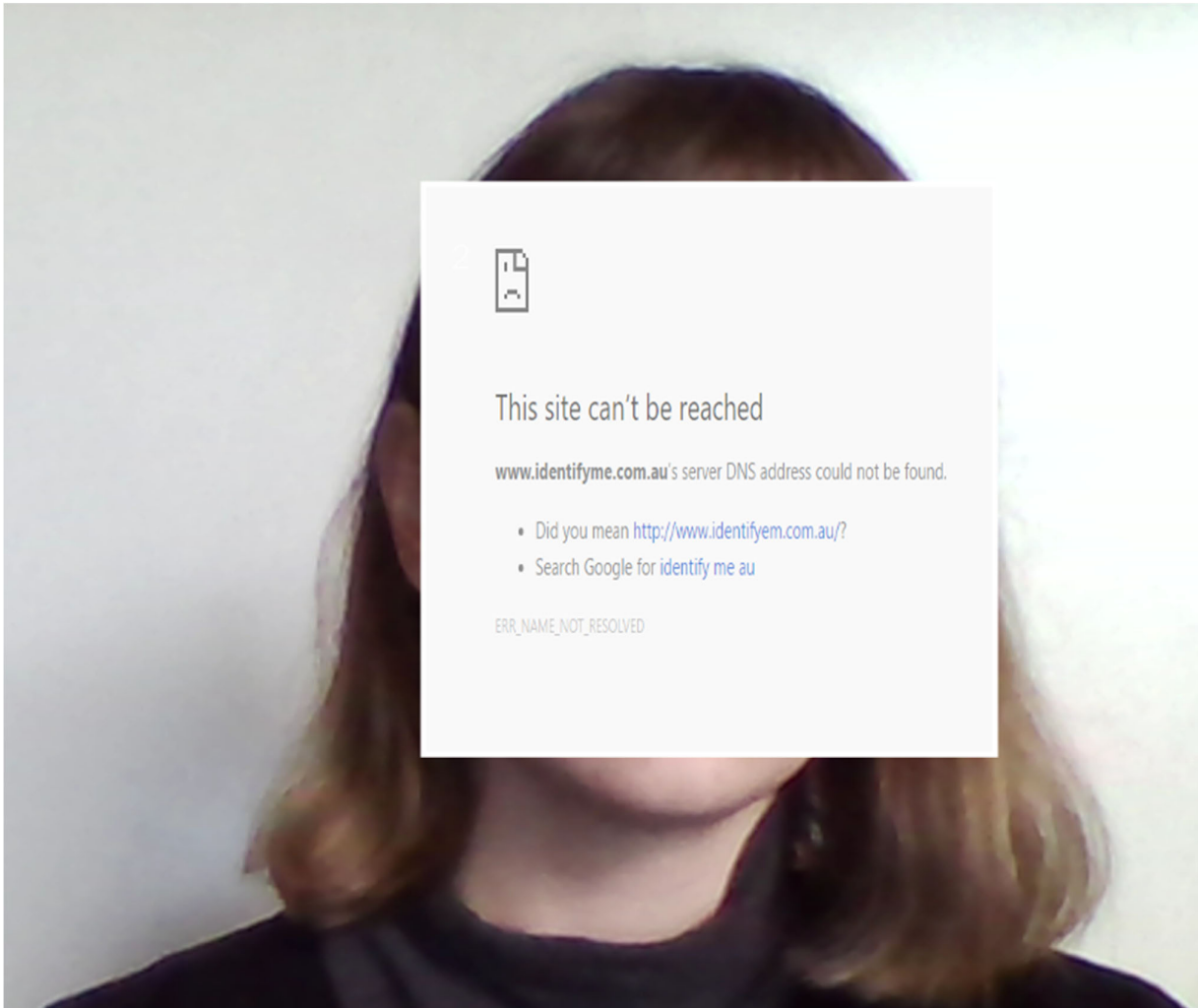


# Critical Coding as Resistance in the Digital Knowledge Economy

Mia Van den Bos



Supervisor: Simon Biggs

Visual Art

Bachelor of Art & Design (Honours)

School of Art, Architecture, and Design

University of South Australia

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## **i. Abstract**

Once conceived of as an egalitarian invention that would liberate information, the internet is becoming progressively controlled, surveilled and privatised by corporate entities. Knowing how to code—to speak the language of computers—seems increasingly necessary for survival in the digital knowledge economy. Can the process of learning how to code enhance creative practice? Having acquired skills, is an artist better equipped to subvert and critique patterns of surveillance, ownership and exploitation on the internet? The project is driven by the hypothesis that emerging technologies can liberate instead of surveil – if citizens have equal access to and knowledge of digital literacy skills. The practice-based research process, which culminated in a multidisciplinary body of work, was the result of the artist teaching herself to program Java on open-source platform Processing. Action research, autoethnographic journaling and literature and artefact analysis provided the methodological basis of the study. This is timely research that provides a case study documenting how a computer novice can approach empowering themselves on the internet as part of their visual arts practice.<sup>1</sup>

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<sup>1</sup> Sentences within this abstract were previously submitted as part of the Research Proposal.

UNIVERSITY OF SOUTH AUSTRALIA

SOUTH AUSTRALIAN SCHOOL OF ART

## **STUDENT DECLARATION**

I declare that this thesis is the result of my own research, that it does not incorporate, without acknowledgement, any material submitted for a degree or diploma in any university, and that it does not contain any material previously published, written or produced by another person except where due reference is made in the text.

Signed:

A handwritten signature in black ink, appearing to read 'Mia Van den Bos', written in a cursive style.

Date: 14<sup>th</sup> November 2016

## 1. Introduction

Born in the nineteen-nineties I could have been a digital native,<sup>2</sup> but wasn't, with our household getting its first computer a decade after my peers. My parents were uninterested in new technology and concerned about the risks, from the additional complication to the threat of ominous hackers. This digital naiveté became an enduring sense of incompetency and trepidation, never thinking I could engage with the digital world beyond the basics of document editing and user-friendly social media. I had missed the Digital Native bus, it had sped past on the Information Superhighway long ago. Post-Snowden,<sup>3</sup> I became acutely aware of the internet as the site of shifting political developments, particularly mass surveillance and the commodification of user data. I began to think of digital literacy as a political and economic survival skill.

We live in a digital knowledge economy;<sup>4</sup> for the first time in history, information, not goods, are the profit margins of many of the world's richest companies. It is increasingly necessary for individuals to learn new skills to engage with, compete within or liberate themselves from the flux of corporatised information flows. However, developing computer programming skills largely remains an esoteric pursuit<sup>5</sup>, as seemingly impenetrable to the common person as literacy was during the Middle Ages<sup>6</sup>. We have not yet had our Gutenberg press watershed moment, 'which made every man a reader'<sup>7</sup> as

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<sup>2</sup> A person who has been familiar with computers, the Internet, and other digital technology from a young age.

<sup>3</sup> Edward Snowden is a whistleblower who released documents revealing the widespread surveillance of citizen internet and phone usage by Western security agencies.

"Edward Snowden: The whistleblower behind the NSA surveillance revelations", Glenn Greenwald, Ewan MacAskill and Laura Poitras, accessed 15<sup>th</sup> May 2016, <https://www.theguardian.com/world/2013/jun/09/edward-snowden-nsa-whistleblower-surveillance>

<sup>4</sup> The digital knowledge economy is defined as the 'production and services based on knowledge-intensive activities that contribute to an accelerated pace of technical and scientific advance, as well as rapid obsolescence'.

Walter W. Powell and Kaisa Snellman, "The Knowledge Economy," *Annual Review of Sociology* 30, no. 1 (2004).

<sup>5</sup> Theodor Nelson first called for education of citizens in computer programming skills in the nineteen seventies to prevent corporate and governmental power being controlled by the skilled few initiated into the 'Computer Priesthood'. Theodor H. Nelson, *Computer Lib ; Dream Machines* (Tempus Books of Microsoft Press, 1987), 3.

<sup>6</sup> Hadi and Ali Partovi, "What 90% of Schools Don't Teach", accessed 19<sup>th</sup> June 2016, [http://www.huffingtonpost.com/hadi-and-ali-partovi/teach-coding-schools\\_b\\_2759066.html](http://www.huffingtonpost.com/hadi-and-ali-partovi/teach-coding-schools_b_2759066.html)

<sup>7</sup> Neil Kleinman, "The Gutenberg Promise," in *The Emerging Cyberculture: Literacy, Paradigm and Paradox*, ed. Stephanie B. Gibson, Oviedo, Ollie O. (New Jersey: Hampton Press, 2000), 83-84.

barriers to digital knowledge continue to reflect existing social inequities such as class, race and gender.<sup>8</sup>

During my undergraduate studies I used my work as a means to experiment with computers to creatively critique aspects of the digital world, swapping my paintbrush for Photoshop and video editing software. This research is a continuation of this process, driven by the hypothesis that I could deepen my critical engagement with contemporary power structures if I further developed my digital literacy skills. To test this hypothesis my research has centred on the daunting and exhilarating process of learning the Java programming language<sup>9</sup> on open-source platform Processing<sup>10</sup>. This endeavour has been used to determine the impact these skills have toward enhancing my creative ability to critique the political economy of the corporate internet within a multidisciplinary body of work.

