Chapter 10

Signs of Surveillance

Daniel Buzzo

Abstract This chapter discusses the challenges of working with complex digital information, visual images, meta-data, and temporal and geo-spatial information, as raw materials for artistic expression. In the chapter the reader will have an insight into the thought process and working practice, artistic and technical, of forming information into a recognizable body of work and processing both the content and the form of the work into an emotional, reflective experience. It not only discusses the challenges of working with external, commercial software frameworks and web services and the challenge of dealing with the brittleness of digital things but also the ‘semantic affordance’ offered by computer systems in working at a conceptual level with art materials. The ‘Signs of Surveillance’ project originated as a photographic observation and collation activity in early 2015 and has grown to a complex digital web and installation live visualization project. Since that time thousands of photographs of signs of surveillance and the warning signs, indicating an area or activity is being monitored by video-camera, have been captured in more than 15 countries, including Belgium, Canada, China, Denmark, France, Germany, Greece, Italy, Japan, Korea, Luxembourg, Netherlands, Portugal, Spain, Sweden and the UK. This chapter discusses the development of one aspect of this multi-part work, dealing directly with managing and manipulating a large body of digital data and working with complex visualization systems and online and offline digital distribution technology.

Keywords Digital art • Media art • Installation • Semantic affordance • Digital brittleness • Surveillance society • Derive • Geo-location • Web technologies • Visualization

10.1 Introduction

The pervasive nature of surveillance, as well as the normalization of the signs of it—both physical and metaphorical, is arresting when it is laid out how clearly intertwined this silent over-watch of endless surveillance cameras has become with our everyday

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lives. Across Europe and the wider globe, surveillance of the body public, of civic space, of every interaction in everyday society appears at some kind of saturation point.¹ In 2015, the then UK Information Commissioner, Tony Porter, himself a former counter-terrorism officer said:

The lack of public awareness about the nature of surveillance troubles me

and as Matthew Thomas wrote in the Guardian newspaper, quoting Porter:

[it] risks changing the “psyche of the community” by reducing individuals to trackable numbers in a database

This is despite strong evidence that the publicly stated goals of civic safety and crime prevention are not being fulfilled [25]. The 2005 UK Government Home Office Research, Development and Statistics Directorate concludes in its official report, ‘Assessing the Impact of CCTV’ [14] that:

the CCTV schemes that have been assessed had little overall effect on crime levels [...] CCTV is an ineffective tool if the aim is to reduce overall crime rates and make people feel safer. The CCTV systems installed in 14 areas mostly failed to reduce crime (with a single exception), mostly failed to allay public fear of crime (with three exceptions) and the vast majority of specific aims set for the various CCTV schemes were not achieved.

In 2004, Richard Thomas the then UK Government Information Commissioner warned [2]:

My anxiety is that we don’t sleepwalk into a surveillance society where much more information is collected about people, accessible to far more people shared across many more boundaries, than British society would feel comfortable with

Making a comparison to the collection of vast quantities of information on individual of Franco’s fascist state and the eastern European communist regimes, he added in response to the question of whether there was a risk of Britain following this route,

I think there is a danger. I don’t think people have woken up to what lies behind this. It enables the government ... to build up quite a comprehensive picture about many of your activities.

It is against this confusing and disturbing backdrop that this project asks a question of the surveillance colonization of the physical environment around us by building, visualizing and exploring an international database of signs of surveillance. These seemingly ubiquitous information/warning displays come in all shapes, sizes and designs, while often appearing helpful or informative is actually (in the UK at least) part of the legal obligation, largely unknown by the public and ignored by operators,

¹In its 2013 report, *The Picture Is Not Clear: How Many CCTV Surveillance Cameras Are There in the UK?* [3] the British Security Industry Association (BSIA) suggested that camera numbers in the private sector could outnumber those used by public bodies by as much as 70 to 1. The BSIA survey covered the whole of the UK, not just London, and its maximum estimate suggested there was a CCTV camera for every 11 people in the country though it said the most likely figure was closer to one for every 14 people.

on any operator or installer of a CCTV surveillance camera. The Information Commissioners Office (ICO), the independent UK authority, explains in the guidance ‘CCTV filming carried out by others: What can I expect?’ [23]

The CCTV operator must let people know they are using CCTV. Signs are the most usual way of doing this. The signs must be clearly visible and readable, and **should include the details of the organization operating the system** if not obvious. (emphasis added)

CCTV should only be used in exceptional circumstances in areas where you normally expect privacy—such as in changing rooms or toilets, and should only be used to deal with very serious concerns. The operator should make extra effort to ensure that you are aware that cameras are in use.

As can be seen from the corpus of collected images in this project, this point that CCTV warning signs ‘*should include the details of the organization operating the system*’ is one that is notable when operator information *is included* rather than when it is absent, such is the apparently casual attitude to the use of CCTV and any adherence to privacy or regulatory policy.

