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Citation: Goodfellow, Paul (2019) Reframing the Horizon within the Algorithmic Landscape of Northern Britain. Arts, 8 (3). ISSN 2076-0752

Published by: MDPI

URL: <https://www.mdpi.com/2076-0752/8/3/114> <<https://www.mdpi.com/2076-0752/8/3/114>>

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Article

Reframing the Horizon within the Algorithmic Landscape of Northern Britain

Paul Goodfellow 

Department of Arts, Northumbria University, Newcastle NE1 8ST, UK; paul.goodfellow@northumbria.ac.uk

Received: 27 June 2019; Accepted: 29 August 2019; Published: 4 September 2019



Abstract: Emerging from the artist's constructed photographs and walking projects in the north, this paper considers the tension between the photograph as a fixed composition of the world and the dynamic image constructed from data. Whereas arguably, the traditional photograph exhibits a stable relationship between the world and the image, the constructed photograph shifts the focus onto the underlying algorithmic processes of production. This focus on the relational nature of the constructed photograph shifts our gaze from the horizon to the underlying systems in operation as we consider the relational nature of data as a photograph.

Keywords: systems; photograph; algorithmic image; flat ontology; uncanny; eerie

1. Introduction: The Photograph as Index and Icon

This paper focuses on my art practice of walking and, in particular, the ontological status of the photographic images constructed from data collected during these walks. At the root of this discussion is the difference between traditional photographic pictures of the world, which suggest an underlying narrative imagined from the photographer's perspective, and a systems description of the world, which demonstrates the underlying processes operating in the world, and may be manifested in the algorithmic image.

There are several differences between a traditional analogue photograph and a digitally constructed photograph which is constructed from samples of reflected light data. Braxton Soderman discussed the semiotic distinctions between these two forms of images in *The Index and the Algorithm* (1999), by considering the three forms of signs: index, icon, and symbol, articulated by Charles Sanders Peirce. Soderman summarised the distinction between the three forms as follows. "An icon resembles or imitates the object it signifies; an index shares a physical connection with the object it represents; and a symbol is associated with meaning through convention or habit" (Soderman 2007, pp. 156–57).

Firstly, a traditional photograph is a physical material process as light is reflected from the subject of the photograph, the object, through the lens of the camera, and chemically reacts with the film to produce an image which has a correspondence with the external world. Thus, from Peirce's perspective, the photograph operates as an indexical sign, as it shares a direct connection with the object it represents. As Peirce states,

Photographs, especially instantaneous photographs, are very instructive, because we know that they are in certain respects exactly like the objects they represent. But this resemblance is due to the photographs having been produced under such circumstances that they were physically forced to correspond point by point to nature. In that aspect, then, they belong to the second class of signs, those by physical connection [indices]. (Soderman 2007, p. 157)

In addition to the indexical nature of the photograph, Peirce states that the photograph is also iconic, as not only does the photograph share a physical connection with the subject, but it also represents it. Consequently, the photograph is a combination of index and icon, as Peirce states, “a photograph is an index having an icon incorporated into it” (Soderman 2007, p. 158). Whilst the iconic aspect of the photograph is contingent on appearance the indexical nature of the photograph is bound by the physical connection between the film and object.

In contrast, the digital image has a more complex relationship with the object in both indexical and iconic terms, and a common criticism of digital media, observed by Laura Marks is that “the indexical link between image and represented object is irrevocably severed” (Marks 1999, p. 66). Whereas the analogue photograph is an index of photons, etched into the photographic emulsion, a digital image is a sampling of information captured by sensors and manipulated by algorithms. A digital image is created when the reflectance values are registered by the camera’s sensor and translated into numerical values. This process of translation from photon to numerical value will result in a loss of detail, as the sensed values are reduced into discrete units or pixels which represent a limited range of stepped colour values, or bit-depth. In addition to this reduction in resolution, the information can be translated through various algorithmic processes, so that the original information is manipulated numerically to generate new information. Satellite images, for example, are manipulated to reveal patterns within the data, which may point to environmental patterns on the ground. Whereas photographs may be manipulated in order to more closely correspond to a symbolic sign, such as a culturally constructed notion of beauty. All such computational translations complicate the provenance of the final image and erode the indexicality, specifically in relation to the original object.