Many theorists and artists address issues relevant to this study, investigating power, agency, surveillance and exploitation. However scholarly research was not found of an artist's perspective of the praxis of learning to code for political ends, and the effect of this process on their work.<sup>11</sup> This research provides a timely case study of an artist's ability to empower herself within the digital knowledge economy; to become a digital creator, not simply a passive consumer.

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<sup>8</sup> Alexander van Deursen and Jan van Dijk, "The Digital Divide Shifts to Differences in Usage," *New Media & Society* 16, no. 3 (2013): 511-12.; Stacy Hollins et al., "The Digital Divide through the Lens of Critical Race Theory: The Digitally Denied" (University of Missouri, 2015), 3-6.

<sup>9</sup> A computer programming language especially applicable to the Internet.

<sup>10</sup> 'Processing is a flexible software sketchbook and a language for learning how to code within the context of the visual arts'.

"Processing", Ben Fry and Casey Reas, accessed 3<sup>rd</sup> March 2016, <https://processing.org/>

<sup>11</sup> The terms coding and computer programming are used interchangeably in this exegesis.

## 1.1 Research questions

The question guiding this research project is:

Can computer programming skills enhance an artist's ability to critique and subvert patterns of networked surveillance, ownership and exploitation through their creative work?

This key question elicits further sub-questions:

What are effective methods used to subvert or critique power through the visual arts?

How can the effectiveness of the method be determined?

To what extent does coding affect subjective feelings of digital empowerment versus power to produce change?<sup>12</sup>

This research project is founded on the critical assumption that 'mass economic surveillance' and the commercial ownership and commodification of personal data is unethical and necessitates subversion and critique.<sup>13</sup>

## 2. Methods and Methodology

The qualitative methodology for this research project was practice-based research utilising literature and artefact analysis, targeted autoethnographic journaling and an action research paradigm in the studio. When triangulated these methods functioned as a methodological assemblage providing the pedagogical, creative and reflective requirements of the research topic.

Literature and artefact analysis has been used to understand the intersection of critical theory, corporate power, digital technology and the internet. Additionally, literature analysis provided a method to determine and contextualise effective methods of critique and subversion in creative production. Literature and artefact analyses were guided by a series of questions (Appendix A).

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<sup>12</sup> Sentences within the Introduction and Research Questions were included in the Research Proposal.

<sup>13</sup> Christian Fuchs, *Social Media a Critical Introduction* (Thousand Oaks, Calif.: SAGE, 2013), 131.

Action research was used to structure the studio 'making' processes. Artworks in various media, including sculpture, video, computer programming and digital painting were created through the cyclical process of unplanned action, critical reflection and responsive planning.<sup>14</sup> Action research is grounded in the field of social psychology as a method of creating systematic change through active immersion and as such maintains a strong relevance to the aim of this research.<sup>15</sup> Action research is a form of ontological politics, a way of affirming that social conditions are not predetermined and that there are myriad potentialities that are 'shaped with and through practices'.<sup>16</sup> This research manifests this practice of 'world-making' as it can 'conjure up new ways of thinking and seeing' in relation to how we use the internet.<sup>17</sup> Stephen Scrivener describes these potentialities as 'apprehensions', a way of knowing that engenders 'possibilities rather than conclusions'. This research aims to create 'material for seeing' which offer novel ways of perceiving one's relation to the digital networked environment.<sup>18</sup>

During the action phase of the creation process it was crucial to give mind, eyes and hands free reign to create, while establishing greater distance with critical faculties. This allowed the direct engagement with material actualities, both physical and digital, to set the foundation for the development of the work. *Cynosure of all spies* began as an experiment in stone carving and has been continually developed throughout the research via the intuitive process of making without prior planning; allowing the materiality and incidental visual associations to assemble new meaning.

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<sup>14</sup> Paul McIntosh, *Action Research and Reflective Practice : Creative and Visual Methods to Facilitate Reflection and Learning* (London ; New York: Routledge, 2010), 38.

<sup>15</sup> Clem Adelman, "Kurt Lewin and the Origins of Action Research," *Educational Action Research* 1, no. 1 (1993): 13-14.

<sup>16</sup> Timon Beyes and Chris Steyaert, "The Ontological Politics of Artistic Interventions: Implications for Performing Action Research," *Action Research* 9, no. 1 (2011): 103.

<sup>17</sup> *Ibid.*, 102.

<sup>18</sup> S Scrivener, "The Art Object Does Not Embody a Form of Knowledge," *Working Papers in Art and Design* 2 (2002).





Figure 1) Mia van den Bos, *Cynosure of all spies*, work in progress, April 2016

Figure 2) Mia van den Bos, *Cynosure of all spies*, May 2016

The material engagement driving the body of work is powerful not as an explication of an existing idea or concept; but as the aesthetic and conceptual factors that emerged through a felt understanding of varied materials.<sup>19</sup> Tacit knowledge developed through my involvement with the symbolic system of computer programming and expanded through working with familiar materials such as digital painting, video editing and installation.<sup>20</sup> The action research cycle was apt as the ‘DIY’ ethos of ‘de-bugging’ through a continuous sensitivity to feedback and developing work through an ‘apprentice-type engagement’ is inherent to the medium of code.<sup>21</sup> The incrementally developed knowledge provided nuance and depth to the critical lens revealed through the body of work.

<sup>19</sup>John S Drummond and Markus Themessl-Huber, "The Cyclical Process of Action Research the Contribution of Gilles Deleuze," *Action Research* 5, no. 4 (2007): 442-3.

<sup>20</sup> Estelle Barrett and Barbara Bolt, *Practice as Research Approaches to Creative Arts Enquiry* (London: I.B.Tauris, 2010), 29-30.

<sup>21</sup> Drummond and Themessl-Huber, 430.

Autoethnographic journaling was chosen as the method to track the experience of teaching myself to code and to enhance the reflective process.<sup>22</sup> After each self-directed programming lesson a journal entry was recorded using a template consisting of four questions designed to measure both subjective and objective data (Appendix B & C).<sup>23</sup> The journaling was used to track both subjective feelings of modified agency and quantifiable skill development. This data was assessed against the criticality of the work being made concurrently to reflect upon the impact of the computer programming sessions.<sup>24</sup> Intermittently the session reflections were coded via the Grounded Theory method of open coding, systematically labelling themes that arose in the journal entries.<sup>25</sup> Prominent open codes were categorised and rates of occurrence were quantified (Appendix D). This data set was used to gain critical distance and sharpen my capacities for reflection during the process of creation, as well as to better understand how computer programming modified the work. This knowledge was further fed into material creation.

Furthermore, personal memory data was collected using narrative methods outlined by Heewon Chang<sup>26</sup>. The (re)collection of personal memory data encouraged self-reflexivity about the personal context informing the objectives of the research, in order to be aware of my worldview and biases.

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<sup>22</sup> Margot Duncan, "Autoethnography: Critical Appreciation of an Emerging Art," *The International Journal of Qualitative Methods* 3, no. 4 (2004): 6.

<sup>23</sup> A Khan Academy online course and a workbook were used to structure the pedagogy.

"Intro to JS: Drawing and Animation", Khan Academy, <https://www.khanacademy.org/computing/computer-programming/programming>

D. Shiffman, *Learning Processing: A Beginner's Guide to Programming Images, Animation, and Interaction* (Morgan Kaufmann/Elsevier, 2008).

<sup>24</sup> Ibrahim Cetin, Emine Sendurur, and Polat Sendurur, "Assessing the Impact of Meta-Cognitive Training on Students' Understanding of Introductory Programming Concepts," *Journal of Educational Computing Research* 50, no. 4 (2014).

<sup>25</sup> Steven Pace, "Writing the Self into Research: Using Grounded Theory Analytic Strategies in Autoethnography," *TEXT Special Issue No 13* (2012).

<sup>26</sup> Heewon Chang, *Autoethnography as Method*, Developing Qualitative Inquiry (Walnut Creek, Calif. : Oxford: Left Coast ; Berg [distributor], 2008).

