction of a new framework of analytical premises. The most useful characteristic of such a framework should be to acknowledge that *the criterion for deciding what belongs or not to the sphere of control is neither the consciousness of the subject or the group involved, nor the will of those who produce the 'controlling' effect in question, but mainly the conditions that shape the interaction between those two parties*". Lianos (2003) 416.

[13] It is important to note that contemporary surveillance technologies are not merely technological innovations that have been discovered to carry along with them social impacts. These are technologies actively developed because they are seen as a viable response to particular political-economic pressures. Governments adopt automated surveillance systems because they wish to limit or eliminate labor costs where possible. At the same time the same governments must appear actively engaged in reducing crime and creating safe zones for consumption. The political need to appear engaged in reducing crime acts as a major motive for deploying these technologies. On the other hand, the narrowing profit margins for companies drive companies to develop these technologies in an effort to successfully target niche consumers.

and high tendencies toward error.[14] These characteristics of contemporary surveillance systems make it doubtful whether we are ready to turn over the keys of the tower just yet.

3. Contemporary surveillance as social sorting

Surveillance has conditioned action within urban environments for centuries. In medieval cities walls regulated the flow of townspeople. On high-tech factory lines optical technology autonomously inspects circuit boards.[15]

Contemporary surveillance techniques do not simply direct behavior, but they sort behavior into categories in order to predict future actions. First, digital surveillance relies on databases that use tags to categorize information and make vast data histories culled from electronic records instantly accessible. These data histories act as an electronic clone – or *data double* – of the flesh and blood individual for purposes of electronic surveillance.[16] Distributed to databases across a wide array of networks, these data doubles serve as a nexus for incessant flows of information. Data doubles routinely include everything from pharmacy printouts and notes taken by doctors during routine medical exams to tax reports, banking records, search engine histories, credit card statements and employer files. Searchable databases, and their increasing size and inter-connectedness across different institutions, are key to developing profiles on

[14] See section 3 below.
[15] Or, *automated optical imaging*. See below, section 5.
[16] See Lyon (2003) 20-22 and 26-28; also, Los (2006) 77-79.

individuals in industries connected to policing, insurance and marketing.

Despite their global reach databases are not neutral warehouses of information. Database tags categorize the data and, in the process, encode the attitudes and values of stakeholders in law-enforcement, intelligence services, insurance and the financial industries.[17] Information accessed through database searches generates profiles on the basis of these tags and the profiles are key to determining eligibility for reception of benefits, denial of claims, damage awards, permission to travel across borders, employment offers and more. Profilers sift the mountain of data linked to a person's data double for relevance to the litigant, insurance claimant or potential employee under scrutiny.[18]

Coupled with databases, predictive algorithmics drive the assessments that compute future behaviors of bodies. For instance, police rely on predictive softwares to determine the probability of changes in future criminal activity in specific locations to make decisions about whether or not to increase patrols in those neighborhoods. Crunching terabytes of data algorithms project likely storm trajectories for tropical storms forming in the Caribbean. Exploiting minute movements in share price and long-term patterns in markets, computer-powered algorithms endlessly execute purchase and sell orders at the rate of a million per second.[19] From policing to tracking endangered

[17] Bowker and Star (1999) even argue that software is better understood as, "frozen organizational and policy discourse", (135).
[18] Lyon (2003) 15.
[19] See Baumann (2013).

species, contemporary surveillance systems are designed with the goal of predicting individual and group behaviors and forecasting social trends.[20] On the basis of the data doubles associated with individuals,[21] an algorithm generates an assessment of probabilities of that person's likely future behaviors.

Successful behavior prediction depends on effective algorithms driving the software at the basis of the system. Broadly understood, an algorithm is just a set of rules that, when coded, solves a particular problem. The problem for the marketer is to induce those perusing Facebook profiles to click on their ad. In the case of a university recruiting students, the problem is to route the student toward completing a school's application. The algorithm frames a series of prompts in the form of emails, ad windows, and even friendly phone calls from the admissions office to continually re-

[20] As Lyon (2003) describes: "The coding is crucial because the codes are supposed to contain the means of prediction…The codes form sets of protocols that help to alter the everyday experience of surveillance", (24).

[21] Most surveillance strategies in wealthier societies depend increasingly upon high speed computing. Searchable databases coupled with remote networking capabilities have allowed surveillance to extend from monitoring fixed subjects from fixed locations to mobile positioning where both surveillants and surveilled can be simultaneously in motion. Thus, two elements have become key to the effectiveness of contemporary surveillance: information processing and reliable communication networks. It is important to note that this technology does not just 'happen'. Consider for a moment the shift to the importance of CCTV in Europe, North America and Asia in dense urban environments and the link up of these to a growing range of locational devices that not only situate data subjects in a fixed space but also while on the move. See Lyon (2003) 16.

route the student's attention toward completing the online application form. Thus, if database tags sort things and bodies according to the electronic histories attributed to their data doubles then the algorithm attempts to route them into pre-determined channels framed by the 'if-then' instructions at the heart of the software.

As a mathematical set of instructions, algorithms would seem to lie outside the realm of bias, much less politics.[22] However, these instructions are generated by individuals within institutions with existing value systems. Advertisers, insurers and the police hold established values regarding the worth of subjects who are young-old, rich-poor, gay-straight, healthy-sick, black-white, male-female. Institutional values determine the variables of the algorithms and serve as the

[22] Emily Gilbert (2010) explains: "[for face recognition surveillance] there is a great variability in rates of recognition on the basis of age, gender, and race. Faces that deviate from the standard (such as the faces of visible minorities) are more likely to trigger a mechanized and/or human response. Thus a standard is inbuilt to which normalcy gets affixed, while those whose facial characteristics differ are implicitly construed as abnormal and targeted as potential 'risky subjects'. These processes are especially hard to detect when the underlying decision-making (the decision threshold policy) is obscured, and the comprehension of its mechanisms is in the hands of only a small number of experts. Moreover, the experts themselves perpetuate biases in the management of the data as a 'security continuum' is drawn across multiple and disparate realms – such as crime, unemployment and immigration – by security professionals. Inbuilt biases may by themselves be minimal, but they can become multiplied and magnified as they become tied to other practices and spread across multiple networks". (234) See also G. Agamben's (2004) argument in his letter to *Le Monde*, *Non au tatouage biopolitique*.

framework for surveillance software that then assesses expected social behaviors by the targeted groups.[23]

As people circulate the sorting process reveals its social biases. Police scan license plates with car-mounted readers as motorists on the freeway pass from home to work. They also conduct the same scans as they patrol high crime neighborhoods where the presence of law enforcement is already more concentrated than in more affluent neighborhoods. Consequently, in these neighborhoods more motorists are stopped and more parked cars are tagged for violations and alerts.[24] On the basis of data histories, scanned passports at immigration kiosks grant easy entry for the majority of visitors while routing alerts to immigration officers who detain or even deny entry to those who have done something as simple as having visited in the recent past a country flagged by the system or accidentally sharing the same name with a serial killer. Some receive credentials, work or insurance benefits while others are denied the same opportunities on the basis of information an employer or social worker inferred from a posting on their Facebook profile.[25]

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[23] Bowker and Star (1999) explain that the biases expressed by particular systems are not always intentional: "Some are the [result of the] tyrannies of inertia – red tape – rather than explicit public policies. Others are the quiet victories of infrastructure builders inscribing their politics into the systems. Still others are almost accidental – systems that become so complex that no one person and no one organization can predict or administer good policy" (50).

[24] See ACLU (2013).

[25] As Norris and Armstrong (1999) show being young, male and black in Britain ensures a higher rate of scrutiny by Britain's 4 to 6 million street-mounted CCTV cameras.

This sort-function is intrinsic to the softwares that drive electronic surveillance networks and its effects go far beyond merely producing data and storing it. As Bogard (2006, 108) states: "Surveillance is not just about collecting information, but decoding and recoding it, sorting it, altering it, circulating it, re-playing it".

Even as designers, vendors and administrators of contemporary surveillance systems claim they monitor environments neutrally, both long term use and competitive testing of these systems has shown the sorting engines at the base of the software can be far from neutral in assessing the actions of bodies.[26] David Introna and Lucas Wood (2004) have explained how the facial recognition systems that form the basis of smart CCTV systems depend on three principal elements: 1) the still or video camera that captures the image; 2) the recognition software that identifies or verifies the probe image on the basis of the type of facial recognition algorithm employed and the database;[27] 3) a human operator to initiate appropriate actions in the case of an alarm or a match.

Bias creeps in through a number of vectors. The facial recognition algorithms reduce facial image data in order to make comparisons with the database. This data

[26] Introna and Wood (2004).

[27] Introna and Wood (2004) describe two main categories of facial recognition algorithm – image template algorithms and geometry feature-based algorithms. Both operate according to the principle of reduction: "In order to be efficient in processing and storage the actual face image gets reduced to a numerical representation (as small as 84 bytes or 84 characters in the case of FaceIt)". (186) Because of the way these algorithms reduce facial features in order to form a biometric facial signature of the person in question bias is unavoidable.

reduction causes systems to be biased toward certain types of faces which trigger alerts more frequently when the probe images are compared with those stored in the system's database. Further, the network depends on databases in part generated by geo-demographic inputs that rely on real world urban spaces like neighborhoods and the historical perceptions that law enforcement organizations, marketers and/or insurance companies have of them. Finally, the categories framing the databases depend on tags whose coding is embedded with both designer and client values.