This growth of surveillance and reactions to it, rather than being a recent phenomenon, has been going on for nearly three decades. Several artists and projects have worked in this area; notable amongst them are recent projects such as ‘Art and Surveillance’ lead by Susan Cahill in Canada that collates artistic projects on surveillance [8] and older ones such as <http://www.spotthecam.nl> created in early 2000s by Maurice Wessling and Bits of Freedom² in conjunction with the Waag Society in Amsterdam, Netherlands³ and the ‘Surveillance Camera Theatre’⁴ from the Surveillance Camera Players [24], an informal activist theatre troupe formed in 1996 in New York City between Bill Brown and Michael Carter. Carter, in his 1995 manifesto ‘The Guerrilla Programming of Video Surveillance Equipment’ [9], proclaims:

It is important to remind oneself of the relationship between the eye of the media and that of the corporate police state – for they are both the guardian of the commodity, however nebulous and ephemeral that commodity may become. As a tactic designed to point out the paradox of a system that turns the lens on a public that has been taught to place more importance on images recorded by cameras than images seen by their own eyes, we propose *Guerilla Programming of Video Surveillance Equipment* (emphasis added).

As a photographic observational project, the existing corpus of images of ‘signs of surveillance’ comprises over 2000 digital photographs taken across the globe between 2015 and 2019. Each image contains date, time and geo-location meta-data allowing geographic mapping and search and retrieval in a variety of ways. The whole project has several elements:

- A compendium of the designs, locations and forms of the myriad of sign-types in the collection (see Fig. 10.1)
- A traditional digital photographic print exhibition

²<https://www.bitsoffreedom.nl>.

³<https://waag.org>.

⁴<http://www.notbored.org/scp-how-to.html>.

Fig. 10.1 Example of the variations and number of different sign shapes, designs and forms from numerous countries

- An interactive 3D geo-map-based visualization
- An online web-based searchable catalog that asks for public contribution to extend and complete the European map of Signs of Surveillance
- Training a machine learning system on the corpus of signs to enable automatic sign recognition.

This chapter deals with the development of element number three, the development of an interactive, dynamic 3D geo-map-based visualization of the photographic collection.

10.2 Process of Gathering Raw Images and Meta-Data

The process of gathering raw images for the collection of photographs of signs of surveillance began as a non-verbal act of noticing, in noticing the apparent overabundance of these signs in public spaces. After noticing came the wordless desire to evidence that noticing, to collate and compare, to contrast and reflect, to investigate if the feelings of noticing were borne out by actual evidence—in this instance the evidence being the collation of photographs recording the signs. This process of observation and recording as basic research, and raw material, is common to many artistic practices, and is a recurring theme I use to undertake non-verbal investigation of items of importance I see in the world around me. In some ways I use the camera as one would use a microphone to take field recordings for later study in the studio. In this work the gathering of images made the proliferation of these signs in public spaces abundantly clear (see Fig. 10.1); partly as the act of looking for them became habit, partly as my subconscious eye became trained to see these small icons, images and visual devices and the kind of places they would appear high up on walls of large buildings, low down on shop doorways, in the entrances and lobbies of offices and houses. The act of looking also revealed the signs in unexpected places, among piles of pastries in display cabinets, buried in hedges and flower beds in residential gardens, on the sides of cars, buses, trams and trains, and on vending machines and garden sheds.

10.2.1 *Building Semantic Affordance with Artistic Raw Materials*

In the process of gathering the photographs, extending the corpus of images from country to country as I traveled while engaged in work on other projects, a feel for the body of work began to emerge. The feeling of emergent, artistic, comprehension is the one that I recognize when undertaking works of almost any sort, from extended drawing studies of scenes (see Fig. 10.2) or objects to wrestling with the philosophical

Fig. 10.2 Example of extensive use of drawing for exploration and visualization, here showing early explorations of using image meta-data and tagging to map-tile backgrounds

aspects of how best to structure a system when incorporating dense computer code (such as the Volca project [6, 7] or the Time Machine [4, 5]).

This understanding is the developing of a cognitive, sensory and implicitly non-verbal relationship with the materials and ideas or objects under scrutiny. It is a feeling of what I call ‘semantic affordance’, in that one feels an innate ability to cognitively manipulate the essential conceptual elements embodied by whatever is the subject of scrutiny. This affordance gives a direct fluidity and competence that allows further examination and contemplation of the materials at hand at a conceptual and ontological level. This affordance or agency to manipulate the conceptual elements embodied by the material under study could be seen as the central activity in my artistic practice. It is through this level of deep non-verbal understanding of the manifold semantic concepts seen held within objects and materials that inform the aesthetic choices that are made when re-formulating materials in the preparation and creation of artistic outputs. As the artistic outputs are imagined, sketched, produced as maquettes and prototypes, a re-connection to the original non-verbal enquiry is sought. The process is a search to close the loop from initial observation, non-verbal comprehension, manipulation and synthesis of conceptual structures to a final embodiment of concepts as an intervention into the physical world. The answering of the initial question and the final scratching is a mental itch. In this sense the works are predominantly conceptually driven and operate at a physical level in the

conceptual rather than technical or decorative world. As Shanken [21] raises in ‘Art in the Information Age: Technology and Conceptual Art’, although the divisions between conceptual art and technological art have generally been seen as in conflict, he explores the view that while the history of technological art has been seen as separated from that of conceptual art both were rooted in experimentation and re-interpretation and proposes a re-thinking of their status as separate and divorced from each other. He quotes Sol Lewitt’s 1967 essay ‘Paragraphs on Conceptual Art’ [16] where Lewitt describes conceptual art as a quasi-mechanical process:

In conceptual art the idea of concept is the most important aspect of the work . . . [t]he idea becomes a machine that makes the art.