### 3. Art-political praxis

The idea of art as a political praxis cannot be discussed without reference to the twentieth century European revolutionary avant-garde, such as Dada, Constructivism, and the Situationists. However the failure of the actions of May 1968 marked for many the end of utopian Modernism and with it, the avant-garde.<sup>27</sup> John Roberts has argued against the historicised avant-garde, claiming that the avant-garde has continued and expanded its programme in the face of neoliberal crisis capitalism and abrupt social changes.<sup>28</sup> As the elite Art World has become an uncritical Spectacle,<sup>29</sup> a broad mass of artists have been empowered by the resources of digital technology; using their ample unstructured time<sup>30</sup> to produce a ‘sizeable critical mass of creativity’ creating ‘a living or dissensual space within the very heart of waged labour.’<sup>31</sup> These artists continue the avant-garde practice of creating within ‘the gap between the actual and the ideal’ and provide possibilities and implications for the present and future.<sup>32</sup>

Political scientist Murray Edelman has written about the way in which art ‘provides a reservoir of images, narratives, schemata and models’ for understanding the world which ‘shape the meanings of everyday developments’<sup>33</sup>. As such, art provides the ‘menu of models’ that individuals draw upon to understand political events, and that provide illustrations of available action.<sup>34</sup> Edelman claims that the power of art to influence political conceptions is the result of the ambiguity and complexity of visual signifiers which effect ways of ‘conceiving, seeing and understanding’.<sup>35</sup> As opposed to offering a dry argument pertaining to a specific political issue, art effects deep interpretive structures which transcend specific time and place and colour the perception of a broad range of

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<sup>27</sup> Robert Hughes, *The Shock of the New : Art and the Century of Change*, 0th ed. (London: Thames & Hudson, 1991).

<sup>28</sup> John Roberts, *Revolutionary Time and the Avant-Garde* (London: Verso, 2015), 30.

<sup>29</sup> Guy Debord, *Society of the Spectacle* (Detroit: Black & Red, 1983).

<sup>30</sup> Both the educated and unskilled population in advanced economies face mass unemployment and precarious employment due to the casualization of the labour force.

J. Roberts, *Revolutionary Time and the Avant Garde* (Verso Books, 2015), 36-37.

<sup>31</sup> Roberts, 36-37.

<sup>32</sup> *Ibid.*, 30.

<sup>33</sup> Murray Edelman, *From Art to Politics: How Artistic Creations Shape Political Conceptions* (Chicago: University of Chicago Press, 1996), 5-7.

<sup>34</sup> *Ibid.*, 9, 20, 37.

<sup>35</sup> *Ibid.*, 7, 24-25.

similar events.<sup>36</sup> Edelman claims that art must question present conditions or it is not art, but propaganda.<sup>37</sup> In this context, the aim of this research is to create a critical and subversive lens through which to view corporate networked surveillance and exploitation.

#### 4. Agency and networked consciousness

N. Katherine Hayles claims our current state as technologically-engaged ‘posthumans’ has problematised the liberal humanist notions of autonomy and individual agency:<sup>38</sup>

“The posthuman subject is an amalgam, a collection of heterogenous components, a material-informational entity whose boundaries undergo continuous construction and reconstruction...the presumption that there is agency, desire of will belonging to the self and clearly distinguished from the “will of others” is undercut in the posthuman..”<sup>39</sup>

The posthuman exists not as an autonomous individual but as a composite entity consisting of communicative parts. These parts, including the technology and organic matter we utilise, are part of us, and have agency. This idea relates to Bruno Latour’s work on Actor-Network Theory. Latour affords equal agency to anything that can ‘modify a state of affairs by making a difference’, anything that does so is an ‘actor’.<sup>40</sup> Actors socialise and create networks through ‘momentary association’, gathering to create new shapes or ‘networks’<sup>41</sup>. This perspective reframed the research goal from a focus on increasing personal autonomy when engaging with the monopolised web, to a focus on becoming a positive actor facilitating critique and subversion within the networked environment.<sup>42</sup>

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<sup>36</sup> Ibid., 24-25.

<sup>37</sup> Ibid., 56.

<sup>38</sup> While Hayles provides this definition of the posthuman, she also criticises the posthuman paradigm for prioritising the mind over the body, as the Liberal Humanist paradigm did.

<sup>39</sup> N. Katherine Hayles, *How We Became Posthuman : Virtual Bodies in Cybernetics, Literature, and Informatics* (Chicago, Ill.: University of Chicago Press, 1999), 3.

<sup>40</sup> Bruno Latour, *Reassembling the Social : An Introduction to Actor-Network-Theory*, 0th ed. (United States: Ebooks Corporation Limited, 2005), 72.

<sup>41</sup> Ibid., 65.

<sup>42</sup> This section is taken from the Literature Review.

## 5. Corporate surveillance and the panopticon

Critical theorist Christian Fuchs provides a political and economic understanding of the use of surveillance in contemporary corporate social media. Fuchs uses methods such as critical discourse analysis and quantitative data to analyse the accumulation models, business practices and legal frameworks of social media companies<sup>43</sup>.

Fuchs utilises the concept of the 'Prosumer' (producer and consumer) to explain user exploitation on social media sites such as Facebook, Youtube and Google. Prosumers engage in unpaid 'playbour'<sup>44</sup> that serves two functions: content-creation that encourages others to use the site, and secondly, this content and interaction is used to generate detailed user data profiles<sup>45</sup>. Marketers pay to advertise with these sites due to the large audiences and the data amassed about users, which facilitates accurately targeted advertisements. Fuchs's research contextualises the reasons why citizen computer literacy and programming skills are necessary to protect economic and personal privacy in an increasingly monopolised environment. These skills enable individuals be able to make educated decisions about what sites to use and how to use them and to contribute to open source, not for profit, social media alternatives, such as Diaspora\*.<sup>46</sup>

Michel Foucault's Panopticism helps us understand the way in which states and companies construct, control, monitor and monetise internet usage.<sup>47</sup> Panopticism describes a highly systematised method of control through surveillance, exemplified in Philosopher Jeremy Bentham's late eighteenth century Panopticon. This architectural structure allows hundreds of individuals to be simultaneously surveilled by one overseer, who themselves is never seen, thus creating an asymmetric power dynamic. Foucault argues that Panopticism has spread laterally from institutions to envelop the whole of society<sup>48</sup>.

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<sup>43</sup> Fuchs, 164.

<sup>44</sup> Julian Kücklich, "Precarious Playbour: Modders and the Digital Games Industry," *Fibreculture Journal*, no. 5 (2005).

<sup>45</sup> Fuchs, 114, 69.

<sup>46</sup> A Facebook alternative. The Diaspora\* project, accessed 18<sup>th</sup> October 2016, <https://diasporafoundation.org/>

<sup>47</sup> Sentence taken from Annotated Bibliography.

<sup>48</sup> Michel Foucault and Alan Sheridan, *Discipline and Punish : The Birth of the Prison*, Penguin Social Sciences (Harmondsworth, England: Penguin, 1991), 207.

Foucault's Panopticism is an apt framework to contextualise Fuchs' analysis of corporate social media. Facebook coerces users to 'agree' to a misleading privacy policy which legalises their surveillance and exploitation in exchange for connection to the 21<sup>st</sup> century 'global village'.<sup>49</sup> However Facebook is opaque about how consumer's personal data is used by the company and their advertising clients, acting like a one-way mirror. The company utilises surveillance to gather information for the benefit of certain groups at the expense of others.<sup>50</sup> Facebook, like the Panopticon, is a 'machine for dissociating the see/being seen dyad', prosumers are always watched but sightless, while advertisers see everything and remain safely cloaked in invisibility.<sup>51</sup>



Figure 3) Mia van den Bos, *AI Page*, *AI Schmidt* and *AI Zuckerberg*, 2016

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<sup>49</sup> Fuchs, 166.

<sup>50</sup> *Ibid.*, 158.

<sup>51</sup> Foucault and Sheridan, 202.

The AI series of digital paintings presents those who stand to gain from panoptic internet surveillance; leaders of the globe's omnipresent social media companies, Google CEO and co-founder Larry Page, Google Chairman Eric Schmidt and Facebook CEO and co-founder Mark Zuckerberg. The digitally painted portraits are fleshy and permeable. They resemble the removed silicon epidermis of an artificial intelligence robot, eliciting the perturbation of the uncanny valley effect.<sup>52</sup> The digital paintings are printed on textured plastic to evoke the abstraction of form into pixels, preserving their native state. The paintings are hung to evoke political protest banners, as well as the propaganda posters of fictional all-seeing dictator Big Brother from George Orwell's *1984*.<sup>53</sup> These portraits act as embodiments of Foucault's Panopticism and suggest the existence of a consolidated all-seeing power in the contemporary context. The works in traditional and composite mediums, such as the AI series, come from the will to inhabit the contemporary post-digital space, utilising the many available tools to explore a concept.<sup>54</sup> The variety of media allowed the research to continue consistently and in tandem with the developing programming skills.<sup>55</sup>

## 6. Framing Technology critically

Martin Heidegger's 1954 text *The Question Concerning Technology* is an early philosophical text which presents the potential perils of uncritical technology use. Heidegger warns that technology threatens the poetry ('poiesis') inherent in the hand-wrought artefact, instead 'revealing' the world as solely quantifiable; as 'stock' available for use and appropriation.<sup>56</sup> Heidegger advises that such a materialist worldview threatens the beauty of life and distracts humankind from the true nature of being. Heidegger claims that the Arts can be the 'saving power' that reinstates a complex and reflective mode of thinking that can reveal truth to humanity.<sup>57</sup> Heidegger's ontological view is supported by contemporary social scientist Sherry Turkle who cautions that communication technology is degrading our

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<sup>52</sup> "Uncanny valley: why we find human-like robots and dolls so creepy", Stephanie Lay, accessed 5<sup>th</sup> November 2016, <https://www.theguardian.com/commentisfree/2015/nov/13/robots-human-uncanny-valley>

<sup>53</sup> G. Orwell, *1984* (Arcturus Publishing, 2014).