Because surveillance technologies are programmed biases creep in through the terms selected to define database tags and in the way an algorithm's matrix of variables are described. However, since most of this programming forms part of the system's proprietary technology it disappears into a black box that can frustrate detection of these biases in advance. It can prove impossible for even experts to identify what component of a surveillance network – the database, the facial recognition algorithm or both - is the cause of the cascades of false positives being triggered within a given surveillance environment. The presumed function of social sorting is to sift data flows and determine in- and exclusion on the basis of determinations of risk given the individual's data history. Far from constituting a collection of objective, though digitized, facts, a person's data history involves a series of ongoing and complicated translations. Consider for instance an event as simple as taking a person's fingerprint through the use of a biometric scanning device. As Van der Ploeg (1999, 301) states: "The issue of bodily integrity as it relates to biometric technology

should not stay focused on the question whether biometric sensors violate the body's integrity by being physically invasive or not. The focus should instead be on the *inscription* of the individual's body with identify/-fiers that is achieved by the combination of fingerprint-taking, storage in a central database, *and* the coupling with biometric sensing equipment and automated searches".

Unlike panoptic surveillance, the actions of the subject within electronic surveillance environments are often irrelevant. For instance, the algorithmic sort-function embedded in Smart CCTV systems are designed to relay to human operators for further scrutiny individuals whose biometrics have already been flagged in the system's databases, as in the case of an individual already known and wanted by law enforcement. However in practice they regularly raise alerts on those with specific sets of physical characteristics, like being dark-skinned and older. Over the history of the system alerts raised on these groups generally prove a succession of false negatives generated by both the system's limitations and factors like poor lighting or crowd conditions that greatly reduce system efficiencies.

As vendor testing of these systems has shown, when deployed in real world environments the majority of the alerts triggered by them have nothing to do with behavior at all.[28] For instance, with facial recognition softwares factors like age, ethnicity and gender of subjects along with the lighting conditions when the images are taken have been shown to greatly affect the comparison of the two sets of images involved – those stored in the database and the probe images taken in the

[28] See Introna and Wood (2004).

surveillance context for comparison with them.[29] This occurs simply because the facial characteristics of the one show greater variation than the other from the standard facial template that comes bundled with the device. Even detecting individuals already flagged by the system by law enforcement can be notoriously unreliable unless the number of persons actually under surveillance is *greatly* limited *and* environmental conditions are optimum.[30] An older gentleman of Arab American descent has a much greater likelihood of triggering calls for more scrutiny by the system than a 20-something Caucasian woman *already* flagged by the system's software as a person of interest.[31] As Introna and Wood (2004, 188) have shown the error rate for the software that comes standard with CCTV cameras increases considerably in the kinds of conditions one might find in an urban setting or a busy airport.

Contemporary surveillance does not aim to repress. It sorts. For instance it sorts consumers by monitoring consumption patterns, even incentivizing individuals to monitor their own data doubles by providing feedback to augment various social perks such as preferential credit ratings, computer services, or rapid movement through customs. Efforts to evade the gaze of different systems involve an attendant trade off in social rights and benefits and exclusion from life opportunities.[32] Unlike panoptic logics, contemporary surveillance technologies do not aim at conducting

[29] See Introna and Wood (2004).
[30] Introna and Wood (2004) 184-194. Also Gilbert (2010).
[31] Introna and Wood (2004) 184-194.
[32] In this way Haggerty and Ericson (2000, 619-620) speak meaningfully of the disappearance of disappearance.

conduct or serving as a watchful gaze that evaluates and corrects. Smart surveillance technologies sort by interrupting and re-directing, grouping individuals into flows made more or less predictable on the basis of the digital histories associated with the bodies in the environment under surveillance. Digital surveillance often has very little to do with directly observed, embodied behaviors *at all*.[33] Digital surveillance routes bodies from one environment to the next on the basis of the digital histories tagged to data doubles that represent those bodies within the networks. These events of routing constantly redirect the movements of individuals but they also grant and deny benefits in the process of doing so. The systems are notoriously prone to error often routinely interrupting the movements of individuals for no reason other than the system's own limitations.

4. Distributed bodies – Deleuze

In his 1992 essay, *Post-scriptum sur les sociétés de contrôle*,[34] Deleuze argues that for well over a century processes of social ordering have been undergoing a decisive shift, away from architectures of discipline toward a surveillance-based society.[35]

[33] See Haggerty and Ericson (2000).

[34] *Post-scriptum sur les sociétés de contrôle* was originally published in *Futur antérieur*, (1) Spring 1990. It was later reprinted in the collection, *Pourparlers* (2003) 240-244.

[35] For Deleuze, a panoptic space like the prison is also a kind of surveillant assemblage but one that attempts to close itself off to connections with outside spaces. As Bogard (2006) describes it: "A machinic assemblage joins or separates diverse material flows. For example, the prison, as Foucault sees it, is a territorial machine that

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Deleuze claims that spaces of disciplinary enclosure have long been in a state of crisis and that a transformation of power has already largely occurred from closed forms of disciplinary organization to open, directed flows monitored by, what he calls, *surveillant assemblages*:

> Individuals have become 'dividuals', and masses [have become] - samples, data, markets, or '*banks*'.[36]

In societies of control, both similarities and differences between people are reduced to variations of code. Within the context of contemporary surveillance technology, knowing the body requires its breakdown into a series of discrete data flows that act as a supplement to the flow of bodies through the surveillance context. For this to happen the flesh and blood body must have already been made, as Deleuze terms it, *dividual.*[37] This *dividuality* is at the basis of the

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works by enclosing and partitioning space, segregating bodies, or again, by connecting them together by larger, functional ensembles, coordinating their corrective flows, and so on", (104).

[36] "Dans les sociétés de contrôle, au contraire, l'essentiel n'est plus une signature ni un nombre, mais un chiffre : le chiffre est un mot de passe, tandis que les sociétés disciplinaires sont réglées par des mots d'ordre (aussi bien du point de vue de l'intégration que de la résistance). Le langage numérique du contrôle est fait de chiffres, qui marquent l'accès à l'information, ou le rejet. On ne se trouve plus devant le couple masse-individu. Les individus sont devenus des «dividuels», et les masses, des échantillons, des données, des marchés ou des «banques»", Deleuze (2003a) 241. See also Deleuze (2003b).

[37] Societies of control function through mechanisms that report the positioning of any element within an open environment at any given

shift away from panoptic surveillance to digital surveillance and it happens along two registers: First, biometric interfaces – from facial recognition cameras to iris scanners – are meshed with parts of bodies, transforming them into packets of code. Second, the options open to encoded bodies within networks are laid out *in advance* by the parameters of the algorithms driving these systems.[38]

Flows of flesh and blood bodies through the surveillance context are digitally 'striated',[39] fixed temporally and spatially by the different devices and processes whose co-functioning define the assemblage.[40] For Deleuze, the effectiveness of

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instant. For Deleuze, coding is crucial to this shift because codes are at the basis of predictive systems. These systems anticipate events (like crimes), conditions (like ebola), and behaviors (like smart phone consumption) that have yet to occur. Further, the old world of surveillance dependent on the layout of the city has now been transformed by what Virilio calls *audio-visual protocols* (Virilio, 1997, 383). For Virilio the key to contemporary urban surveillance is *pro*spection, or vision in advance (Virilio. 1989). The function of this kind of surveillance is not to discipline bodies but to sort them, subjecting them to regular events of interruption and re-direction as they pass through the surveillance context.

[38] As Bogard (2006) states: "In its more advanced forms, it [the surveillant assemblage] is like a 'pre-recording' machine that can capture performances 'in advance' (in the same sense clones are like pre-recorded life forms, or profiles are pre-recorded statuses or identities", (107).

[39] *Striation* refers to the process of introducing breaks and divisions into otherwise free flowing phenomenon. See Deleuze and Guattari (1987) 385.

[40] As an *assemblage,* surveillance environments constitute a collection of objects – cameras, fingerprint scanners, databases, tip hotlines, facial recognition algorithms etc – whose unity comes from how these different objects function together to shape a field

contemporary surveillance relies on mediating behaviors of real life bodies through networked interfaces that connect the body to webs of information.[41] At the level of the network the result is the digital data double whose data history includes biometric events. Events of biometric striation can be of the discontinuous kind as, for instance, with a fingerprint scan at an airport immigration kiosk. Or, they can be of an 'always-on' variety, like the location tracking many smart phone apps perform automatically.[42]

Given the practical and ontological implications of Deleuze's critique of Foucault in, *Post-scriptum sur les sociétés de contrôle*, it is evident that the processes embedded in predictive software are not only technical in character but also have clear biopolitical implications for him as well. Critics like Kevin Haggerty and Richard Ericson see advantages to Deleuze's paradigm with its emphasis on rhizomatic linkages, cyborgic

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of unified effects. For Deleuze and Guattari any discrete assemblage is itself composed of multiple assemblages, which, in turn, are multiple. See Patton (1994) 158.

[41] These processes operate from scattered centers of calculation, which, for Haggerty and Ericson (2000) include sites like forensic laboratories, statistical institutions, police stations, financial institutions, and corporate and military headquarters; as they describe them: "In these sites the information derived from flows of the surveillant assemblage are reassembled and scrutinized in the hope of developing strategies of governance, commerce and control", (613).

[42] For the surveillance assemblage, the human body is increasingly then also a cyborg, or a flesh-technology-information amalgam. See Haraway (1991) chapter 18. As a collection of processing devices, the surveillant assemblage renders digitally 'visible' a host of flows from auditory, olfactory, tactile, chemical, visual, ultraviolet and informational inputs.

human/machine interfaces, and ability to explain features shared by open networks.[43] As Haggerty states:

> …the surveillant assemblage relies on machines to make and record discrete observations. As such, it can be contrasted with the early forms of disciplinary panopticism analyzed by Foucault, which were largely accomplished by practitioners of the emergent social sciences in the eighteenth and nineteenth centuries. On a machine/human continuum, surveillance at that time leaned more toward human observation. Today, surveillance is more in keeping with the technological future hinted at by Orwell, but augmented by technologies he could not have even had nightmares about.[44]

Unlike the traditional panoptic environments described by Bentham and Foucault whose inmates pattern behavioral norms until they have internalized the practices, the operations of sorting, sifting and distributing at the heart of digital surveillance routinely adjust the patterns of lived life according to constantly changing criteria that shift as Deleuzean 'dividuals' pass through different institutional environments.[45]

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[43] See Haggerty and Ericson (2000) and Haggerty (2006).