Indexicality refers to the capacity of the sign to associate our thoughts with external reality as Peirce stated the index “may simply serve to identify its object and assure us of its existence and presence” (Soderman 2007, p. 161). Thus, the constructed images operate indexically, not solely in relation to the original object, but as an index of the processes which have acted upon the image. Consequently, the algorithmic image is indexical in two distinct ways. Firstly, like the traditional photograph, there is a material indexicality, but whereas the analogue photograph is a record of photons, the digital image is a record of electrons. In *How Electrons Remember* Marks maps out this digital indexicality suggesting that “If all matter is intimately interconnected by wave-surfing electrons, then all electronic images have an indexical or analog connection to-matter” (Marks 1999, p. 73). The second form of index is the record of processes, or the underlying system and algorithms which have acted upon the image and this form of indexicality is the focus of the paper. Soderman captures the essence of this digital indexicality in the following passage.

The essential point here is that in thinking about the digital image, one must speak of indexicality not in terms of a perceived “physical connection” between an image and a “natural” [. . .] referent, but in terms of a forced connection between a digital image (the sign) and the algorithmic process that creates or changes it (the object). [The] key is recognizing that the indexical link is forged between a symbolic structure and the image (not a natural object and a captured image of it). [. . .] We must begin to recognize that digital images, as indexical signs, can refer to conceptual objects (computer programs or algorithmic processes). (Soderman 2007, p. 164)

Thus, a digital image has an indexical relationship with a conceptual object—the algorithm, computer program or system employed in its creation or transformation. The photographic images discussed in this paper exhibit an indexical relationship with two interrelated conceptual objects: the system underlying the artwork, and the computer algorithms employed in the construction of the image. The term algorithm is employed here to refer to the articulation and application of instructions to perform a specific task, such as a numerical calculation. Whereas, the term system refers to the overarching descriptive system which structures and describes the work and this encompasses the algorithms employed in the transformation of the digital data.

Thus, the art practice described in this paper is centred on the production of algorithmic photographs, which are created from data collected on walks. Each walk follows a set of production rules which define aspects of the work, such as the location of walk, route, and interval of photographs. Once captured, the data is numerically transformed through the application of algorithmic image-processing operations. Taken together, these rule-based operations in both the collection and transformation of information form a system and the final photographic images have an indexical relationship with both the algorithm and the overarching system.

2. Walking in Art

Walking, particularly in Northern England and Scotland, is central to this practice. A combination of geography, aesthetics, and personal history are grounded through walking, as I seek to make sense of my relationship to landscape and how access to the world is mediated by time and memory. As Oscar Van Den Boogaard notes,

Walking is a way of becoming unstuck from yourself, of merging with your environment: the boundary between yourself and the environment is relinquished. A cosmic unity is restored. It is about a dematerialization of the self, dissolution into space, becoming part of the geography. In the meantime, you shape something new; you become movement, measure, scale, direction, dimension and space. (Van Den Boogaard 2014, p. 120)

With a background in geographic surveying, I have long contemplated the different ways in which we engage and seek to articulate our relationship with place, for example, in the difference between narrative histories which foreground the passage of time, compared to maps which foreground spatial relationships. In addition to these temporal and spatial depictions, I am interested in photographs and the pictorial time-slices they offer, and algorithmic images which extend the photographic form into the realm of data.

Walking within art has a well-documented history, including most recently (Solnit 2006, 2014; Coverley 2012; Evans 2013; O'Rourke 2013; Gros 2014). Whilst a comprehensive history is unnecessary here, we might note that walking has been employed within art in distinct ways: as social investigation, as an embodied engagement, and as a narrative device. These approaches are briefly introduced here as they have informed my walking practice.

Firstly, artists have walked as social, political, and poetic investigations of place. Walter Benjamin's *The Arcades Projects*, for example, documented his walks and observations in the ageing arcades of Paris in the 1920s and 1930s (Benjamin 2002). The text uses the spatial dimension of the Parisian arcades as a way of structuring and anchoring a complex relational web of observations and ideas, and this radical approach of triangulating between location, experience, and idea has since been employed by many writers who wish to foreground the spatiotemporal and relational nature of their ideas, including W.G. Sebald's *Rings of Saturn* (Sebald 2013) and Iain Sinclair's *London Orbital* (Sinclair 2003).