<sup>54</sup> Florian Cramer, "What Is Post-Digital?," *A Peer Reviewed Journal About* (2014).

<sup>55</sup> Sentences from this section were included in the Literature review.

<sup>56</sup> Martin Heidegger, *The Question Concerning Technology, and Other Essays* (New York: Garland Pub, 1977), 15.

<sup>57</sup> *Ibid.*, 34.

social relationships. Social media promises to make our lives more convenient, with friends available 24/7, able to be turned on and off at will. However interacting in such a way eliminates the complexity of human relationships for ‘convenience’ and robs us of the connection we need to feel fulfilled.<sup>58</sup> Furthermore, the programmed structure of the site, which controls whose posts you see and places limitations how you interact, regulates both your behaviour and your relationships.<sup>59</sup> As with Heidegger, Turkle sees the solution to these problems not in doing away with technology but in thinking critically about it and in adjusting our use accordingly.

In 2003 artists Eva and Franco Mattes deceived the Viennese public into believing that sportswear company Nike had bought the right to rename and brand a central city square ‘Nikeplatz’ using a promotional campaign consisting of a central information booth and believable corporate website. The parafictional<sup>60</sup> work *Nike ground* is an example of art effectively resulting in widespread critical reflection through subversive action.<sup>61</sup> The public dismay provoked critique of the privatisation and commercialisation of public space, and the commodification of our cities and bodies through branding.<sup>62</sup>

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<sup>58</sup> Sherry Turkle, *Alone Together Why We Expect More from Technology and Less from Each Other* (New York: Basic Books, 2011), 136.

<sup>59</sup> Aaron Swartz and Laurence Lessig, *The Boy Who Could Change the World: The Writings of Aaron Swartz* (London: Verso, 2016), 44.

“Everything We Know About Facebook’s Secret Mood Manipulation Experiment”, *The Atlantic*, accessed 30<sup>th</sup> June 2016, <http://www.theatlantic.com/technology/archive/2014/06/everything-we-know-about-facebooks-secret-mood-manipulation-experiment/373648/>

<sup>60</sup> Parafictional work is art that inhabits the realm of truth for a period of time, blurring the boundaries between fiction and reality. This mode is often used by political artists such as the Yes Men, to exaggerate truths or reveal other potentialities. Carrie Lambert-Beatty, “Make-Believe: Parafiction and Plausibility,” *October*, no. 129 (2009).

<sup>61</sup> Nike ground, Eva and Franco Mattes, accessed 27<sup>th</sup> September 2016, <http://0100101110101101.org/nike-ground/>

<sup>62</sup> Ibid.





Figure 4) Eva and Franco Mattes, *Nike Ground* (Information booth), 2003



Figure 5) Mia van den Bos, *Silicon kloof (1 & 2)* (part of the *Visionary and Entrepreneurial series*), 2016



Figure 6) Mia van den Bos, *Visionary and entrepreneurial*, 2016

Like *Nike ground*, the body of works *Visionary and Entrepreneurial* appropriates corporate motifs for subversive effect. The works accurately mimic the Silicon Valley aesthetic; the clean cut, white, clear and sky blue, as seen widely in the branding and architecture of tech company campuses and homes in the area. Developed at the start of the process of learning Java, these works included the first experiments in creating programmed drawings using only shape and colour functions. The motif of spheres emerged in both the sculptural work



and programmed drawings, eliciting visual associations to eyes and the globe. In addition to serving as a cross-cultural symbol of homogenous unification, such as networked globalisation. As the works developed during the research trajectory experimentation began with displaced motifs to disrupt and subvert the clean and friendly Silicon Valley aesthetic. Materials and motifs such as barbed wire, sharp stones, CCTV cameras, trypophobic imagery<sup>63</sup> and the burned remains of Guy Fawkes masks, the symbol of the hacktivist group Anonymous, were used. Motifs evoking the domestic environment, such as shelving, wallpaper, carpet and imagery of children and toys were experimented with to create a tension between homely comfort, and the sense of being watched. Domestic motifs also served to elucidate the fact that networked surveillance and data mining happens every day in our most intimate environments. The works rely on ambiguity of form and functionality to create a sense of unease.<sup>64</sup>



Figure 7) Mia van den Bos, *Untitled*, 2016



Figure 8) Mia van den Bos, *Untitled* (detail), 2016

<sup>63</sup> 'Trypophobia - a 'fear of holes' - is a condition which triggers individuals to suffer an emotional reaction when viewing seemingly innocuous images of clusters of objects, usually holes.

"Does this picture make you feel sick?" Arnold Wilkins, *The Daily Mail*, accessed 25<sup>th</sup> October 2016, <http://www.dailymail.co.uk/sciencetech/article-3518998/Are-scared-sinkholes-crumpets-overactive-BRAIN-Fear-holes-causes-mind-work-harder.html>

<sup>64</sup> Sentences from this section were submitted in the Literature Review

## 7. Hacktivism

To hack is to make use of a technology, or in a broader sense, any system, in an ‘original, unorthodox and inventive way’ which is often subversive and illicit.<sup>65</sup> Hacktivism involves utilising a hack as a method to produce social change. Mackenzie Wark has recontextualised the work of Marx and Engels for the digital knowledge economy.<sup>66</sup> In his text *The Hacker Manifesto* Wark claims that content-creators, particularly those with coding skills, are presently the class that hold revolutionary potential.<sup>67</sup> Wark names the Vectoralist class, the business leaders of the knowledge economy, as the new Bourgeoisie. The Working Class is no longer only alienated from the material goods they make, but increasingly, their intellectual property. Their ideas, relationships, images, videos and identities are the profit margins of the Vectoralist class. The Hacker Class are those who have the skills and means to create new ‘abstractions’, subversive ways of seeing, living and engaging within our digital world.<sup>68</sup> A form of hacking tied to the arts is tactical media. The Critical Art Ensemble defines tactical media the ‘a critical usage and theorization of media practices that draw on all forms of old and new, both lucid and sophisticated media, for achieving a variety of specific noncommercial goals and pushing all kinds of potentially subversive political issues’.<sup>69</sup> Paulo Cirio is an artist who exemplifies the unification of artist and hacker through the use of tactical media. In his 2006-2011 *Hacking Monopolism Trilogy* Cirio used his computer programming skills to code software that exploited vulnerabilities on Google, Amazon and Facebook. Cirio hacks as a critique of the way ‘internet giants concentrate, misappropriate, and monetize large quantities of information and user interactions’.<sup>70</sup> In the 2005 work *Google Will Eat Itself* Cirio programmed bots to click on Google ads on his own hidden websites, thus generating revenue which he used to buy Google shares. The speculative end goal to become a majority shareholder and to make Google a publicly owned company.<sup>71</sup>

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<sup>65</sup> Paul A. Taylor, *Hackers : Crime and the Digital Sublime* (New York: Routledge, 1999), 15.

<sup>66</sup> Karl Marx and Friedrich Engels, authors of the Communist Manifesto.

<sup>67</sup> McKenzie Wark, *A Hacker Manifesto* (Cambridge, MA: Harvard University Press, 2004).

<sup>68</sup> Ibid.

<sup>69</sup> Critical Art Ensemble, *Digital Resistance: Explorations in Tactical Media* (Brooklyn: Autonomedia, 2001), 5.

<sup>70</sup> Paulo Cirio, "Hacking Monopolism Trilogy," <https://paolocirio.net/work/hacking-monopolism-trilogy/>.

<sup>71</sup> "Google Will Eat Itself (Gwei)," <http://paolocirio.net/work/gwei/>.

Sections of this discussion were submitted in the Literature review.