[44] Haggerty and Ericson (2000) 612. See also Bogard (2006); Galloway (2004) 13; Lyon (2003) 22-24 and (2006) 86-89; and note 3 above.

[45] As Deleuze (2003b) states in his 1990 interview with T. Negri: "[Foucault] was actually one of the first to say that we're moving away from disciplinary societies, we've already left them behind. We're moving toward control societies that no longer operate by confining people but through continuous control and instant

ALGORITHM

Deleuze's control paradigm consistently accounts for many of the key features exhibited by today's digital surveillance networks. However, as shown in section II the sorting engines at the heart of digital surveillance do not simply monitor specific real time behaviors happening within given environments.[46] Where surveillance theorists like Haggerty, Ericson, and Bogard are right to point to certain advantages the control paradigm forwarded by Deleuze has to the currently dominant panoptic model, they are surprisingly silent about the bias these systems exhibit when they speak about Deleuze. Surveillance networks are designed to function predictively, and they do so by triggering alerts on individuals at least in part on the basis of an individual's 'dividual' physical characteristics like skin color, gender and age that often have no intrinsic connection with the behaviors presumably for which the surveillance is being

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communication. Burroughs was the first to address this. People are of course constantly talking about prisons, schools, hospitals: the institutions are breaking down. But they're breaking down because they're fighting a losing battle. New kinds of punishment, education, healthcare are being stealthily introduced. Open hospitals and teams providing home care have been around for some time. One can envisage education becoming less and less a closed site differentiated from the workspace as another closed site, but both disappearing and giving way to frightful continual training, to continual monitoring of worker-schoolchildren or bureaucrat-students. They try to present this as a reform of the school system, but it is really its dismantling. In a control-based system nothing is left alone for long", (244).

[46] As Newman (2009) states: "Control techniques are used not so much to identify a particular individual, but rather to identify a future risk and to attach this risk to certain types of individuals", (106).

conducted in the first place. The social sorting they conduct is itself derivative from the base components of digital surveillance – the database and the algorithm – that encode these 'dividuals' and, when combined with biometric inputs, direct bodily flows by triggering events of in- and exclusion often on the basis of these characteristics alone.[47]

At this point a curious fact emerges about the nature of the surveillance conducted by such systems, a fact that is definitely suppressed by vendors and often sidelined by even surveillance commentators. Many of these systems were put into place in the late 90s and early 2000s and have now seen long-term deployments in a variety of urban environments. Over the long term many of these systems have shown an astonishing lack of effectiveness in generating leads on suspects or generating evidence leading to successful prosecutions. Thus, it may come as little surprise that being young, male and black in Britain ensures a higher rate of scrutiny by the UK's 4 to 6 million street-mounted CCTV cameras. However, a comprehensive Home Office report published in 2005 assessing the effectiveness of electronic surveillance in the UK concluded that CCTV coverage was more vendor-driven than results driven.[48] The same report conceded its findings made it possible to conclude the overall ineffectiveness of CCTV as a crime prevention measure

[47] Introna and Wood (2004) 182.

[48] "[CCTV] was oversold – by successive governments – as the answer to crime problems. Few seeking a share of the available funding saw it as necessary to demonstrate CCTV's effectiveness…Yet it was rarely obvious why CCTV was the best response to crime in particular circumstances" (Gill and Spriggs, 2005, 116).

in the UK.[49] Similar questions have been raised concerning the effectiveness of CCTV networks deployed in Atlanta[50] and Chicago.[51] Surveillance

[49] "It would be easy to conclude from the information presented in this report that CCTV is not effective: the majority of the schemes evaluated did not reduce crime and even where there was a reduction this was mostly not due to CCTV; nor did CCTV schemes make people feel safer, much less change their behaviour". (Gill and Spriggs, 2005, 115). See also Home Office/ACPO (2007) 4-5 and Squires (2010).

[50] For instance, a distinct shift can be detected in claims made about Atlanta's, *Operation Shield*, a surveillance network composed of both private and public sector cameras monitored by a video integration center (VIC). In 2011 David Wilkinson, President of the public-private Atlanta police foundation claimed Atlanta's video integration center (VIC) would integrate both public and private security cameras into a network that, "will use software that can identify suspicious activity and guide officers right to the scene of a crime as it's occurring. In effect, the software will multiply the eyes and ears of the five to seven people per shift who will initially monitor video footage around the clock". (Garner, 2011) However, two years later expectations have clearly been lowered. While Atlanta's surveillance network has grown from 500 private-public cameras in 2011 to 1200 in 2013 operators no longer claim that the network will prevent crime much less record criminal acts as they occur: "As Lieutenant Leanne Browning points out, instead of spotting crime as it happens, the VIC is more useful for discovering details after the fact". Where claims were made in 2011 that software would direct cameras with 'Gun Spotter' software to cue up to the sound of gunshots now the goal of developers is to eventually coordinate camera coverage with incoming 911 calls. Still, the city is committed to spending $350,000 yearly to place cameras at $13,000 apiece to provide coverage of Atlanta's parks by 2016. Developer's claim that "soon 10000 cameras will cover the city" but given that the system began in 2007 and by 2013 had only managed to network 1200 cameras this claim seems another example of vendor hyperbole driving expenditure of mostly public money on technologies whose effectiveness does not match

systems installed at Palm Beach airport and Tampa Bay stadium in Florida were finally dismantled because both systems had failed entirely to register a single genuine security threat while, at the same time, generating an unending stream of false alarms.[52] These last examples involved large scale, expensive surveillance systems that over their life spans were shown conclusively to generate nothing but false positives.[53]

Thus, where Deleuze shows clearly in this short essay that contemporary digital surveillance circulates and sorts bodies through open networks on the basis of

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expectations. Especially disturbing is the reciprocity agreements between at least some private security firms and the Atlanta police department that allow private security access to the APD cameras. See Blau (2012) and Rehagen (2013).

[51] Chicago is an especially important case to consider because Chicago's private camera system is the most extensive, expensive and integrated one in the United States. As of 2013 its $60 million network linked some 22,000 private and public cameras. However, the effectiveness of the system continues to be questioned. One study (La Vigne, 2011) showed the cameras brought decreases in certain kinds of crime in one neighborhood (Humboldt Park) with no noticeable effect on crime rates in another (West Garfield Park). Another study suggested the cameras do not influence certain kinds of violent crime at all or register only a modest reduction when they are first introduced with no further gains registering with increasing saturation of the area with cameras (Reese, 2011). However, as Chapman (2010) argues: "Chicago police say the cameras have produced 4,000 arrests since 2006. That sounds like a lot, but it works out to only about 1 in 200 arrests".

[52] See Trigaux (2001), Canedy (2001), Scheeres (2002) and ACLU (2002).

[53] Assuming that there were at least some sought-for individuals among the populations under surveillance and that the systems failed to trigger an alert on any person of interest over the time of their deployment then the chances are considerable that the system issued also *false negatives* as well as false positives.

how those bodies have been encoded, he does not consider here the significance of the routine failure of digital surveillance to actually positively identify genuine threats or locate persons of interest. If due weight is given to the ubiquity of the false positive in the processing at the basis of these surveillance sorts it becomes clear that determining threat potentials on the basis of real-time inputs actually occurring in the area under surveillance *is not the practical effect of these systems*. The ubiquity of the false positive also further challenges the idea that contemporary electronic surveillance systems function panoptically. If one is effectively subject to interventions no matter how one behaves (or, rather, for no behavior at all and simply on the basis of certain 'dividual' physical characteristics) then such interventions cannot serve as either a positive or negative basis for conducting behavior.

Smart surveillance systems exhibit a startling tendency toward error. However, in the systems described, alerts are forwarded to human operators who can investigate and then intervene to either escalate the alarm or dismiss it as yet another false match. However, latest generation surveillance systems are designed to operate autonomously. In the drive to develop a so-called 'system of systems', the *human monitor itself* has increasingly been replaced by independent, automated visioning systems deployed in the late 90s and early 2000s from the factory floor to the battlefield. Given the often planet-sized quantities of data involved, designers push to automate systems to perform surveillance and sorting functions without a human operator actually present within the surveillance loop. It is important to consider the implications of this latest generation of

industrial and military surveillance systems that, on the surface, seem a logical extension of the Deleuzean society of control.

5. The vision machine

Increasing deployment of so-called *closed loop* automated visioning processes has given rise to the dream of a new utopic by designers adapting stand alone vision machines to industrial and military applications since the early 2000s.[54] Considering briefly the objectives of these entirely automated surveillance systems raises pressing questions about the convergence of socially discriminatory sorting processes with startlingly reductionist bio-political agendas embedded in the basic sorting functions of these systems.

Currently, stand alone, AOI vision systems occupy essential roles in networks devoted to industrial, military and space applications.[55] With the AOI system, inspection algorithms utilize millions of data points from an imaging process that uses *structured light* to generate a 3D effect that makes possible comparisons of even complex objects like circuit boards or engine blocks with computer aided design (CAD) models. The algorithms generate assessments on the basis of these

[54] Virilio (1994, 60) states: "Once we are removed from the realm of direct or indirect observation of synthetic images created *by the machine for the machine*, instrumental virtual images will be for us the equivalent of what a foreigner's mental pictures already represent: an enigma. Having no graphic or videographic outputs, the automatic-perception prosthesis will function like a kind of mechanized imaginary from which, this time, we would be totally excluded".