It is this very idea that drives my quest for these conceptual affordances in the work, which allows mental structures to be created from which the art creates itself. The arena of the technical in part is a desire to work unbounded by both convention and the patina of the physical that seem part and parcel of other mediums of expression. The ‘active’ nature of technology allows for embedding, encoding and subsequently animating these ‘*conceptual machines to make art*’ into the systems underlying the physical surface of the work.

10.2.2 *Gathering Images and the Dérive*

In this project the initial activity was a process of subconscious harvesting, conducted as an ongoing photographic *dérive*, a drift, though the world we inhabit with a watch for these signs of surveillance that had now become artistic items of interest. Guy Debord, French philosopher and author of ‘The Society of the Spectacle’ often associated with Situationist International,⁵ describes the *dérive* as:

a mode of experimental behavior linked to the conditions of urban society: a technique of rapid passage through varied ambiances [13]

Over the period beginning with the first photograph of the series, taking in Lisbon in June 2015, and lasting through 15 countries and more than four years over 2,000 images of signs of surveillance were recorded in *dérive* fashion.

10.3 Managing and Manipulating Large Digital Image Corpses as Artistic Raw Material

Dealing with materials gathered using digital tools as the subject of artistic study has a number of opportunities and also challenges. Some of these are common to the practice of much artistic research and some unique to digital materials. Digital

⁵<https://www.tate.org.uk/art/art-terms/s/situationist-international>.

materials, while fluid, flexible, malleable, and almost instantaneously duplicable and transferable, are also at their core, inherently brittle. Their flexible, immaterial, nature and their ability to be versioned, trans-coded, summarized and edited means that any notion of an original is fleeting and slippery. Attempting to trace the origin, and original of a digital document, is like grasping at a ribbon blowing in the wind. Partly this is the nature of sampling the world with digital, that is, numerical processes. It is important to remember that the sampling process is fundamentally divorced from techniques of the analog recording realm.⁶ The connection with the place and instant of creation is fleeting, and beyond the memory of the place and time that a button was pressed or a menu item clicked the digital object has no patina or evidence of its place or moment of creation.

10.3.1 Meta-Data and Artistic Data Management

All digital artifacts have meta-data, that is, there is data about the data. There is information about the information contained inside any digital document, be it sound file, image, text, video or software code. What is unusual is that in the digital realm this meta-data is built of the same substance as the material it describes. In the instance of this project each image was recorded with meta-data describing the image. There are basic facts associated with any digital files, for example, creation date, modification date, byte size of the file, name, filetype and the current location of a document in a specific computer system. There also, commonly, exists within image files additional data using the EXIF (EXchangeable Image File format) standard.⁷ The EXIF data standard was originally introduced by The Japan Electronic Industries Development Association (JEIDA) in 1998 and is widely adopted as a standard to store extended information about digital photographs. This meta-data commonly includes information about the make and model of the apparatus or camera used for the original recording and extends to information about lenses, flash, aperture and shutter speed of the recorded image. The meta-data also includes contextual or circumstantial data including the date/time of the image capture and increasingly common with images taken with smart phones and the latest generation of hand-held cameras, the geographic meta-data, expressed as latitude, longitude and altitude. This EXIF data and specifically the associated geo-location data became of particular interest in the course of this project and is processed and manipulated heavily in the final artworks produced as part of the work (see Figs. 10.3 and 10.4).

⁶Sampling puts a mesh to the world and encodes numerically, explicitly sampling reality at positions on a pre-defined grid—the only parameters of this crude and bombastic approximation are the frequency and resolution of the grid and the depth of the data captured or sampled at each point. All information, texture and nuance between the sampling points of the grid are simply ignored or disposed of.

⁷<https://www.exif.org>.

Fig. 10.3 Early map visualization using C++ and openFrameworks with spline paths generated following chronological order or recording of individual images. Here showing walks through Kyoto, Japan over a three day period in 2018

Fig. 10.4 Early map visualization using C++ and openFrameworks with spline paths generated following chronological order or recording of individual images. This version utilizes only geo-location and temporal data from each image

10.4 Developing Artworks Combining Hand-Coded and Industrial Digital Tools

Developing artworks utilizing technology, whether that be industrially mass-produced physical materials such as paint, canvas, glass-fiber, electronics or software involves a level of compromise and negotiation with the materials an artist chooses to engage with. Being restricted to colors manufactured by a supplier, being constrained by the retail costs of a device or being challenged by the features available in a software API are all within the same canon of challenges faced by artists working in many contemporary contexts. As an artist regularly working in depth with technology, and software specifically, this challenge of adapting, working with, fighting with and customizing industrial products is a regular occurrence. Part of the aesthetic of much technology orientated art is this engagement with, and subversion of, industrial products, situating them in new contexts and utilizing them in new and novel ways. Implicitly tied to this aspirational goal of both mastery and subversion comes a challenge within the practice of making art with technology, one that is endemic to all art but is amplified exponentially when engaging with software. This challenge is the negotiation, both in production and distribution of works, with the inherent brittleness of digital things.