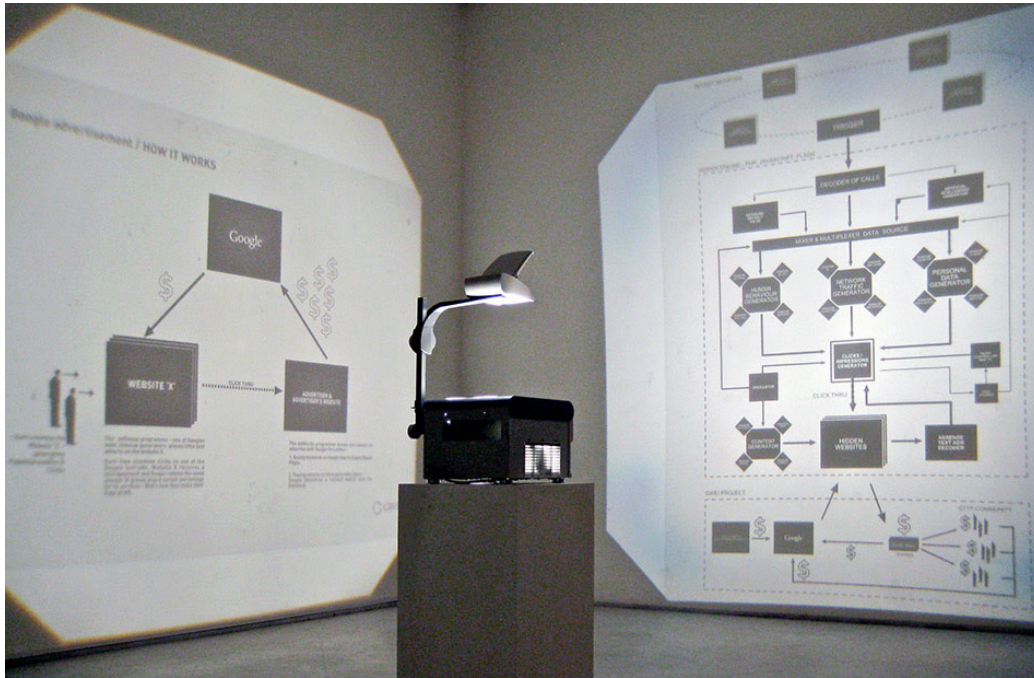


Figure 9) Paolo Cirio, *Google will eat itself*, 2005

The lives and culture of hacktivist groups, from the public life of Aaron Swartz to the faceless, ever-changing and decentred mass that is Anonymous, has influenced the aesthetic and conceptual aspects of the artefacts. Aaron Swartz was a programmer, hacktivist and advocate of free culture. Swartz founded the copyright licencing Creative Commons and activist organisation Demand Progress. He also engaged in hacks, such as the download and release of millions of public court documents that were unconstitutionally being kept behind a paywall. Swartz tragically ended his life after being charged with a United States federal felony for accessing the MIT system and using a program he wrote to download the entire JSTOR database. His specific intentions in taking this action are unknown but it has been suggested that he did so to analyse the data to find connections between corporate research funding and outcomes in Climate Change research.<sup>72</sup> Unlike Swartz, who had clearly defined political ideals, Anonymous creates hacktivist spectacle and collectively engage in hyperbolic pranks announced via theatrical videos released on Youtube and Reddit.<sup>73</sup> Visual cues and ‘memes’ from both Swartz case

<sup>72</sup> Brian Knappenberger, John Dragonetti, and Charles Annenberg Weingarten, *The Internet's Own Boy : Story of Aaron Swartz* ([Neutral Bay, N.S.W.]: EnhanceTV, 2014).

<sup>73</sup> Gabriella Coleman, *Hacker, Hoaxer, Whistleblower, Spy: The Many Faces of Anonymous* (Verso Books, 2014).



and Anonymous' grandiose aesthetic have been used to interrupt and subvert the visual cues of the power structures of Silicon Valley.



Figure 10) Mia van den Bos, *Expctus* (still), 2016

The video work *Expctus* is a poetic mock-announcement video in the style of hacktivist collective Anonymous. Part 1 of the video utilises Snapchat augmented reality filters – both in-built filters and my own face-swaps of Mark Zuckerberg and a Lizard person – to distort and mask my identity, while stating incendiary and poetic one-liners: ‘Throw a wrench in the matrix’/ ‘We watch u because we love u’ / ‘tilt brush yourself a placard, bold red letters, Stop Watching Me’. Part 2 uses humour, a woman sexily dances in the mirror to Big Sean’s hit ‘I don’t f\*\*k with you’, the image pans out and she is wearing a Guy Fawkes mask, subverting the association of Anonymous with the white male nerd archetype. ‘Expctus’ plays with the use of virtual and actual masks. The work presents a speculative example of the subversive ‘hack’ of commercial social media, with its features being used to protect

the identity of the activist as opposed to the gathering of information to target them in collusion with state security agencies<sup>74</sup>.

## 8. Outcomes & Discussion

At the start of this research the tentative hypothesis was that learning basic computer programming skills would enhance my creative practice and improve my ability to subvert and critique networked power within my work. This would be achieved through an increased understanding of the symbolic system that programs the internet. The process of learning to code, though still in its early stages, has indeed given me a new entry-point into the digital world. This has resulted in an unprecedented level of agency and confidence to critically engage issues of corporate surveillance and data exploitation.

The autoethnographic journal documented 40 hours of computer programming over the course of the research, and significant developments in understanding and skill were observed. The programmed works evolved from drawings using only shape and colour, to animation and interactive programs which respond to mouse movement and key presses. An example is a programmed animation of an eye in which spheres emerge from the iris and move across the screen leaving a trail. When a key is pressed the eye blinks and a black triangle appears in the background.

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<sup>74</sup> Christian Fuchs, *Occupymedia! The Occupy Movement and Social Media in Crisis Capitalism* (Hants: Zero Books, 2014).

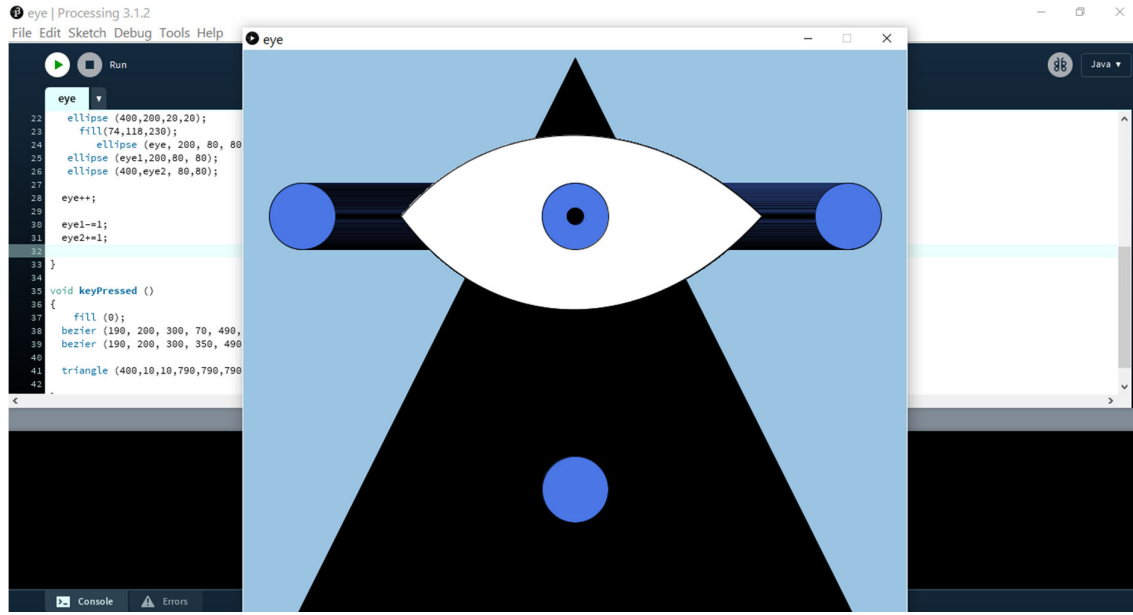


Figure 11) Mia van den Bos, untitled animation, 2016

Autoethnographic journaling exercises post-programming sessions showed that I often felt a great sense of amazement, excitement and accomplishment when completing even basic programming exercises and this same affect continued as my programming work developed to show perceptible critical effect. This suggested that my subjective feelings of accomplishment were not directly correlated to enhanced agency to critique power structures within the digital and were largely independent of critical outcomes. This was important to be aware of during the research to maintain a rigorous perception of the work and to prevent programming from becoming a mere novelty.

As my learning progressed I discovered I knew enough about the medium to have scope for ideas outside of specific workbook exercises. Having developed enough of a vocabulary to know what I didn't know, I sought information to fill gaps in my knowledge and experiment outside of the confines of the workbook structure. This change in pedagogical method led to my experimentation with the Open CV<sup>75</sup> facial recognition library.<sup>76</sup>

Open CV was referenced in Jillian Mayer's 2013 mock-Youtube makeup tutorial *HOW TO HIDE FROM CAMERAS*.<sup>77</sup> Mayer uses make-up and hair techniques to teach viewers

<sup>75</sup> Computer vision.

<sup>76</sup> An algorithm that has previously been trained to recognise faces based on a specific library of images.

<sup>77</sup> Jillian Mayer, Makeup Tutorial: HOW TO HIDE FROM CAMERAS, <https://www.youtube.com/watch?v=kGGnnp43uNM>



how to avoid facial recognition technology using Adam Harvey's CV Dazzle method.<sup>78</sup> With facial recognition algorithms used readily on Facebook to 'tag' photographs and by security agencies to analyse CCTV footage, this work playfully addresses the serious issue of Panoptic surveillance both on and offline.