[55] Also known as machine vision.

comparisons, which allow the visual system to choose the best image generated and to detect, for instance, any deviation of the products from projected results. Systems register even minute imperfections in the morphology and the testing performance of soldered connections on circuit boards and they do this without any person in the loop.[56] Interestingly, an additional, almost Alice in Wonderland, requirement of these machine vision systems is the importance of interfaces for the human operators who work alongside them. These interfaces do not provide people a means to intervene in the production process as they do with alerts raised by smart CCTV systems, since here interfaces are not integral components but only peripherals. They are meant merely to provide constant reassurance to those who work alongside the vision systems that the machines are, in fact, functioning properly.[57]

However, even when coupled with an interactive human interface, automated vision systems generally function through a two-step process that cedes to them relative autonomy. For instance, latest generation navy military helicopters like the *Cyclone* can only function through the automation of visioning made possible by TACCO/SENSO display networks. These systems convert optical images from pick-up devices like camera

[56] Though a human interface is still needed for set up and the customization of the light patterns given context and the product. Nor should it seem a limitation of this technology that these examples focus on vision systems as deployed currently in factory line settings since, for Foucault, panoptic logics initially structured factory environments. See Bachelor and Waltz (2001).

[57] See Bachelor and Waltz (2001) 201-203. Also consider the interface on *Baxter* by Rethink Robotics at Carr (2013).

tubes and vidicons[58] into electronic signals. Signals are then converted into optical symbols on the TACCO/SENSO displays. Pilots read the symbols on the displays but what they read there forms a tiny slice of the total video inputs. The majority of the transferred data has to be automated so as not to overwhelm the pilots overseeing the helicopter's operations.[59]

DARPA's 2003 program, *Combat Zones that See* or *CTS*, claims to engage in a new generation of foreign urban surveillance that sorts, targets and kills in a closed system that requires no human interface.[60] The CTS project intends to render foreign urban battlefields as transparent as open desert by coupling massive computing power with hundreds of thousands of micro- and nano-surveillance devices scattered throughout the urban landscape.

However, CTS goes far beyond the electronic surveillance carried out by Smart CCTV systems, since these earlier generation systems are designed to forward tagged events to human operators who can then determine whether the event warrants further response. Unlike the cameras, the objective of CTS is to automate machine-visioning systems to the point that they instantly communicate interpreted data to other automated systems responsible for targeting and killing. Because of the vast amounts of data involved, this system of systems can only function as designed if no human user intervenes at any point. For Foucault, disciplinary architectures and the panoptic utopia they

[58] Refers to a small television camera tube.
[59] See Colucci (2010).
[60] See DARPA (2003); Schactman (2003) and (2005); and Graham (2006a), (2006b) and (2010).

made possible depended intimately on inmates arriving at the point where they had assimilated the architectural structure and began self-monitoring. If, as Deleuze argues,[61] a shift has already long occurred from panoptic logics to the surveillant assemblages that install the new societies of control, then the objective of designers developing 21st century military surveillance of urban battlefields would clearly no longer aim at conditioning behaviors or producing self-monitoring subjects. Rather, the function of CTS-like systems is of the most biopolitical reductivist kind – to automatically, *predictively* distribute persons toward inclusion in and exclusion from life itself and to whom, why, where or when this will occur may very well be anyone's guess.[62]

References

ACLU. (2002). Flaws in face-recognition at palm beach airport. *Aclu.org*, 5/14/2002. Retrieved

[61] Developers and institutional consumers of these technologies describe them as if destinies come built into the technology and to a certain extent the analyses of Deleuze seem to accept that the technology functions as advertised. Again, CCTV certainly does not operate in Chicago, Atlanta, or the UK as intended. Also, in the midst of the camps of the planners, designers and implementers of these systems there is considerable disagreement on what these systems are capable of actually accomplishing, once deployed, in the real world. Thus, considerable conflicts exist among the branches of the armed forces about the efficacy of CTS with the Army and Marines expressing particular skepticism about its use-value for real world combat environments.

[62] For Stephen Graham (2006a, 256) systems like CTS operate by sorting citizen from Others and by sorting legitimate citizens from those who may behave as Others (Graham, 2006a, 260). See also, Graham (2010) 199-223.

from https://www.aclu.org/news/flaws-face-recognition-palm-beach-airport.

(2013). You are being tracked: how license plate readers are being used to track Americans movements. *Aclu.org*, 7/13/2013. Retrieved from https://www.aclu.org/files/assets/071613-aclu-alprreport-opt-v05.pdf

Agamben G. (2004). *Non au tatouage biopolitique*. *Le Monde diplomatique.* January 10, 2004.

Batchelor, B. and Waltz, F. (2001). *Intelligent machine vision: techniques, implementations, applications.* London: Springer-Verlag.

Baumann, N. (2013). Too fast to fail: how high speed trading fuels wall street disasters. *Mother Jones*, Jan/Feb 2013. Retrieved from http://www.motherjones.com/politics/2013/02/high-frequency-trading-danger-risk-wall-street?page=2.

Blau, M. (2012). Atlanta under surveillance. *Creative Loafing*, 12/20/2012. Retrieved from http://clatl.com/atlanta/atlanta-under-surveillance/Content?oid=7121394.

Bogard, W. (1996). *The simulation of surveillance*. New York: Cambridge University Press.

(2006). Surveillant assemblages and lines of flight. In Lyon D. (ed.), *Theorizing*

surveillance: the panopticon and beyond (97-122). New York: Routledge.

Bosquet, G. (2006). Space, power, globalization: the internet symptom. *Societies,* 4, 105-113.

Bowker, J. and Star, L. (1999). *Sorting things out: classification and its consequences*. Cambridge: MIT Press.

Butchart, A. (1996). The industrial panopticon: mining and medical construction of migrant african labour in south africa, 1900-1950. *Social Science and Medicine*, 42 (2), 185-97.

Canedy, D. (2001). Tampa scans the faces in its crowds for criminals. *The New York Times,* 7/4/2001. Retrieved from http://www.nytimes.com/2001/07/04/us/tampa-scans-the-faces-in-its-crowds-for-criminals.html.

Carr, J. (2013). Meet baxter – the $22,000 robot. *Wired Cosmos,* 1/13/2013. Retrieved from http://wiredcosmos.com/2013/01/21/meet-baxter-the-22000-robot/.

Chapman, S. (2010). Surveillance cameras a flop. *The Chicago Tribune*, 5/6/2010. Retrieved from http://articles.chicagotribune.com/2010-05-06/news/ct-oped-0506-chapman-20100506_1_surveillance-cameras-vandalism-effect-on-violent-crime.

Colucci, F. (2010). Cyclone search. *Avionics Today,* 5/1/2010. Retrieved from http://www.aviationtoday.com/av/military/CycloneSearch_67768.html#.Vb0RPu1Viko.

DARPA. (2003). Pre-solicitation notice: combat zones that see (cts). Retrieved from https://www.fbo.gov/index?s=opportunity&mode=form&id=9cffd19485baeed4999152d8ac16f3c3&tab=core&_cview=0.

Dennis, B. (2003). Ybor cameras won't seek what they never found. *St Petersburg Times*, 8/20/2003. Retrieved from http://www.sptimes.com/2003/08/20/Hillsborough/Ybor_cameras_won_t_se.shtml.

Deleuze, G. (2003a). *Post-scriptum sur les sociétés de contrôle*. In *Pourparlers. Les éditions de minuit*: Paris, 240-247.

(2003b). *Contrôle et devenir*. In *Pourparlers. Les éditions de minuit*: Paris, 229-239.

Deleuze, G. and Guattari, F. **(**1987). *A thousand plateaus*. Minneapolis: University of Minnesota Press.

Foucault, M. (1975). *Surveiller et punir: naissance de la prison*. Paris: Gallimard.

(2004). *Sécurité territoire population*.

Paris: Seuil/Gallimard.

Galloway, A. (2004). *Protocol: how control exists after decentralization*. Cambridge, MA: MIT Press.

Garner, M. (2011). Atlanta police to monitor eyes, ears citywide. *The Atlanta Journal-Constitution,* 2/14/2011. Retrieved from http://www.ajc.com/news/news/local/atlanta-police-to-multiply-eyes-ears-citywide/nQqc8/.

Gilbert, E. (2010). Eye to eye: biometrics, the observer, the observed, and the body politic. In Macdonald, F., Hughes, R. and Dodds, K. (eds.), *Observant states: geopoltiics and visual culture* (225-245). London: IB Tauris.

Gill, M. and Spriggs, A. (2005). *Assessing the impact of cctv.* Home office research study no. 292. London: Home Office Development and Statistics Directorate.

Gordon, D. (1987). The electronic panopticon: a case study of the development of the national criminal records system. *Politics and Society* (15:4) 483-511.

(1990). *The justice juggernaut: fighting street crime, controlling citizens*. New Brunswick: Rutgers Press.

Graham, S. (2006a). Cities and the 'war on terror'.

International Journal of Urban and Regional Research, 30:2, 255-76.

(2006b). Surveillance, urbanization, and the us revolution in military affairs. In Lyon D. (ed.), *Theorizing surveillance: the panopticon and beyond* (247-269). New York: Routledge.

(2010). Combat zones that see: urban warfare and us military technology. In Macdonald, F., Hughes, R. and Dodds, K. (eds.), *Observant states: geopolitics and visual culture* (199-223). London: IB Tauris.

Haggerty, K. and Ericson, R. (2000). The surveillant assemblage. *The British Journal of Sociology,* 51: 4, 605-622.

Haggerty, K. (2006). Tear down the walls: on demolishing the panopticon. In Lyon, D. (ed.), *Theorizing surveillance: the panopticon and beyond* (23-45). New York: Routledge.