10.4.1 *On the Brittleness of Digital Things*

As all physical things decay and change under what appears to be the effect of time,⁸ so do digital ones, and this decay is seemingly at a rate inversely proportional to the power of digital material. Just as a digital image can be spread around the world and seen and manipulated by a billion people simultaneously it can also collapse, cease and disappear with equal speed. A server outage, a power failure, a change in the software application programming interface (API)⁹ or even the simple act of

⁸One could begin a lengthy discussion in the nature of the perception of time, correlation and causality. Suffice to say that in most practical and functional aspects it would appear that as Stappers and Giardi point out in their work on designing for temporal context [22]:

The most important thing designers should know is that there is no such single thing as time.

As Carl Sagan says “[Time] is profoundly resistant to simple definition.” Discussing the nature of time, Sagan, in an interview during the making of NOVA’s TV program ‘Time Travel’, goes on to note [20].

Ever since St. Augustine, people have wrestled with this, and there are all sorts of things it isn’t. It isn’t a flow of something, because what does it flow past? We use time to measure flow. How could we use time to measure time?.

⁹In computer programming, an application programming interface (API) is a set of subroutine definitions, communication protocols, and tools for building software. In general terms, it is a set

applying a seemingly unrelated operating system update can bring digital artworks, not to their knees, but to a state of ceasing to be. Though digital files and lines of software code may still be intact, software art, like video art before it, is performative and temporal; it exists at the moment of viewing; it needs to be run, to execute, to function and to fulfill its promise as art. This base need of instantaneous creation, to generate itself at the moment of viewing by an observer, is the challenge, excitement and weakness at the heart of digital artworks. *Bit Rot*, [10, 15] or occasionally *Link Rot*,¹⁰ is described by Coupland in his 2016 book of the same name [12] as:

the way digital files of any sort spontaneously (and quickly) decompose

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and is ‘a slang term’ for hypertext links that are broken. Link rot is created when a web page is moved, taken down or re-organized. Clicking on a rotten link usually results in a 404 error, which includes a message that the page cannot be found. This ‘digital decay’ affects all computational systems and is in equal parts the ventral thrill and motivation and also an ever-present challenge in digital art making. As the internet pioneer Vinton Cerf observes [10]:

There is something ultimately satisfying about keeping information in digital form... But this blissful outlook may not comport with the reality of digital information preservation and interpretation.

In the context of this artwork I am writing about—sat in seat 6c on a flight to Lisbon, tapping on a tablet computer (and now weeks later re-editing on a subway train under Hong Kong harbor)—hoping that what I write here will synchronize flawlessly with the master version for this document so I can continue on my laptop at home, or the desktop computer in my office or the myriad of other computers I have in my two studios—the challenge of working with industrial tools in the making of signs of surveillance has been great. Both in the practicality of the making of the

of clearly defined methods of communication among various components. A good API makes it easier to develop a computer program by providing all the building blocks, which are then put together by the programmer. An API may be for a web-based system, operating system, database system, computer hardware or software library. An API specification can take many forms, but often includes specifications for routines, data structures, object classes, variables or remote calls. POSIX, Windows API and ASPI are examples of different forms of APIs. Documentation for the API is usually provided to facilitate usage and implementation. (<https://en.wikipedia.org/wiki/Applicationprogramminginterface>).

¹⁰<https://www.techopedia.com/definition/20414/link-rot>.

work, designing, programming and forming it, and also in the conceptualization of it, the philosophical and aesthetic decisions underpin it structurally. This arena is the ill-defined and rarely talked about area where semantics and ontology meet engineering, where philosophy becomes embodied in systems and structures and ways of doing things. Just as William Gibson says [1] with incisive clarity:

We can't see our culture very well, because we see with it

Perhaps this sentiment is distilled to its essence in the Japanese anecdote that 'to a hammer, everything looks like a nail'.

10.4.2 *Aesthetics, Frameworks, APIs and Ontologies*

When looking through the gathered body of work, mentally sitting among the thousands of photographs from around the world, and reflecting on the journey of collection and understanding, a non-verbal set of connections start to be made, there begins to form an ontological framework of what is and what is not, what does go and what does not when considering, comparing, organizing and arranging the material. Alongside the challenges in managing digital collections, of cataloguing, versioning, trans-coding, naming, renaming and duplicating and archiving, there is the selection of applicable tools to manipulate these non-physical collections of *things-that-may-be*.