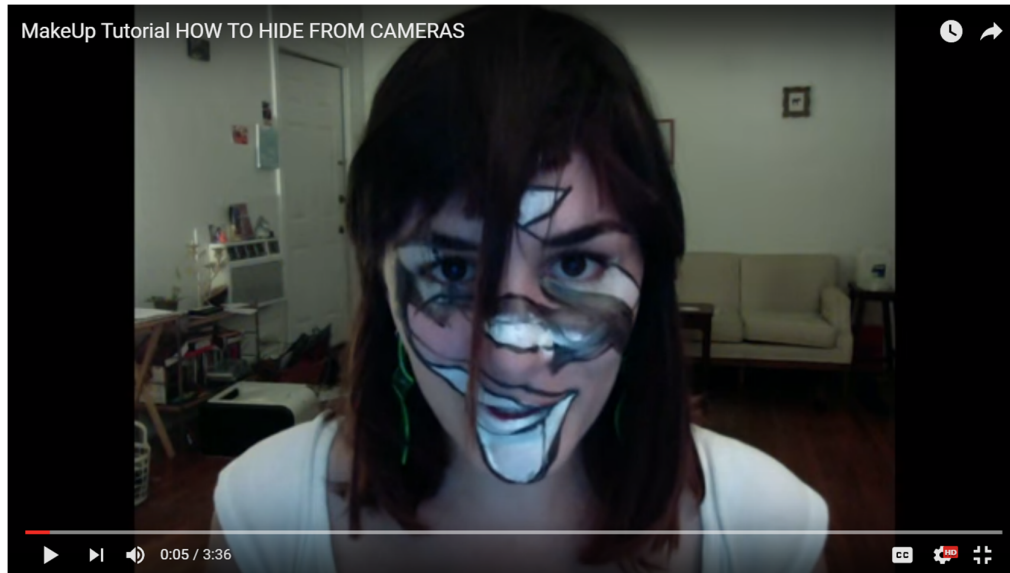


Figure 12) Jillian Mayer, *How to hide from cameras*, 2013

One experimentation with Open CV featured the security footage used in the prosecution of Aaron Swartz.<sup>79</sup> The original footage presents striking example of the Panoptic 'see/seen dyad', with the faces of university staff and police blurred out, while Swartz remains indefinitely exposed.<sup>80</sup> I experimented with Open CV and video editing to conceal Swartz's face and to symbolically re-identify the other individuals, thus subverting the institutionalised power imbalance.

A theme which arose in the autoethnographic data (Appendix D) was a mutual influence and interrelationship between the programmed works and work in other mediums. This is shown in another experimentation with Open CV programming, in which I programmed an application which overlays my *AI Zuckerberg* digital painting over any recognised face.

<sup>78</sup> "CV Dazzle", Adam Harvey, accessed 23<sup>rd</sup> October 2016, <https://cvdazzle.com/>

<sup>79</sup> The footage was made public domain after a successful Freedom of Information Act.

<sup>80</sup> Google uses similar auto-facial blurring.

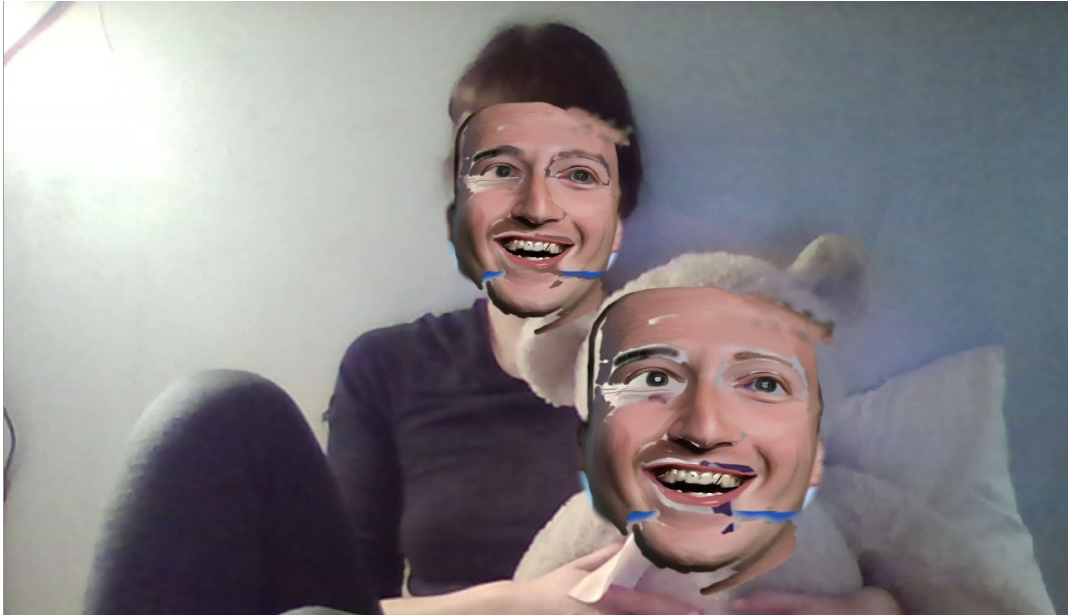


Figure13) Mia van den Bos, Facial recognition program using a digital painting, 2016

*This site can't be reached* is a work resulting from my experimentation with programming facial recognition software.<sup>81</sup> The work is installed in a dark room, with an open laptop on a plinth, and the screen image projected on the far wall. Any face that enters the vision of the laptop webcam is concealed behind an image of the Google search engine 404 error for an unused domain name 'www.identifyme.com.au'. As the literature analysis indicated, artists have the ability to reveal societal potentialities through their work, and to provide archetypal models through which to understand events.<sup>82</sup> *This site can't be reached* presents the idea that 'power today is vested not in the ability to connect and become visible, but in the ability to disconnect, to become invisible and untraceable, at will.'<sup>83</sup> This program visually advances the proposition, first explored in the video work *Exptus*, of a future in which individuals will need to engage in defensive citizen action to protect their identity from the widespread use of facial recognition technologies.

<sup>81</sup> The program I wrote is based on code by Daniel Shiffman, Greg Borenstein and Jordi Tost.

<sup>82</sup> Edelman.

<sup>83</sup> Eric Kluitenberg, "Society of the Unspectacular: Leaving Debord Behind," in *Delusive Spaces: Essays on Culture, Media and Technology*, ed. Geert Lovink (Rotterdam: NAI Publishers, 2008), 287.

The programmed facial recognition works contribute to the multidisciplinary body of work in a way that unifies both the material and conceptual realities of networked surveillance and data expropriation. This mode of direct engagement and subversion would have not been possible without an understanding of the language of code.

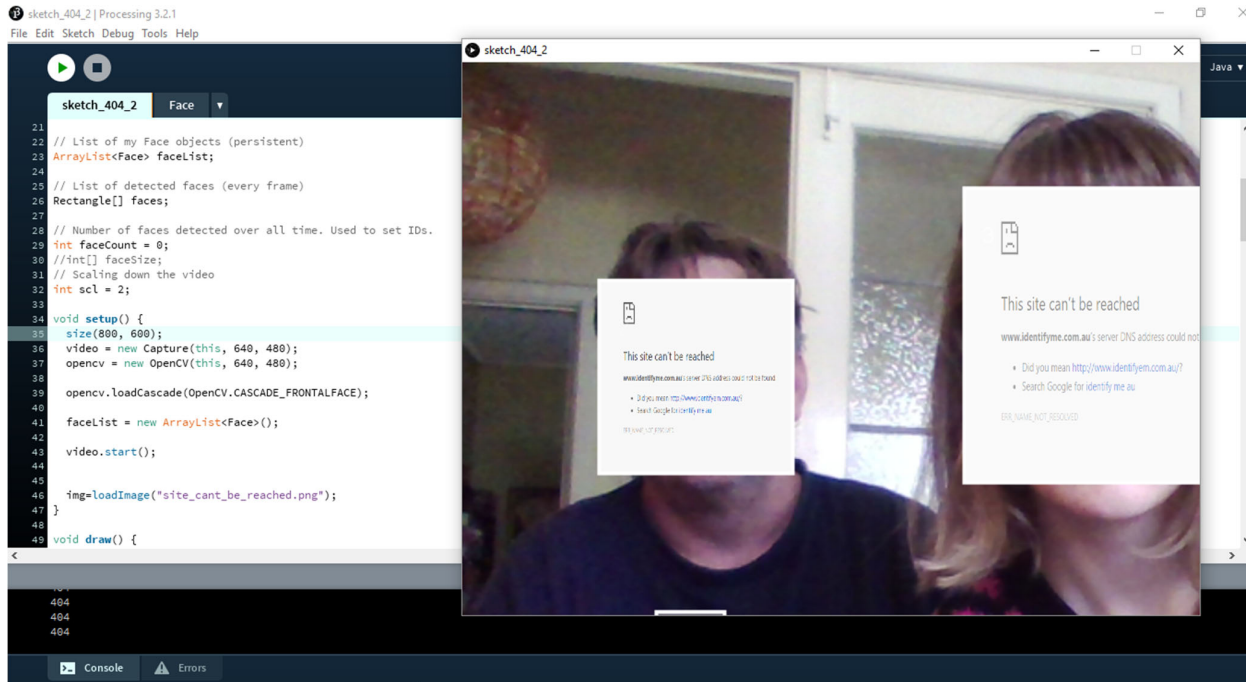


Figure 14) Mia van den Bos, *This site can't be reached*, 2016, image from autoethnographic journal

## 8.1. Conclusion

This research project was initiated by the desire to access the symbolic framework of the networked environment. The language of computers had always seemed impenetrable, a code a digital late-bloomer like me was never meant to decipher. The stimulating process of learning the Java programming language has enabled my work to match its conceptual and material aims. Having delved beneath the textual surface of the internet, I have identified patterns inherent to the medium which defines the power dynamics of the 21<sup>st</sup> century; and I have used this knowledge to create a facial recognition program which reverses its common use in Panoptic surveillance. This research has resulted in a thoroughly post-digital body of work, utilising a variety of mediums to critique corporate

networked surveillance and data exploitation. All the research artefacts are the result of the autoethnographic process of developing an enhanced digital literacy. The outcomes of this project could be applicable to other artists, providing a starting point for further research into the effects of digital skill development on their work and to advance the practice of critical coding.<sup>84</sup>

**Body text word count: 4653**

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<sup>84</sup> Pace, 6,9.