Home Office/ACPO. (2007) *National cctv strategy.* London: Home Office.

Haraway, D. (1991). *Simians, cyborgs and women: the reinvention of nature*. New York: Routledge.

Introna, D. and Wood, L. (2004). Picturing algorithmic surveillance: the politics of facial recognition, *Surveillance Studies,* 2:2/3, 177-198.

La Vigne, N.; Lowry S.; Markman, J.; Dwyer, A. (2011). Evaluating the use of public surveillance cameras for crime control and prevention – a summary. *Urban Institute,* 9/19/2011. Retrieved from http://www.urban.org/research/publication/evaluating-use-public-surveillance-cameras-crime-control-and-prevention-summary.

Lianos, M. (2003). Social control after foucault. *Surveillance and Society*, 1 (3): 412-430.

Lord, R. and Henney, M. (2015). Surveillance society: students easy target for data miners. *Pittsburgh Post Dispatch*, 8/20/2015. Retrieved from http://www.post-gazette.com/news/surveillance-society/2015/08/20/Surveillance-Society-Students-easy-targets-for-data-miners/stories/201508230018.

Los, M. (2006). Looking into the future: surveillance, globalization and the totalitarian potential. In Lyon, D. (ed.), *Theorizing surveillance: the panopticon and beyond* (69-94). New York: Routledge.

Lyon, D. (1993). An electronic panopticon? a sociological critique of surveillance theory. *The Sociological Review*, 41(3).

(2003). *Surveillance as social sorting: privacy, risk and digital discrimination*. London and New York: Routledge.

(2006). *Surveillance studies: an overview*. Cambridge, UK: Polity Press.

Mann, S.; Nolan, J.; and Wellman, B. (2003). Souveillance: inventing and using wearable computing devices for data collection in surveillance environments. *Surveillance and Society*, 1 (3), 331-55.

Mathiesen, T. (1997). The viewer society: michel foucault's 'panopticon' revisited. *Theoretical Criminology*, 1(2), 215034.

Newman, S. (2009). Politics in the age of control. In Poster, M. and Savat. D. (eds.), *Deleuze and new technology* (104-122). Edinburgh: Edinburgh UP.

Norris, C. and Armstrong, G. (1999). *The maximum surveillance society, the rise of cctv*. Oxford: Berg.

Poster, M. (1990). *The mode of information: post-structuralism and social context*. Chicago: University of Chicago Press.

Patton, P. **(**1994). Metamorphologic: bodies and powers in *a thousand plateaus*. *Journal of the British Society for Phenomenology,* 25(2): 157–169.

Reese, R. (2011). Police blue light cameras not deterring the most violent crimes. *Medill*

Reports: Chicago, 2/10/2011. Retrieved from http://news.medill.northwestern.edu/chicago/news.aspx?id=178125.

Rehagen, T. (2013). Inside the apd's video surveillance room. *Atlanta Magazine*, 5/1/2013. Retrieved from http://www.atlantamagazine.com/news-culture-articles/apd-video-surveillance/.

Shachtman, N. (2003). Big brother gets a brain. *Village Voice*, 07/08/2003. Retrieved from http://www.villagevoice.com/news/big-brother-gets-a-brain-6409852.

(2005). City snoop program returns?. *Defensetech*, 3/18/2005. Retrieved from http://defensetech.org/2005/03/18/city-snoop-program-returns/.

Scheeres, J. (2002). Airport face scanner failed. *Wired Magazine*, 5/16/2002. Retrieved from http://archive.wired.com/politics/security/news/2002/05/52563.

Squires, P. (2010). Lessons from a surveillance culture. Paper prepared for, *Citizens, Cities and Video-Surveillance Programme*. *European Forum for Urban Safety*, May 2010. Retrieved from http://www.petersquires.net/research/cctv-surveillance/.

Trigaux, R. (2001). Cameras scanned fans for

criminals. *St Petersburg Times,* 1/31/2001. Retrieved from http://www.sptimes.com /News/013101/TampaBay/Cameras_scanned_fans_.shtml.

Van der Ploeg, I. (1999). The illegal body: eurodac and the politics of biometric identification. *Ethics and Information Technology*, 1(4): 295-302.

Virilio, P. (1997). The overexposed city. In Leach, N. (ed.) *Rethinking architecture.* London: Routledge.

(1994). *The vision machine*. Bloomington: Indiana University Press.

Yar, M. (2003). Panoptic power and the pathologisation of vision: critical reflections on the foucauldian thesis. *Surveillance and Society*, 1(3), 254-271.

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TAOIST DATA VISUALIZATION: AN EMBODIED AESTHETIC APPROACH TO DATA VISUALIZATION THROUGH GESTURE-BASED TECHNOLOGY

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The study of data visualization from an aesthetic perspective has become an emerging area that focuses on user experience rather than exclusively on the communication of information. It has the potential to enhance emotional engagement in the perception of visual images, while facilitating users' ability to decode meaning. This discourse is primarily based on Western aesthetic concepts. This paper argues that traditional Chinese aesthetics and Taoist body philosophy have the potential to benefit the aesthetic dimension of data visualization. The aim of this paper is to explore the possibility of a new embodied aesthetic of data visualization that applies Taoist body principles to gesture-based technology. This new concept of Taoist data visualization emphasizes how traditional Chinese aesthetics could be explored and examined in the contemporary digital technological context. It involves the development of the notion of the "Taoist digital body", where the unification of the human body and digital technology creates the experience of harmony,

immersion, and imagination between subjects (users) and objects (data). This paper presents an example of Taoist data visualization using sleep EEG data as sample data visualized through gesture-based technology, specifically the Microsoft Kinect platform. The gesture-based technology makes it possible to integrate traditional Chinese aesthetics with contemporary technology. This paper explores the transformational relationship between the human body and technology, particularly in creating a new embodied aesthetic combining Taoist body philosophy and digital technology.

Keywords: data visualization, aesthetics, Taoist, gesture-based technology, Kinect

1. Introduction

Data visualization makes it possible to search for valuable insights within visual patterns of data. An established history exists of scientists and engineers using visualization technology to present data as visually understandable information. Traditionally, data visualization has been applied to communicating and understanding data from research findings in the science or engineering disciplines (Jörgenson, Kriz, Mones-Hattal, Rogowitz, & Fracchia, 1995). However, recent research argues that an aesthetic approach has been identified as having value in contributing to visual aspects of data visualization, which includes increasing user engagement and promoting subjective experience (Card, Mackinlay, & Schneiderman, 1999). An aesthetic emphasis also plays a key role in enhancing design for learning and creative thought

(Norman, 2004). More recently, the popularization and advancement of computer technology has raised debates about data visualization on a cultural level, where it is no longer considered as a technological tool for visually representing a substantial amount of data but as an independent medium with large expressive (communicative) potential (Rodenbeck, 2008).

An aesthetic approach to data visualization has become more and more prominent in emphasizing the role of aesthetics in improving data visualization and enhancing user engagement with data. It also involves digital art practices that use data for creative purposes related to the social, political or cultural contexts. This extends to the field of visual art, with an increasing number of artists using various forms of data as creative material for their artistic practices. Corby (2008) argues that data visualization is "capable of functioning as a sensual and critical art medium able to handle complex affective and emotive subject matter" (462). Data-based artworks have been widely exhibited and recognized, such as the 2001 *Data Dynamics* exhibition at the Whitney Museum of American Art, New York, and a conference on visualization in the humanities at MIT in 2010 (Manovich, 2010; Viegas & Wattenberg, 2007).

Existing practice-led research projects into aesthetics that focus on beauty with its emphasis on the visual pleasure of colors and shapes are often based on Western aesthetic concepts. The beautiful graphics of data visualization display data as a way of promoting clear communication and enhancing comprehension (Tufte, 2001). However, this paper argues that traditional Chinese aesthetics has potential benefits to offer

aesthetic aspects of data visualization through its specific unification of the body and the cosmos. In particular, Taoist[1] philosophy emphasizes a unity of the cosmos and humanity with the embodiment of the Tao (way) of nature that cultivates the creation of Chinese traditional art. This paper therefore, proposes, a concept of "Taoist data visualization", which stresses the unification of the body and the power of technology as one whole to generate and sustain the experience of immersion and the powers of imagination. It provides an alternative way to generate a harmonious and interactive environment for data visualization through new technologies.

2. Background

2.1 Aesthetic and data visualization

Recent research focuses on investigating how aesthetic principles might benefit data visualization. In a way different to data visualization, aesthetics is applied to examine taste in philosophical study or the critical judgment of art. The term refers to sensation, feeling, or perception (Cooper, 1997). The concept links human perceptual experience of objects in which pleasure or displeasure might be felt in response to experiences of

[1]Taoist and Taoism are English translations of Chinese indigenous religion and philosophy of Tao based in the Wade-Giles Romanization system (Komjathy, n.d). More recently, these terms have been translated as "Daoist" and "Daoism" according to the Chinese *pinyin* system. This paper adopts the term "Taoist", as Taoist is a classic translation and many studies adopted it in the discussion of the concept of Tao.

beauty, elegance, harmony, proportion, balance, colour, depth, and sublimity (Janaway, 2006).

In data visualization, an aesthetic approach refers to the investigation of the judgment that examines the value of the visualization work according to the sensation it produces (Sack, 2011). The judgment about the value of visualization in scientific or engineering disciplines prioritizes features of utilization, such as the speed, accuracy, or efficiency of the task (Card et al., 1999). For example, judgments about medical data visualization will depend on whether it helps doctors make a diagnosis more quickly and accurately. Similarly, scientists often use mathematical models to visualize the world for identifying the nature of physical issues.