In the development of the work the public exposure of the meta-data inside each image became increasingly important in relating an individual item in the collection to the whole. Beginning with a process of drawing, commonly with ink on paper, ideas of collating, relating and visualizing this relationship, between individual element and the whole, took shape. Sketching ideas in code, using the C++ toolkit, openFrameworks,¹¹ a sense of the dynamic in the material came to the fore. Initially the project was an observation and *dérive* exercise and at a certain stage it transformed into a discussion with the gathered material. As is of often the case in life drawing, one starts with mark making in reference to the subject being observed but at some point crosses into mark making in reference to the body of marks one has made on the paper or canvas. Adding to or subtracting from a growing object that begins to exist independently of that which is originally observed. This is the point where a piece of work develops its own life or emergent identity, one that is divorced from being a facsimile of the original scene.

After working with initial crude mappings of the geo-located images into 3D space using geometric primitives and texture mapping of a variety of representations of the earth's surface a move to a more complex visualization was needed. To access high-resolution maps and images of the surface of the whole earth necessitated engaging with external data sources, initially continuing working writing code

¹¹'OpenFrameworks is an open source C++ toolkit designed to assist the creative process by providing a simple and intuitive framework for experimentation' (<https://openframeworks.cc/about/>).

in C++, the open-source online OpenStreetMap (OSM).¹² Geographical information system (GIS) database was accessed through its web-based API.¹³ While this brought huge flexibility and access to a wealth of visual and meta-data about the earth it added a subtle but pivotal disjuncture in the work. Even though the code was still handwritten C++, compiled to run locally as an executable binary application on a specific machine, the work now had a brittle chain of failure built into it. The work now became reliant on an internet connection, reliant upon a connection of sufficient bandwidth to the outside world and at the other end of a chain of routers and connections. It was reliant upon the servers at OSM being available, and that the access restrictions and protocols of their API, and the data in their underlying database were available and had not been altered, patched, upgraded or had their license of use changed. What also began to happen is that the underlying ontology, the causal philosophy of the interrelation between elements, images, ideas and concepts that was embodied in the architecture of the software I was writing changed. The attitude and values in the project, the structure, classifications and ontology that was emerging, was codified in its most concrete form in the classes, methods, functions, loops, arrays, iterators and variables that scaffolded and guided the work to become at the moment of performance. By engaging with this external API, and the underlying philosophy, attitude, ontology and expectation encoded within it, it there began and evolving and protracted negotiation on how to navigate the external conceptual space without becoming overwhelmed hegemonistically¹⁴ and becoming merely an extension of it. Illustrating what it could do, rather than a master of it demonstrating what I could do with it, sculpting it to my will and the will of the evolving work. This conundrum is somewhere between the Sapir-Worf hypothesis [17] on how language shapes thought and conceptions of one's reality and the ominous words of Friedrich Nietzsche when he said [18]:

Whoever fights monsters should see to it that in the process he does not become a monster.
And if you gaze long enough into an abyss, the abyss will gaze back into you.

This negotiation for control became a battle, metaphorically, for the ground under the project, and this external empire of protocols and ontologies and the emerging

¹²<http://www.openstreetmap.org>.

¹³Utilizing the openFrameworks add-on ofxMaps (<https://github.com/bakercp/ofxMaps>). ofxMaps creates an interface to OSM in the 'SlippyMap' style (<https://wiki.openstreetmap.org/wiki/SlippyMap>). It is written and maintained by Christopher Baker.

¹⁴The Encyclopedia Britannica describes Hegemony as the dominance of one group over another, often supported by legitimating norms and ideas. The term hegemony is today often used as shorthand to describe the relatively dominant position of a particular set of ideas and their associated tendency to become commonsensical and intuitive, thereby inhibiting the dissemination or even the articulation of alternative ideas. The associated term hegemon is used to identify the actor, group, class or state that exercises hegemonic power or that is responsible for the dissemination of hegemonic ideas. (<https://www.britannica.com/topic/hegemony>).

artwork—using C++ but communicating into a web-based world, using http transport¹⁵ layers—began to shape, not only what was being said but a shift linguistically into the world of web technologies. That is not to say that the possibility to stay in the dialect I was writing in was not available, it was entirely, but the challenge would be to re-write for myself the additional tools, utilities, libraries and processes I was beginning to rely on to achieve the realization of my increasingly complex and specific pen and ink drawings of the project. Just as a decision to make your own paint becomes a significant part of the work so does the decision to make one's own digital tools.

As Richardson discussed in his 1998 article 'New Media, New Craft' [19] reflecting on what the status of new digital tools may be in an art context:

Using programming to create a piece of art or design requires an abstraction of thinking, translating the idea of the final visual form into a structure required to create the work. A leap of understanding is required to translate a creative idea into a piece of code. Creative ideas and solutions are thus abstracted into structures and objects that are natural to the computer material. Such an understanding of material subsequently creates work that echoes the invisible structure of the code

Richardson goes on to add:

The use of programming, as a way of manipulating and understanding the new material, also represents the means by which artists and designers are able to get closest to the virtual material. When they use programming to create a visual work, the underlying process and structure become of fundamental importance. The invisible structure of the work becomes as significant as the final outcome. The work experienced by the viewer is a visual translation of the underlying framework and mental engagement of the artist or designer with the material.