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Figure 1) Mia van den Bos, *Cynosure of all spies*, work in progress, April 2016

Figure 2) Mia van den Bos, *Cynosure of all spies*, May 2016, carved pink dolomite, paver, bouncy ball, 35 x 26 x 30 cm. Image courtesy of Grant Hancock.

Figure 3) Mia van den Bos, *AI Page, AI Schmidt and AI Zuckerberg*, May 2016, digital painting on textured plastic, 45 x 120 cm.

Figure 4) Eva and Franco Mattes, *Nike Ground (Information booth)*, 2003, accessed 27<sup>th</sup> September 2016, <http://0100101110101101.org/nike-ground/>

Figure 5) Mia van den Bos, *Silicon kloof (1 & 2)* (part of the *Visionary and Entrepreneurial* series, May 2016, cast resin, stress balls, plastic cord, 3D printed spheres, 3D printed 'Like' thumbs, cast glass, leisure clay, wire, decorative stones, shelves, scroll brackets, bathmat, digitally manipulated, dimensions variable.

Image courtesy of Grant Hancock.

Figure 6) Mia van den Bos, *Visionary and entrepreneurial*, May 2016, diamond cut acrylic, cast resin, timber, cast glass, decorative stones, plastic bag, air freshener pellets, storage basket, 60 x 110 x 40 cm

*Code painting no.5*, Processing painting on plastic, May 2016, 45 x 120 cm.

Image courtesy of Grant Hancock.

Figure 7) Mia van den Bos, *Untitled*, September 2016, digitally manipulated photographic image.

Figure 8) Mia van den Bos, *Untitled (detail)*, October 2016, burned Guy Fawkes mask, textured plastic, CCTV sticker.

Figure 9) Paolo Cirio, *Google will eat itself*, 2005, computer program and projected concept slides, <http://paolocirio.net/work/gwei/>

Figure 10) Mia van den Bos, *Expctus* (still), 2016, single-channel video, 3 mins 29 secs.

Figure 11) Mia van den Bos, *untitled animation*, screenshot from autoethnographic journal, 2016.

Figure 12) Jillian Mayer, *How to hide from cameras*, 2013, Youtube video, accessed 3<sup>rd</sup> April 2016, <https://www.google.com.au/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=teaching%20facial%20recognition>

Figure 13) Mia van den Bos, Facial recognition program using digital painting, September 2016, image from autoethnographic journal

Figure 14) Mia van den Bos, *This site can't be reached*, October 2016, image from autoethnographic journal

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## **Appendices**

### **Appendix A**

#### **Questions for Literature and Artefact Analysis**

1. What is the position of this text/artwork on Capitalist power structures and the internet?
2. What is the position on the political agency of those with computer programming skills?
3. What does this text suggest about my hypotheses?
4. How does this relate to what I have read or seen previously?
5. How do their methods relate to my methods?

## **Appendix B**

Template for coding lesson autoethnographic journaling

**Coding lesson #:**

**Date:**

**Time and Duration:**

**Learning material used:**

**What I did:**

**Reflection (feelings, thoughts, response to challenges):**

**What work have you made this week?**

**How would you judge it's critical and subversive effect?**

## Appendix C

Excerpted sections from my autoethnographic journal

**Coding lesson #:12**

**Date: 12/9/2016**

**Time and Duration: 5:45pm -10.40pm**

**Learning material used: Khan Academy – Bonus: Resizing with Variables; Learning Processing- Variables, Conditionals; own notes.**

**What I did:**

I finished the chapter on Variables in Shiffman's book. I did a version of Example 4.4 which was varying variables using values declared another variable named 'change'. So you make everything a variable and then after everything is drawn use the assignment operations '+ or – change' to alter the variables progressively, e.g. `circleStroke=circleStroke-change`; so if `circleStroke` is holding the value 255, and `change` is holding 1, then the circle stroke will change from white to grey to black over 255 runs of the `draw()` function.

I did the activities in the Resizing with Variables module on Khan Academy. This section involved fractions and knowing the order of operations for working out equations, so I did these modules in the Khan Academy Maths program because I have a very limited handle on even basic math. I remembered bits of it from school and picked up the ideas quickly enough. The module taught me how to make variables reliant on other variables, so you can resize the dominant variable and have the reliant variable change in proportion. For this you use fractions, so if you want to make a mouth resize in proportion to the face, and the face is 500, and the mouth is 100, you'd write the variable like this

```
mouthSize = facesize/5
```

I used this method to do Exercise 4.5 in which I was instructed to make an image in which all the shapes must resize themselves relative to the size() function by using the System Variables 'width' and 'height'.

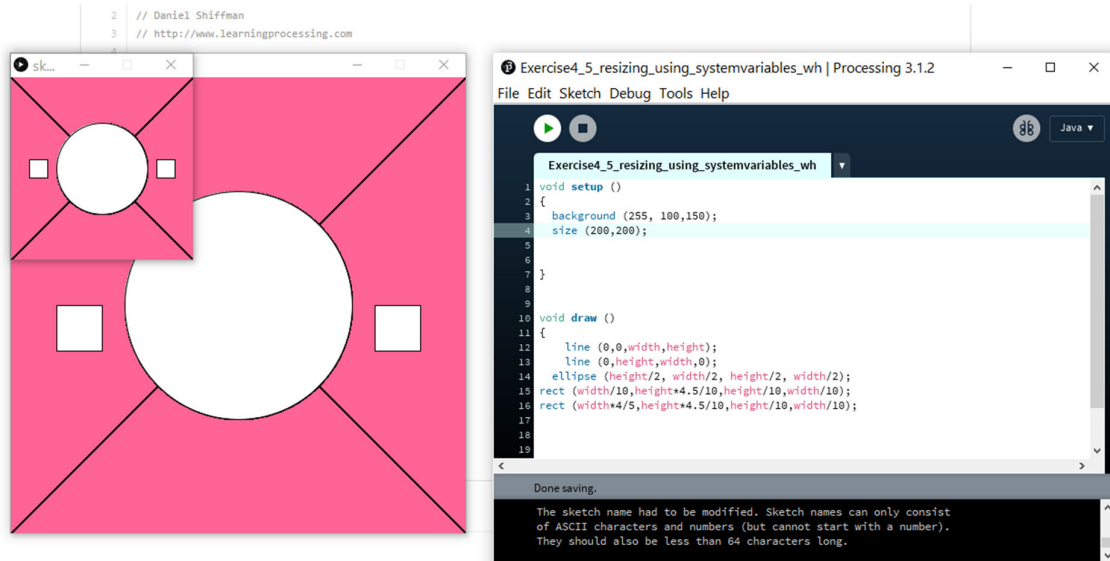
```
void setup ()
{
  background (255, 100,150);
  size (500,500);
}
void draw ()
{
  line (0,0,width,height);
  line (0,height,width,0);
```

```

ellipse (height/2, width/2, height/2, width/2);
rect (width/10,height*4.5/10,height/10,width/10);
rect (width*4/5,height*4.5/10,height/10,width/10);

```

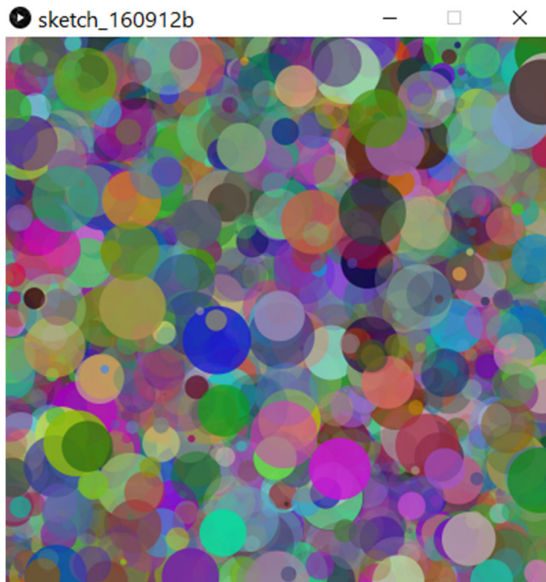
I did it like this, and it works but only if the window size remains in proportion as a square, so I'm not sure if that's right but cannot think of another way right now.