More recent research demonstrates that aesthetics has been gaining attention as a means to promote a positive effect on the perception of visualization in order to enhance experience and amplify the ability to obtain knowledge (Cawthon & Moere, 2007). This has been recognized within the design discipline where research demonstrates that visual attractiveness is a major factor in how users engage with data visualization (Gaviria, 2008). If a data visualization has a high aesthetic value, users may be encouraged to engage in finding meaning within images (Lang, 2008).

2.2 Taoist body philosophy

As a classic Chinese philosophy that I have applied to data visualization, Taoism plays a fundamental role in the history of ancient Chinese thought. The core tenets of Taoism relate to its

cosmological philosophy that emphasizes the concept of Tao, reflecting the *xu* (emptiness) of Taoist ontology. Taoists believe that the Tao is the origin of nature, and represents embodied cosmological attunement. It is considered "the process of the world itself, the 'way' of things" (Hall & Ames, 1998, "Fundamental notions: *dao*," para. 1). The highest realm of practice in Taoism is achieving the unification of cosmos (nature) and body as a whole. The fundamental doctrine of Taoism is described as follows:

> The original Tao gives birth to the one,
> The one gives birth to the two,
> The two gives birth to the three,
> The three produces the ten thousand existents,
> The ten thousand existents carry yin and embrace yang,
> Harmony is born with the breath of median emptiness.
> — Laozi (Cheng, 1994, 49)

This Taoist doctrine describes the essential conceptual structure of the Tao, reflecting cosmological principles that are considered inconceivable to the rational mind. Taoism believes that everything in the world, including humanity, originally comes from the Tao, in which emptiness (*xu*) is a key to constructing harmony through the breath (*qi*). Fung (1960) avers that the concept of Tao refers to the unnameable and the "one" of the doctrine refers to the nameable, in which the nameable is created from the unnameable. The "two" and "three" are considered the beginning of eternity from where all beings come. This concept of the

unnameable in the Tao often "lie[s] beyond shapes and features" (Fung, 1960, 94).

Taoism, in its original form, seeks ways to be healthy and achieve longevity, exemplified in *taijiquan*, which was designed for the purpose of achieving health and longevity. As Taoism emphasizes the unification of the body and the cosmos (or nature), the practice of *taijiquan* achieves harmony between all parts of the body with many benefits to human health. The Taoist viewpoint of the body actually is "the cosmic body" that is "perceived as a replica of the universe" (Lévi cited in Giblett, 2008, 159). Taoism emphasizes that the human body refers to a small cosmos (microcosm) while the universe refers to a big cosmos (macrocosm). The two cosmoses have existed equally. It is most important that the body and cosmos are not separated and should not be placed in opposition.

Schipper cited in Giblett (2008) states that, compared with Western theory that constructs the body "as something setting humanity apart from nature" (158), Taoism is understood as the embodied nature of humanity, in which the body is not separate from nature. The human body is considered as "the image of a country" (Schipper, 1978, 355), and Taoism treats the body as a landscape consisting of mountains, water, and forests comprising the "Interior Landscape" (Schipper, 1978, 355). Figure 1 shows a wall painting from the Yuan dynasty depicting a Taoist with a decorated cosmological robe, representing earth (mountains), water, and heaven (stars). The painting reflects the idea of the unification of humanity and nature. Therefore, dualism is not applied to the relationship between the human body and the cosmos (or nature) in Taoist

philosophy. It can be highlighted from Kleinman (as cited in Giblett, 2008, 160) that the West believes that the body and nature or matter is dualist, as "the body is a discrete entity, a thing, and 'it', machinelike and objective, separate from thought and emotion". In data visualization, it is important to strive for this Taoist unification of the user's body and the visualized data as one whole in the context of digital technology. The emerging gesture-based technology provides an effective way to create Taoist data visualization creating harmony and immersion.

Figure 1: Hall of the Three Pure Ones in the Temple of Eternal Joy, (detail), Shanxi, China, Wall Painting, retrieved from http://www.cnarts.net/cweb/Exhibition/show/yonglegong/zuopin.asp?nid=4902&page=2.

2.3. Gesture-based technology

Gesture-based technology is a communication technology that positions "visible action as utterance"

(Kendon, 2004, 7). It emphasizes communication through action that is, what Hansen and Morrison (2013) describe as, “body-media specific”. Farnell and Varela argue for the importance of body movement in visual studies and suggest that “dynamically embodied persons in action” should replace “seeing the body as an object” (Hansen & Morrison, 2013, 31). The discussions of gesture-based technology contain similar notions of embodiment found in Taoist body philosophy, which focuses on correspondence between the body and the external world, leading to a Taoist body. In particular, Kinect technology makes it possible to investigate the possibility of unifying the human body and data through visualization of the digital body.

As an emerging gesture-based technology, Kinect has revolutionized the mode of traditional interactivity in gaming technology (Figure 2). As an input device with motion sensors initially designed for game consoles, Kinect allows users to control and interact with games through natural body movements (gestures) or voice commands, which are captured by sensors. Kinect has been designed as a tool that provides “a natural user interface (NUI) for controlling 3-D (three-dimensional) virtual globes such as Google Earth …” (Boulos et al., 2011, "Abstract", para. 1). The platform is based on the concept that human bodily movement is a key to interactivity through a computer interface.

Figure 2: Kinect console

The key difference between Kinect and traditional interactive technology is that gesture-based technology focuses on interactivity and immersion through physical movement. As an input device with motion sensors initially designed for game consoles, Kinect, which was developed by Microsoft Corporation in 2010 as a peripheral for the Xbox 360 game console (Borenstein, 2012), allows users to control and interact with games through natural movements (gestures) or voice commands captured by sensors. This type of interaction is different from the technology used for traditional data visualization in which users engage with a computer system through a keyboard, mouse, or tablet.

The potential applications of Kinect have been explored widely in many fields. For example, Hsu (2011) emphasizes the application of Kinect to teaching and learning. Hsu explores how Kinect, as an important part of pedagogical interactivity, facilitates and enhances teaching and learning. Chang, Chen, and Huang (2011) examines the possibility of rehabilitating people with motor impairments through Kinect in school environments. In my study, Kinect, with its specific gesture-based interactive technology, was used to generate an interactive Taoist data visualization involving elements of human embodiment.

3. Taiji - unification of body and digital technology

To demonstrate the concept of Taoist data visualization, I used Kinect to design a model for embodied interactivity through a unique process of data visualization. My work *Taiji* involves visualizing sleep EEG data as a Taoist body. *Taiji* used sleep EEG data as

a data sample. The sleep EEG data was sourced from PhysioBank (Goldberger et al., 2000). Although an inescapably common human experience, sleep is often considered an enigmatic phenomenon, "which aligns well with the ambiguity of aesthetics and is also often associated with creativity" (Li, McMahon, & Haddad, 2013, 8). The dataset contains data gathered throughout one night, including two key stages in sleep: non-rapid eye movement sleep (NREM) and rapid eye movement (REM). Psychological studies have proven that dreams mainly occur in the REM stage of sleep, and that they are more memorable than dreams in other sleep stages (Hobson, 2009). From consciousness theory it is known that REM sleep, as a proto-conscious state, reflects the development and maintenance of waking consciousness through a model of 'virtual reality' (Hobson, 2009). The data that was used in *Taiji* was recorded in the REM stage and was extracted from the original, overall dataset.

In order to represent sleep EEG data through interactive visualization, I relied on color, obviously one of the most important components of the visual arts in the West. The color used in representing sleep EEG data as lines was inspired in *Taiji* by the Dutch De Stijl movement that focused on creating visual movement using the natural color spectrum (Gage, 1999). In particular, Piet Mondrian's abstract paintings consist of three fundamental colors representing horizontal and vertical lines. His painting highlights a strong visual rhythm through primary colors with lines and squares, which generates movement and dynamism, especially in his work, *Broadway Boogie Woogie* (Figure 3).

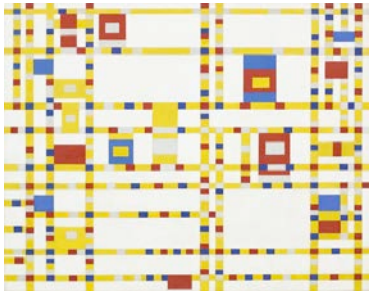

Figure 3: Piet Mondrian, *Broadway Boogie Woogie* (1942-43)

The principles of the RGB color mode involve using red, green, and blue as the primary colors and generating secondary colors by combining red, green, and blue, which is often used in computer programming (Kuehni, 2012). For example, yellow is generated by red plus green; purple is generated by red plus blue; and white is generated by red plus green and blue in the same amounts. RGB color consists of numbers in 24bit true color mode, in which each color ranges from 0-255. Number 0 represents black color and the number 255 represents white. Therefore, the different numbers in each color can generate many different colors. For example, a pure red color means red is set to 255 and green and blue are set to 0. It is represented as *color (255,0,0)*.

The four signals from sleep EEG data, which consisted of EEG Fpz-Cz, EEG Pz-Oz, EOG horizontal and submental chin EMG, were visualized according to their values. Based on the RGB color mode, the first signal (EEG data) was visualized in red. The second signal (EEG data) was visualized in green. The third signal (EOG data) was visualized in blue. If the line is

red, it means the first signal is of a greater number than the second and third signals. And then the three signals composed a mixed color. If the line is grey, it means that the values of the three signals were equal or that they had very close values. If the line is red, it means that the values of the first signals were largely greater than the value of two other signals. By mixing the values of three signals, hue and saturability also become varied (see Table 1).