The Dadaists undertook walking as an artistic practice, photographing their walks through hidden parts of Paris, explicitly avoiding the photogenic or historical locations, as they documented their research projects. This led to the hypnotic walking or deambulation of the Surrealist André Breton, and subsequently, the Situationist International employed these surrealist strategies to deconstruct the operations of 1950's Paris. The central concept of the *Dérive* developed by Guy Debord was a form of 'drifting' through the city with a heightened awareness (Coverley 2012), derived in part from the consciously disoriented drifts of Ivan Chitchevlov documented in *Formulary for Unitary Urbanism* (1953). For Henri Lefebvre drifting highlighted the increasingly fragmented nature of an industrialising Paris, providing, "... a vision of a city that was more and more fragmented without its organic unity being completely shattered" (O'Rourke 2013, p. 11).

Walking as a social engagement was further developed in the 1960s by Vito Acconci and Adrian Piper. Acconci's *Following Piece* (1969) operated as a form of action research whereby he randomly selected a person and followed them until they entered a private space (Rorimer 2004, p. 211).

Interested in body language within public spaces Acconci drew upon Kurt Lewin's *Field Theory* (1933), in which individual behaviour is understood in the context of its environment, or the total field (Lewin 2015). Whilst, Piper's *Catalysis*, (1970–1971) was a series of conceptual performances in New York, documented through photographs, and intentionally contravening social norms of public behaviour. Piper described this project as the examination of “the difference between human objects, that is, objects who have subjectivity, and other kinds of objects that do not, other kinds of nonsentient objects” (Rorimer 2004, p. 161).

A more focussed engagement with personal embodiment led Bruce Nauman to explore “the limits of movements and the pull of gravity within the confines of the studio” (O'Rourke 2013, p. 31), in works such as *Walking with Contrapposto* (1968). Likewise, Hamish Fulton and Richard Long created pieces in which the walk and the underlying conceptual idea for the walk became the artwork. These conceptual works were a direct engagement with space and place, but unlike monumental Land Art, sought to minimise material impact and turn attention to the flow of ideas and information. Long's *A Line Made by Walking* (1967) established a walking practice which expressed the clarity of Minimalism, and resonated with the serial repetitions, measurements and constructions of artists such as On Kawara and Mel Bochner. These artists performed a paradox inherent within contemporary culture, which seeks to measure and systematise the world while simultaneously acknowledging the impossibility of such a task. As Bochner observed, “measurement is one of our means of believing that the world can be reduced to a function of human understanding. Yet, when forced to surrender its transparency, measurement reveals an essential nothingness” (Salvo 2005, p. 19).

Kawara and Bochner demonstrated that the world could not be reduced to measurement while Fulton and Long demonstrated that the experience of a walk could not be reduced to a photograph, and their focus on the underlying system, (measurement), and the affective engagement with the world, (the walk) resonate with the contemporary condition of information excess and alienation from primary lived experience. It is, therefore, understandable that artists are demonstrating a renewed interest in walking as a process of art.

3. Ground-Truthing

My walking practice owes an intellectual debt to these earlier artists but also draws directly from a background in geography and mapping. This began with undergraduate study at the School of International Development at the University of East Anglia, a radically interdisciplinary department which considered the interrelationship of physical and social systems. Underpinning this interdisciplinarity was the concept of the system, and physical phenomena were understood in terms of the ecosystem, while social phenomena were understood in terms of social, political, and economic systems. Simon Bell introduced Systems Thinking and its application in information systems as a lens through which complex environmental and social operations could be mapped together (Bell 2013). The spatial dimension of the data became the shared common ground so that ecological changes, for example, could be mapped to human activity.

In contrast to this systematised and formalised perspective, the undergraduate study also included a serendipitous group field study, organised by Janine Dakyns, an expert in the literature and life of Gustave Flaubert. Spending four days retracing Flaubert's steps in and around Rouen, Dakyns walked us through the medieval heart of the city to its industrial edge on the River Seine, stopping to read key passages of text. This was intermingled with apocryphal side stories, including elements from Julian Barnes' novel *Flaubert's Parrot* (Barnes 2009). Stopping at cafés, we made associations between the text, the sense of place, the spring weather, and the food we ate. Daykins showed how Flaubert mentally moved between times and places while still anchoring his experience and text in Normandie. As Daykins remarked, “in a grain of sand in the hem of Emma Bovary's winter gown . . . Flaubert saw the whole of the Sahara” (Sebald 2013, p. 8), and the walk created a multi-dimensional mapping of the text that a simple linear reading could not offer.