This challenge, between using available tools, and traveling further, faster and making everything from scratch for oneself, perhaps risking re-inventing the wheel having taken years to learn how to best make a wheel, is common to many artistic endeavors but never more so than in self-coding digital artworks. Richardson continues pointing out the difference that hand-crafted digital tools make in the conceptual understanding of any artwork:

In direct contrast to the post-modern point-and-click, cut-and-paste approach to creating a piece of creative work, the use of programming requires that a framework is firmly established, around which the work is built.

Having made strategic choices and seen where the project wanted to go, and how it could be formed in a way that allowed it to talk for itself, investigations of middleware frameworks and software libraries began in earnest. Moving parts of the codebase into java script and using the browser as interpreter and platform wheel, rather than the byte code produced by CLANG or the GCC C++ compiler

¹⁵http, or hypertext transport protocol, is a computer protocol that is used to allow clients (commonly web browsers running on users computers to request and subsequently receive text, image, audio and video data from web servers).

allowed easy integration with online utilities I was already using, such as map-tiles¹⁶ of satellite and geo-political imagery and reverse geo-coding.¹⁷ This easy ability to communicate with remote functions, features and data comes with an additional cost beyond the loss of independence, self-reliance and overall stability (see Fig. 10.5).

Fig. 10.5 Browser based version written in JavaScript using leaflet.js showing early tests with meta-data extraction and visualization

¹⁶Map-tiles are a way of breaking large GIS-orientated datasets such as maps into smaller fragments that can be called and used as needed, remedying the need to load large datasets as monolithic pieces. A calculation is made of the geo-location that is of interest, the scale that the map is to be viewed and the size of the viewing port (or in our instance, web browser window); a series of request are made; the map-tile server and the corresponding map fragments are returned as individual files and then tessellated in the viewer.

¹⁷Reverse geo-coding is the ability to take a specific geo-location, commonly expressed in latitude and longitude, and return a descriptive physical world location. For example, the a reverse GeoCode request for the location 52.356991666666666, 1.2931251573910854 is returned as Oostpoort 12, Waldenlaan, Winkelcentrum Oostpoort, Amsterdam, North Holland, Netherlands, 1093NH, Netherlands by the OpenStreetMap database functions that allowed the work to turn the GPS latitude and longitude data inside individual images into named localities with street town and country data.

In this instance it carried a commercial one. Although I was using a free developer account for one of the major mapping utility providers, the monthly usage limit was quickly reached for data requests. Due to license limitations on usage of the data that was provided, it was not legally possible to cache data between sessions of usage, nor store it in any long term or permanent way. This necessitated performing a reverse geo-code lookup for the locations of images each time the project was viewed or run, necessitating over 2000 calls to the remote API each time. Although the cost of an individual reverse geo-code request was only fractions of a cent per request, this added up to a cost of USD2 every time the work was viewed. The map-tile imagery requests came in addition to this cost. Looking at open-source alternatives became complex, while the service cost was free and the license terms far less restrictive in the data servers were not configured for heavy use, resulting in the servers banning the IP address of the requesting machine after the first few hundred geo-code requests. A strategy was developed to pre-request and cache the geo-code data and serve it from a self-hosted server by writing a script that requested the relevant information from the open-source server at a deliberately slow, throttled rate and writing the returned reverse lookup data to a local file in geoJSON format.¹⁸

This conformed with both the terms of use of the open-source server and also its license on use and retention of data. The second challenge was on how to deal with the mapping data being requested from the commercial provider. Open-source map data providers, understandably, were unable to supply maps data in the quantities the project needed and also separated the idea of individual users of the service from the creation of applications that would use the service. Unfortunately, there appear very few instances of a middle ground for artistic or non-profit uses of open-source services putting most artworks or projects that use third-party services or data firmly into this arena of being classed as commercial users and being charged accordingly.

One of the options available within the license terms for the core corpus of map image data—the smaller version being in the region of 65gb of image tiles—was to clone the data needed and set up and operate a web-based map data server specifically for the project. This added a layer of technical complexity and a certain amount of unnecessary redundancy but afforded a break from the reliance on commercial providers and also added the possibility of generating a machine-specific version that could run as a single instance of the project with all necessary data held locally. This would remove the requirement for an internet connection for a greater level of autonomy. This involves setting part of the host computer to operate as a web server

¹⁸GeoJSON is an implementation of JSON (JavaScript Object Notation) that encodes geographic information in text form as nested objects, typically containing a latitude and longitude geometry reference optionally followed by additional data. In our instance the data encoded includes details of the EXIF camera data relating to images and their recording location. An example of typical GeoJSON entry will look similar to the following: “geometry”: “type”: “Point”, “coordinates”: [4.927913888888889, 52.356991666666666, 1.2931251573910854], “type”: “Feature”, “properties”: “url”: “sign6.jpg”, “date”: “2018:04:30 10:07:09”, “orientation”: 6, “make”: “Apple”, “model”: “iPhone SE”, “size”: 23397, “type”: “image/jpeg”, “locality”: “Oostpoort 12, Waldenlaan, Winkelcentrum Oostpoort, Amsterdam, North Holland, Netherlands, 1093NH, Netherlands”).

and routing web calls from the work or application back to the locally running web server, sometimes called LocalHost.