First Signal	**Second Signal**	**Third Signal**	**Fourth Signal**
EEG Fpz-Cz	EEG Pz-Oz	EOG	EMG
Red (0-255)	Green (0-255)	Blue (0-255)	Speed
RGB Color Mode: White color represented as (255, 255, 255) Black color represented as (0, 0, 0)			Speed of movement

3.2 Sleep EEG data as performance of Taiji

Taiji was designed as an interactive installation that explores the concept of Taoist data visualization in the context of digital practice, through which it is possible to generate a new aesthetic experience for users. Kinect is considered an ideal gesture-based technology with its distinct interactivity that enables one to “capture,

track and decipher body movement, gestures and voice" (Hsu, 2011, 365). The work of *Taiji* was inspired by Taoist health philosophy that utilizes the practice of *taijiquan* with the flow of *qi* (breath) moving through the body in order to achieve harmony and a feeling of self-transcendence. *Taiji* is an outcome of this digital practice that attempts to represent sleep EEG data in the form of *qi* that users are able to interact with through a Taoist body (Figure 4). This Taoist body is a kind of embodied digital body that links the user's body to the data associated with the digital technology. Indeed, Taoism often highlights that *tian ren he yi* (unification of heaven and human as one) is a fundamental philosophical concept for Chinese aesthetic thought (Li, 1999). Building on this idea, the work of *Taiji* conceptualizes the human body and digital technology as a digital Taoist body.

Figure 4: *Taiji*, (2014). The figure shows a participant interacting with sleep EEG data through his body movement.

When a participant presents him- or herself in front of the screen, Kinect captures the shape of his or her body. The technology integrates the sleep EEG data

and data from the participant's body together as one whole, that is, as a Taoist body. This reflects the Taoist principle of the integration of the human subject, the universe, and the technology. It allows participants to interact with the data through their movements. One of the key characteristics of interactive technology is to generate immersion that enables the participant to engage deeply with visual images. *Taiji* enables participants to interact with the sleep EEG data while experiencing a greater sense of immersion. The lines keep moving across the shape of the virtual body combining sleep EEG data and the data of the living body (i.e. its movements, and distance from the technological interface). The work represents a dynamic Taoist body, which involves a state of dreaming (a kind of subconscious state, although one is also very alert) through digital technology. The visualization is then transformed to different shapes when the participant moves his or her arms and body. The sleep EEG data was continually transformed in its visual form, such as ellipses, based on its values in response to the participant's movements (Figure 5). The colors of these various shapes were based on the value of each numerical data, which is same as the color of the lines.

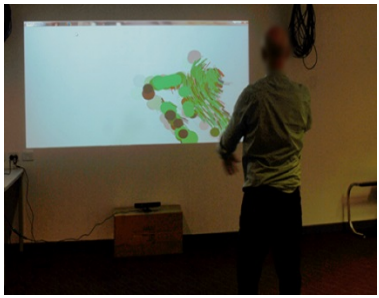

Figure 5: *Taiji*, (2014). A participant is interacted with sleep EEG data with his body movement.

The work also enabled the participant to contemplate more than just visual forms that are generated by computer code. *Taiji* was designed for the participant to consider the myth and power of digital technology. This user engagement is not only a visual experience, but also involves the participant's imagination, and the relationship of digital technology to humans, as well as the experience of the power of new computer technologies. During the exhibition of *Taiji* in Spectrum Space Project at Edith Cowan University, Western Australia in 2015, participants described the work as a "touching experience", which highlights that "knowledge is proximity" in terms of Taoism (Hall & Ames, 1998, "Fundamental notions: *de*," para. 6). Knowledge generated from the work is a kind of proximate, experiential knowledge different from knowledge generated from conventional, cognitively focused visualization technology, such as the waveform patterns.

3.3 The digital Taoist body

Taoism believes that the human body is a microcosm that reflects the universe as a macrocosm. Often Taoist thought emphasizes the importance of a harmonious relationship between nature and the body, with such ideas extending to the attainment of health and longevity. In a modern context, the Taoist body can be understood as a digital Taoist body that transforms the traditional concept of the Taoist body through the

integration of digital technology. This transformation entails a shift from the universe to the body, as Taoism argues that the creation of the universe could be understood through *Laozi*'s body transformation discussed below, which treated *Laozi* as a God in the Taoist religion. Maspero, cited in Schipper (1978), translated, *Laozi*, "transformed his body" (359) and his "left eye became the sun, his right eye the moon, his head the K'un-lun mountain, his beard the planets and the heavenly mansions, his bones dragons, his flesh quadrupeds, his bowels snakes…" (359). From this description, *Laozi*'s body becomes absorbed into the universe. However, the body shape in *Taiji* differs from the traditional Taoist body that emphasizes "tending life" (Schipper 1978, 365). Figure 6 shows that the body shape created by Kinect is not a realistic shape that can be identified; rather it shows an unclear "ghost-like" form of the body that symbolizes the incomprehensible macrocosm of Tao infusing the microcosmic body. In this Taoist data visualization, Tao was not considered the universe or cosmos in a traditional sense but as a concept of "digital technology" in which pixels comprise the basic elements to represent a digital cosmos. In this digital cosmos, a Taoist philosophical approach attempts to build a new relationship between digital technology and human users, in which scientific, numeric data could be perceived, contemplated, and imagined.

Figure 6: *Taiji* (2014)

Aesthetic experience in *Taiji* differs significantly from the traditional information-based data visualization. The interactivity of *Taiji* brings about an uplifting experience, as comments from audience members suggest, describing this work as an "uplifting interactive artwork". The new aesthetic of *Taiji* is connoted in the adjective "uplifting" (Figure 7). It is considered an artistic expression that does not attempt to convey the meaning of the data; indeed the data is neither recognizable nor readable in the work. Instead, users were able to experience immersion or attention through interaction with the data. The key to understanding this work is to recognize that embodied interactivity enhances the user's engagement through immersion (in the data, in the environment) and imagination (of the data, in subjective perception). Imagination is key in this work and has often been undervalued in conventional scientific data visualization. Although science focuses on the explanation of natural phenomenon, it is important to have imagination to "look beyond the limitations of what's currently known, and see what could possibly be … and even more imagination to make sure this venturing beyond current understanding still stays within the bound of reason and known rules of science" (Plait, 2009, April 06, para. 12). Imagination generated from

Taiji provides an alternative approach to scientific data visualization for data insights and discovery.

Figure 7: Taiji (2015) An exhibition held in Spectrum Project Space in Edith Cowan University, Perth, Western Australia

4. Conclusion and further study

Aesthetics offers benefits to the visual representation of data for enhancing engagement, promoting subjective experience, and fostering design for learning and creative thought. This paper has emphasized the importance of traditional Chinese aesthetics to data visualization, as Chinese aesthetics, such as Taoist body philosophy, provides a new kind of interactivity between users, data, and technological systems. The paper has therefore proposed a new concept of Taoist data visualization for generating harmonious, immersive, and imaginative experience through gesture-based technology, represented in this study through Kinect. The interactivity of Kinect makes a possible to generate a Taoist data visualization. This paper explored and analyzed this concept of Taoist data visualization through the process of creating the digital artifact *Taiji*, which visualized sleep EEG data. Further

directions for similar research could explore the application of Taoist philosophy through wearable technology, which some theorists have conceptualized as "a new form of synergy between human and computer, characterized by long-term adaptation through constancy of user-interface" (Mann, 1998, para. 1). In addition, the technology of virtual reality providing new environments could enhance the sense of immersion by eliminating the distance between users and the visual representations. In particular, the iDome is an effective technology displaying panoramic imagery with a high sense of immersion. The use of virtual reality is a natural extension of the Taoist body investigated in this paper and would assist the better realization of the potential of this approach for future users and participants

References

Borenstein, G. (2012). *Making things see: 3D vision with kinect, processing, arduino, and makerbot*. Sebastopol: O'Reilly Media.

Boulos, M. N. K., Blanchard, B. J., Walker, C., Montero, J., Tripathy, A., & Gutierrez-Osuna, R. (2011). Web GIS in practice x: a microsoft kinect natural user interface for google earth navigation. *International Journal of Health Geographics,* 10(1), 45.

Chang, Y. J., Chen, S. F., & Huang, J. D. (2011). A Kinect-based system for physical rehabilitation: a pilot study for young adults with motor

disabilities. *Research in Developmental Disabilities,* 32(6), 2566-2570.

Card, S. K., Mackinlay, J. D., & Schneiderman, B. (1999). *Readings in information visualization: using vision to think*. San Francisco: Morgan Kaufmann.

Cawthon, N., & Moere, A. V. (2007). Qualities of perceived aesthetic in data visualization. *Proceedings of CHI Conference on Human Factors in Computing Systems*. San Jose, USA.

Cheng, F. (1994). *Empty and full: the language of chinese painting* (M. H. Kohn, Trans.). Boston: Shambhala Publications.

Cooper, D. E. (Ed.) (1997). Introduction. *Aesthetics: the classic readings*. Oxford: Blackwell Publishers.

Corby, T. (2008). Landscapes of feeling, arenas of action: information visualization as art practice. *Leonardo,* 41(5), 460-467.

Fung, Y.-L. (1960). *A short history of chinese philosophy* (D. Bodde, Ed.). New York: Macmillan.

Gage, J. (1999). *Colour and meaning: art, science and symbolism*. London: Thames & Hudson.

Gaviria, A. R. (2008). When is information visualization art? determining the critical criteria. *Leonardo,* 41(5), 479-482.

Giblett, R. J. (2008). *The body of nature and culture*. Basingstoke: Palgrave Macmillan.

Goldberger, A. L., Amaral L.A.N., Glass, L., Hausdorff, J.M., Ivanov, P.Ch., Mark, R.G., & Stanley, H.E. (2000). PhysioBank, physiotoolkit, and physionet: components of a new research resource for complex physiologic signals. *Circulation,* 101(23), 215-220.