I also learned about the `random()` function. In which you can tell a floating point variable (only float, not int) to return you a random number between two numbers. You write it like this:

```
float backgroundColour = random (0,255);
```

so this random function variable will choose a new number between 0 and 255 through each run of `draw()`, so the background colour will change randomly. I created a random spot generator, where the size, colour, transparency and position of each spot is random.



I also completed Example and Exercise 4-8 remaking the Zoog creature with only variables. This Zoog is positioned based on the System variables of width and height, Zoog moves up the screen using a `zoogY-1` assignment operation and Zoog's eyes rapidly change colour by using the random function assigning the RGB values.

e.g. `eyeR=random(255)`

`fill (eyeR, eyeG, eyeB);`

I worked out how to make Zoog shake left and right as it moved up the screen by using the assignment operation `zoogX=random(95,105)`; in the `draw ()` function. I first tried it by changing the original declaration of the variable in `setup ()` but that only chose it randomly once, so it didn't shake. But reassigning it a value in `draw ()` worked perfectly.

I started reading the Conditionals chapter, If/else etc. but haven't tried anything out yet.

**Coding lesson #: 13**

**Date: 25/9/2016**

**Time and Duration: 2:05- 4.30pm, 6:00- 8.30pm**

**Learning material used: Daniel Shiffman's Learning Processing- Chapter 5 Conditionals**

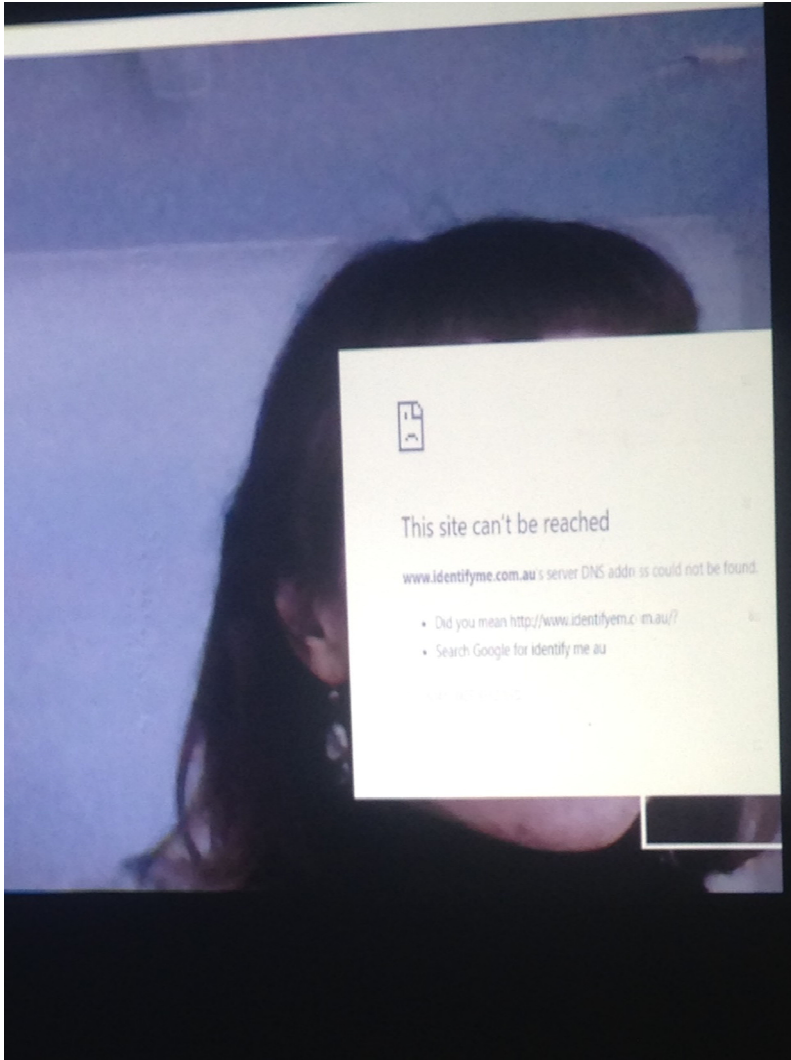
**Reflection (feelings, thoughts, response to challenges):**

I'm really really proud of myself for doing some maths learning and using it in coding, and am amazed to find myself finding math exciting now that it has a purpose and meaning for me – to help me program. I was math phobic throughout school to the point of refusing to engage with it, I just saw no point, I didn't care about measuring things or working out equations and saw no relation to my real life. It seemed overly abstract. I guess I was just never exposed to what math can actually be about, and what it can be used for.

The random function really blew my mind, I couldn't believe it. I am really excited about this. The randomness and relying on chance aspect relates to work I was producing a couple of years ago with Ashleigh D'Antonio, where we were creating a drawing machine out of our relations

using a system based on rules and various tools like laser pointers. The whole idea of it was that it could be at once dictated by rules but it's products should also be completely unpredictable to either one of us, as there are two wildcards in the system, humans. The idea was that the drawings produced were the product of neither one of our vision or 'genius'. The random () function works kind of the same as this process, but the wildcard is the computer. I give it parameters and it makes a series of choices I have no control over. Is this where autopoiesis starts?

### What work have you made this week?



I edited the OpenCV facial recognition program I've been working on (based on a Daniel Shiffman example program and helped during a tute with my supervisor). I used Daniel Shiffman's workbook chapter on Images to work out how to put an image in over the face, I tested a few options, including just a black square and frosted glass but then got the idea to use a 404 error page. I had to find an unused URL, I found one at [www.identifyme.com.au](http://www.identifyme.com.au) and screenshotted the error page.



This is the first purely art work based (not following any exercise whatsoever) project that I've made in code and I'm very excited to have enough of a grasp of the basics to be able to do this. I can experiment and improvise with existing code, reverse engineering what they've done even if I don't have any background knowledge of the concepts and I can problem solve when something goes wrong.

**How would you judge it's critical and subversive effect? Critical (questioning, analysing), Subversive (undermining, disruptive, troublemaking)**

This work's critical and subversive effect is high. The idea of this work is to provide a prototype of how a person with basic computer programming knowledge can use their skills as a form of defensive action against networked surveillance.

I wouldn't have been able to critique and actively subvert this phenomena in such an interactive and engaging way without these skills, as it demonstrates specifically that the algorithmic medium that has enabled mass facial recog surveillance could also be used to prevent it. It's a work where the medium is so inherent to the concept and theoretical discourse surrounding it. I now have a key into this world and a felt, tactile understanding of the processes that create the backbone of the political and economic structures I am critiquing.

It needs more work, making the screen big enough to project, and the code picks up a lot of stray faces, but it's a good start. Not sure if I'll keep the 404 error, was also thinking of doing a mask, or I could use a changing aspect, like the face blacking out using conditionals, logical operators and boolean variables.

## Appendix D

List of themes arising in the journals using Grounded theory open coding and rate of occurrence

<b>Themes that arose in the autoethnographic journaling</b>	<i>Frequency</i>
Experimentation and creativity using acquired knowledge	12
Frustration with coding being time-consuming	9
Building on programming skills already learned	9
Excitement & enthusiasm	8
Enjoyment	7
Amazed by programming	7
Successfully problem-solving and 'debugging' code	5
Creating work with high critical and subversive effect	5
Putting unrealistic expectations into perspective	4
New attitude towards and use of mathematics	4
Achieved mastery over a specific programming skill	4
Synchronicity between programmed works and work in other mediums	3
Sense of pride and achievement	3
Programming skills creating new possibilities for work	3
Previous arts training impacting how I learn and experience coding	3
Inability to understand	3
Feeling supported by supervisor	3
Feeling of personal mastery	3
Discovering unexpected sublime beauty in code	3
Having enough knowledge to create my own projects	3
Working intuitively with code	2
Thinking ahead to potential artworks using programming skills	2
Stressed	2

Revision and reflection aiding learning process	2
Feeling of an inaccessible world opening up	2
Concepts and methods from programming translating into work in other mediums	2
Change in structure of pedagogy	2
Understanding the practical uses of computer programming skills	1
Reverse engineering other's code	1
Programming skills contributing to understanding of political economy of the internet	1
Recognising progress	1
Optimism	1
Lack programming skills	1
Finding ways to expedite learning process	1
Feeling stupid	1
Equality of access to technology	1
Exceeded personal expectations	1
Developing confidence	1
Curiosity	1
Bored by debugging	1
Tactile understanding of the process of programming	1
Socio-economic background of family influencing view of technology	1