With these two elements in hand, batch generated reverse geo-code data, locally held, and provisioning the projects own map data server, the forming, tuning and final choreography of this section the piece proceeded.

10.5 The Challenge of Live Vs Video of Activity or Interactivity of Exposing the Internal or Relying on the Surface

In developing live digital works there is a challenge of exposing and communicating where the work is. In the case of paint and photography and other flat visual arts, the work is commonly readily identified in the surface. When working with live digital processes this identification, location and exposition of the work—in this case meaning the artistic effort, intention or focus of attention—becomes obfuscated and requires specialist technical knowledge to gain insight into often hidden black-box processes. Some artists working with digital/technological processes take the route of exposing the mechanism of systems, disassembling computers into their working component and exhibiting them exploded on gallery floors, deliberately exposing the ‘technology’ to indicate complexity and ‘liveness’. Another common route to provide this exposition to an audience is to make systems interactive or reactive to some aspect of the audience, making clear that something live and dynamic is occurring and perhaps leading the audience into consideration that which is beneath the surface, the ‘deeper mechanic’ inside a work or piece. With work that takes neither of these routes, work that is active but not interactive, that does not make its components part of the artwork display, the challenge is to help the audience understand that what they see is live and not rendered video recordings or pre-made files being re-played. And that each moment seen is created and becoming at that moment. It is being performed live, never to be repeated in that fact same way again.

10.5.1 Exposing the Internal or Relying on the Surface

This challenge of exposing the internal mechanism of projects and works and the delicate balance of the work end up being about the mechanism and the tools rather than the original intent is a complex one. In this work the multi-part nature of the outputs from the project allows a range of expression and nuance which in another work would not necessarily be available. With the installation version of Signs of Surveillance the clean collection nature of the photographic source material and the exposure and manipulation of the image meta-data is clue enough to the live/process nature

behind the work. Alternative versions, such as the artists' book and the controllable web-based version address other elements of the project sufficiently.

10.5.2 *The Final Work for Gallery Installation*

The final instantiation of the work discussed in this article is designed for viewing in a gallery or installation context (see Fig. 10.6), and has been tuned, sculpted and shaped accordingly. In an installation context the audience is mixed, with a range of interests, awareness and contextual insight.

The audience, the viewer also has a range of available temporal modes within which to receive the work and the underlying themes and idea. Part of the work is paced and presented for a transitory audience with short attention and an availability of meaning in the surface of the work that is 'glanceable'. That will survive artistic scrutiny of a glance of a few seconds. At another level the work has a deeper pace and rhythm that is designed to survive deeper scrutiny and draw the viewer into a deeper dialog with and understanding of the work, allowing nuance and interpretation at the pace and depth the viewer is comfortable with. The work for gallery installation is active but unlike its open web-based counterpart (available publicly at <http://signsofsurveillance.com>) not explicitly *interactive* (see Fig. 10.7). To this end, it has a specific set of behaviors that it exhibits to engage the viewer and draw them through the corpus of work. When working through the meta-data accompanying the body of images, a certain irony was revealed, in that, if one followed the time-stamps of the collected images one could re-create, with a varying range of accuracy, the route that I had taken through neighborhoods, cities and countries around the world over the

Fig. 10.6 Mockup of gallery installation of early globe version

Fig. 10.7 Final version showing custom map styling, with clustering, image meta-data and dynamic transitions along the ‘walk-line’ between images over the 5 year period of collection. This location, Ijmeer, Amsterdam, Netherlands

preceding five years. The time-stamp data combined with the geo-location of each image showed the points on the globe that I had stood at the press of every shutter and the capture of each photograph. Beginning to investigate these invisible lines, simple routines were written to create a single path through each geo-point. Using both Catmull-Rom¹⁹ and Bézier²⁰ curves different paths were visualized showing the path between each captured image.

10.6 Conclusion

In this chapter I have attempted to expose and discuss some of the approaches and practices that I have evolved and adopted over the last 30+ years of working with digital technologies. My original thoughts were that working in conjunction with complex, highly sophisticated tools and systems which transformed the relationship from one of artist and tool into much more of an intimate discussion, a collaboration

¹⁹ A Catmull–Rom spline, named for Edwin Catmull and Raphael Rom, is a special case of a cardinal spline. Catmull–Rom splines are frequently used to get smooth transitions between key points and are often used in animation and similar computer graphic works.