Hall, D., & Ames, R. T. (1998). Daoist philosophy. In E. Craig (Ed.), *Routledge Encyclopedia of Philosophy*. London: Routledge.

Hansen, L. A., & Morrison, A. (2013). Materializing movement—designing for movement-based digital interaction. *International Journal of Design,* 8(1), 29-42.

Hobson, J. A. (2009). REM sleep and dreaming: towards a theory of protoconsiousness. *Nature Reviews Neuroscience,* 10(11), 803-813.

Hsu, H. J. (2011). The potential of kinect in education. *International Journal of Information and Education Technology,* 1(5), 365-370.

Janaway, C. (2006). *Reading aesthetics and philosophy of art — selected texts with interactive commentary*. Malden: Blackwell.

Jörgenson, L., Kriz, R., Mones-Hattal, B., Rogowitz, B.,

& Fracchia, F. D. (1995). Is visualization struggling under the myth of objectivity? *Proceedings of the 6th IEEE Visualization Conference (VISUALIZATION '95)* (412-415). Atlanta, USA.

Kendon, A. (2004). *Gesture: visible action as utterance*. Cambridge: Cambridge University Press.

Komjathy, L. (n.d). *The Daoist tradition.* Retrieved from http://www.stpetersdelmar.net/files/forums/Daoism_Presentation.pdf

Kuehni, R. G. (2012). *Color: an introduction to practice and principles*. New York: Wiley.

Lang, A. (2008). *Aesthetics in information visualization*. Trends in information visualization: Hauptseminar Medieninformatik WS 2008/2009. Retrieved from http://141.84.8.93/pubdb/publications/pub/baur2010infovisHS/baur2010infovisHS.pdf#page=16

Li, R. Q., McMahon, M., & Haddad, H. (2013). *An investigation into a new aesthetics of scientific data visualization*. Paper presented at the Australian Council of University Art & Design Schools: *Locations of Practice, Sites for Creativity: From the Studio to the Cloud*. Sydney, Australia. Retrieved from http://acuads.com.au/conference/2013-conference/article/an-investigation-into-a-new-aesthetics-of-scientific-data-visualization/

Li, S. (1999). Reflections on the concept of the unity of heaven and man ('Tian Ren He Yi'). In K.-H. Pohl (ed.), *Chinese thought in a global context: a dialogue between Chinese and Western philosophical approaches* (115-128). Leiden, the Netherlands: Koninklijke Brill NV.

Li, Z. (2009). *Chinese aesthetic tradition*. (M. B. Samei, trans.). Honolulu: University of Hawaii Press.

Mann, S. (1998). *WEARABLE COMPUTING as means for PERSONAL EMPOWERMENT*. Paper presented at the the 1998 International Conference on Wearable Computing ICWC-98. Fairfax, VA.

Manovich, L. (2010). *What is visualization?* Retrieved from http://manovich.net/content/04-projects/063-what-is-visualization/61_article_2010.pdf

Norman, D. (2004). *Emotional design: why we love (hate) everyday things*. New York, NY: Basic Books.

Plait, P. (2009, April 06). Science is imagination [Web log post]. Retrieved from http://blogs.discovermagazine.com/badastronomy/2009/04/06/science-is-imagination/ - .VSYcKtwk-hM

Rodenbeck, E. (2008). Information visualization is a medium. Retrieved from http://infosthetics.com/archives/2009/04/eric_rodenbeck_informati

on_visualization_is_a_medium.html

Sack, W. (2011). Aesthetics of information visualization. In M. Lovejoy, C. Paul & V. Vesna (eds.), *Context providers: conditions of meaning in media Arts*. Bristol: Intellect Ltd.

Schipper, K. (1978). The Taoist body. *History of Religions,* 17(3/4), 355-386.

Tufte, E. R. (2001). *The visual display of quantitative information*. Cheshire: Graphics Press.

Viegas, F. B., & Wattenberg, M. (2007). Artistic data visualization: beyond visual analytics. *Proceedings of the Second International Conference, OCSC 2007. Held as Part of HCI International 2007* (182-191), Beijing, China. Springer:Berlin.

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Throughout: Art and Culture Emerging with Ubiquitous Computing

Edited by Ulrik Ekman

Forward by Matthew Fuller

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648 pp -81 figures. $50 (hardcover).

Reviewed by Sidneyeve Matrix, Associate Professor and Queen's National Scholar, Department of Media and Film, Queen's University ON, Canada

This book aims to define the parameters of an emerging interdisciplinary field, ubiquitous computing, and does so via contributions from almost 40 scholars across a variety of academic locations. The volume successfully describes and demonstrates a range of impacts as out-of-the-box (post-PC) computing gives rise to new cultural arrangements and technosocial realities. Skillfully assembled and framed by editor Ulrik Ekman of The University of Copenhagen, this collection combines history and theory with practical examples and case studies, including chapters by preeminent authors such as Jay David Bolter, Mark Hansen, N. Katherine Hayles, and Lev Manovich. Together these essays deliver an immersive reading experience, exploring multiple facets of a human-centered approach to pervasive computing.

This is an indispensible, authoritative resource for researchers in digital art and media studies, cognitive and computer sciences, and social sciences, who are interested in the cultural study of computing, mobile technology, and The Internet of Things. *Throughout* is the first academic volume to present an in-depth and big picture view of recent developments in, and scholarship about pervasive, context-aware, intelligent, and embedded computing. It serves not only as an essential resource and an inspiring read, but also can function as a textbook, with 34 chapters spanning an expansive range of issues and perspectives from Mark Weiser's earliest work in calm computing to cutting-edge contemporary urban art installations presenting virtual, augmented, and mixed realities from around the world. Fully illustrated, including several color plates depicting augmented reality gaming, the ubiquity of mobile phones in urban spaces, interactive clothing designs, and stunningly beautiful information artworks, the book also comes with an exhaustive and very helpful index.

Ekman's comprehensive and accessible introduction describes the collection as a "bottom-up" approach to understanding "net culture, new media, e-communication, and media arts", designed to "bring computing out into cultural studies (in the broadest sense)" (21). Skillfully connecting the dots between a constellation of authors working at the crossroads of science and technologies studies, Ekman describes key intersections around issues such as multimodal and interaction design, urban computing and locative media, and the co-evolution of humans and machines. Organized into seven broad thematic sections, Ekman's volume can be read in any order, depending on one's

primary and pressing interests, whether they be in biometrics and wearables, surveillance and tracking, the proliferation of smart objects and intelligent ecosystems, or philosophical, aesthetic and sociopolitical debates about the consequences of technical embeddedness.

As promised, this collection addresses a wide range of technical currents and developments in ubiquitous computing ongoing in many places, from advertising to art and photography, from mobile technology and wearable computing to biometrics. Although wide-ranging, the essays do not seem random but, rather, read as a lively, ongoing conversation between passionately engaged critical thinkers. Among the many connecting threads between chapters is a continuous focus on the role of art and design, creativity and experimentation in computer technology research and development. Likewise, as Ekman hints in his introduction, the authors each explore the multilayered significance of living closely with small, robust, networked information processing devices – gadgets that are often mobile, increasingly autonomous, and uncannily unobtrusive. Whether it is N. Katherine Hayles exploring the place of cybernetics in today's mixed realities, Anne Galloway examining geomobile data flows, Larissa Hjorth exploring e-books, Lev Manovich looking at interaction design, or Tom Cohen on science fiction, the overarching concern of the collection is clear: "we are already living in a ubicomp epoch and world" (21). Collaboratively the authors challenge readers to reflect on what this might mean to the configuration of our public spaces, the management of our life- and workstyles, and the intimacies of our relationships with others and our sense of self.

There is one glaring weakness in this volume, but it has nothing to do with the content. Instead it is a format issue that will be immediately apparent to online bookstore browsers and buyers. Without any apparent irony, and certainly through no fault of the editor, MIT press opted not to issue an e-book version of this collection of essays on mobile, pervasive communication technologies. For digital scholars and students accustomed to using desktop and mobile software to read and annotate texts, this shortcoming is surprising and significant. This may be due to the perceived difficulty of digitally distributing the many high quality photographs included in this gorgeous volume. However academics in the target market for this book have high expectations for anywhere/anytime learning, and look to scholarly publishers to produce books as accessible, social, multimodal learning objects. Let's hope the innovative, tech-forward designers and marketers at MIT Press have an e-book edition of *Throughout* in the works, to expand its reach and readership.

The title of this volume pledges to deliver a thorough exploration of the integration of computational technology in art and culture, but it easily exceeds this undertaking. Importantly, the writers are engaged in exploring many different emergent technical and social formations involving screens, sensors, and surveillance apparatus, without losing sight of either the wonders or the dangers of these innovations. As Ekman explains at the outset, pervasive and embedded computing is often treated with "exaggerated fear" by academics, journalists, and policy makers alike (37). With this volume, Ekman and his contributors set out to closely

and critically explore the evolution of what Mark Weiser called the "third epoch" of ubiquitous technologies – evolving beyond desktop computers, embedded in wearables and driveables, smarthomes and augmented environments – linked together in ad-hoc networks to deliver context-awareness in real-time. As fascinating as these cutting-edge technologies are (and the essays by Malcolm McCullogh on ambient commons, Kristin Veel on calm technology, and Jay David Bolter on live media performance, each describe truly enchanting new media formations and exchanges), the volume never loses sight of its critical perspective. Instead, although divergent, the authors' perspectives are complementary insofar as they converge into a primer on the past, present, and future of ambient technology – in all of its most intelligent, intimate, and invisible assemblages. At a moment when distributed, mobile, and embedded technologies are making daily news headlines in stories about online communication, data privacy, and digital creativity, *Throughout* offers a timely, theoretically-sophisticated, transdisciplinary strategy for navigating our technocultural lives