²⁰ Named after Pierre Bézier, a Bézier curve is a parametric curve used in computer graphics. Several points using Bézier curves can be combined to form a Bézier spline.

where one asked questions of the systems one engages in, navigating and negotiating the parameters and avenues in and through the conceptual structures, functions and processes inside the machine. From this comes the innate understanding of the systems and materials one is working with, what I have called semantic affordances. Sadly, this conceptual flexibility and strength that digital materials bring also brings multiple points of failure, usually with no graceful decline. A point of failure at any juncture in a digital artwork is usually a complete failure. This is what I mean when I talk of the brittleness of digital things. For this work, which extensively involved with the collection of a large body of individual items working in the digital gives great flexibility to collate, manipulate, transform and express. It also gives myriad opportunities for instantiation of a work in the physical world, and huge availability of choices of how to make an intervention into the mind of the viewer. At this instance, the challenge came in making gallery-orientated versions and web-based while using web technologies and remote data in both. The issue of reliance on, and of cost, when using external systems, such as map-tile data and geo-location services was a particular challenge but led to new and interesting areas setting up self-hosted and local versions of some of these external commercial data sources. This does, however, have its own drawbacks, and the writing discusses in some detail the philosophical, cultural and ultimately ontological struggle when engaging with external systems, APIs and data. Also that, they have their own political approach, their own ontologies and that can be a hegemonist force with the potential to overwhelm the internal ontology that an individual work of art generates for itself. This question of the internal complexity and dialog that goes on inside active digital works is the last point in this writing, investigating some of the challenges that are balanced when dealing with the decision of how much to expose the internal structures of a work to bring viewers deeper inside, drawing them below the surface of a work while not making the work purely about the internal structure. Thus, working to retain the original focus of the work but helping give insight into the live process at work at the moment of performance, particularly with works with any generative nature to them.

10.6.1 Final Reflection

The final version of this work, or at least the current version, is part of a body of pieces that are differing expressions of a formalized process of collecting and collating. This collecting began as a *dérivé* of observation and photographic collecting around the world. Begun initially as a completely non-verbal process the project developed its own vocabulary and logic over the years of photographing, to the point where the material began to guide the form and the final work. Only then began the process of exploration in the studio, of applying technological processes to illustrate and instantiate the mood developing inside of the work. This process is common to much of my work and my day-to-day artistic activity: one that is an ongoing dialog I

have with the world, of observing, looking, making, and underneath it all ultimately seeking sense-making.

The work, while not forcing a specific political point, is intimately political. It is intended as an exposure of pervasive surveillance of our physical world, to a scale that it continues to surprise me, even as I become inured to it. This journey we have chosen to take with surveillance technology, and the ability we have built to track, record and intrude into every aspect of the body public, and our individual bodies, private is operating at a scale that many would find unimaginable should they be able to see it clearly.

As Noam Chomsky, never one to use an alarming phrase when calm reasoned words will do, says [11]:

there are two things to bear in mind, one is that the phenomenon (of surveillance) should not be at all surprising, the second is that the scale of it is surprising.

10.7 Epitaph for a Digital Artwork

I sit and write, longhand on paper with a pen, the epitaph at the closing of this chapter. The document and journey written covers six countries, countless hours and edits, full of insight and reflection. The final edits are yet to be done but what I can write now is the epitaph. Reading back through this writing, I find I have made a fuller, more complete explanation of my internal process, discussion and artistic activity than ever before in one place. At times on technical, philosophical and political, I trust the reader will forgive me streams of consciousness and occasional melodrama of the miniscule internal theatre that is the struggle of working with digital tools. This writing, alongside ongoing development, coding and versioning of the software, has given me space to reflect on process and practice with a fresh perspective. Thinking of the work, in progress for nearly half a decade, makes me reflect that most readers of this will never see it. That by the time this volume is typeset, proofed, approved, printed and distributed, the work may, in practical terms, cease to exist. Web domains I pay for will expire. Servers will be upgraded, patched, obsoleted and retired and I will go on to new projects, works, technology and software. In very real terms this chapter of ink-on-paper (or the undoubtedly shorter-lived pixels-on-screen) will outlast the work by a magnitude of scale. Sitting in Hong Kong in late June 2019, the mood is somber but resolved and the world seems fragile and tenuous. This work on Signs of Surveillance is a small postcard in a discussion of technological change, reflecting on the fundamental importance of the ephemerality of art, of the importance of its functionless-ness. On the innate lack of practicality that those versions and instantiations of it that require upkeep, maintenance and care to continue to exist are happily always consigned to memory. This is the epitaph to a work of art that will soon cease to be. That will fail by nature of its powerful but short-lived reach and the fickle brittleness of the substance of which it is formed and the un-real substrate on which it is built.

As Picasso, Paul Vale'ry or Da Vinci may have said²¹

Art is never finished, it is only ever abandoned.

and the abandonment of digital works into a continually changing virtual world affords them a very short lifespan when left to fend for themselves.

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²¹There is debate about the correct attribution to the quote, including paraphrasing W. H. Auden in Collected Poems 1965, "Poetry is never finished; it is only abandoned."

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