Upon graduating, I worked with Geographic Information Systems, which addressed the complexity of environmental information distilled from remotely sensed satellite images. This systematised approach presented a uniform simulation of the world in the form of data and had little room for the messy entanglements of direct experience. These systems generated algorithmic maps based on satellite images, and I worked on research projects in Central and South America and the Middle East to map flora and fauna and contribute to computer models predicting environmental change. The satellite images were constructed from millions of coloured pixels derived from several wavelengths of reflected and digitally sensed light. Through a mix of algorithmic transformation and aesthetic judgement, these pixel values could be manipulated, and emergent visual features of rock, water, wetland, and forest would be revealed within these constructed images. From the perspective of the sign as index, icon, and symbol these images demonstrated a complex multi-dimensional nature, as they operated as an index connected to the sensed object Earth in both material and algorithmic terms. They demonstrated the material indexicality described by Marks (1999), through the transfer of electrons from sensed photons to the digital image, whilst also demonstrating an indexical relationship with the algorithms employed in their construction. Additionally, these images were iconic as they had the appearance of the photograph and the original subject—the remotely sensed Earth. Finally, these images also operated symbolically as they demonstrated climate change, deforestation, glacial retreat, and oil spills in the ocean.

This complex entanglement between the subject Earth and the algorithms employed to simulate and visualise it was visually intoxicating, but also psychologically bewildering. As Morton suggests, “environmental awareness might have something intrinsically uncanny about it, as if we were seeing something we shouldn’t be seeing” (Morton 2012, p. 58). There was a creeping sensation that the more data collected and manipulated the focus of study shifted from Earth to its simulation. Morton, in discussing the process of mapping and modelling global warming captures the disorientation felt when confronted with materials which have the appearance of the Earth but have an indexical relationship with the systems designed to describe it.

Learning about global warming serves to make us feel something much worse than an existential threat to our lifeworld. It forces us to realize that there never was a lifeworld in the first place, that in a sense “lifeworld” was an optical illusion that depended on our not seeing the extra dimension that NASA, Google Earth, and global warming mapping open up. The more information we acquire in the greedy pursuit of seeing everything, the more our sense of a deep, rich, coherent world will appear unavailable. (Morton 2012, p. 56)

The algorithmic images are eerie as they do not present us with pictures of the world at a given time or place but operate as reconfigurable outputs of a simulation of the world. As Hoelzl and Marie state these images are not the product of a clearly defined subject-object relationship, but the product of a “dynamic relation between data and data” (Hoelzl and Marie 2015, p. 100). Thus, they cannot be read as stable pictorial tableaux, but must be understood as:

an unstable algorithmic configuration of a database in the form of a programmable view. With navigable image databases, or rather databases that are navigable as images, what the on-screen image actually displays is subject to database updates, connection speed, screen resolution and navigational options provided by the software and the real-time correlation with a given user query or user location. (Hoelzl and Marie 2015, p. 100)

Underlying the operations of these vast information systems is the belief that we can commodify, understand, and even control the operations of the Earth. The models they produce and algorithmic images they present are though, simulacra, removing us from the original material subject, and this perspective challenges our embodied experience of time and place. However, the data collected by the remote sensing satellites had to be authenticated through the process of ground-truthing, whereby the data was cross-referenced with the reality on the ground. Ground-truthing involved walking in the

field and comparing the colour values on the maps generated from satellite images with what was present in situ. I would walk, take notes and document what I saw with photographs. Ground-truthing gave a far more vibrant sense of place than the digital data, as one experienced the landscape, climate, and culture directly. Walking recalibrated the senses, foregrounding embodied experience over the abstract intellectual experience of science, maps, and data. The walks charted a path, and although these experiences were not directly translated back into the maps or data, they gave an invaluable sense of the subject.

Several surveys took place, for example, in the Al Hajar mountains, which intersect Oman and the United Arab Emirates with the ornithologist Simon Aspinall (Porter and Aspinall 2010). I experienced the material reality of the mountains, and the effort required to get there, whilst Aspinall an expert in the ecology of the peninsula and had earlier travelled the region with the writer Wilfred Thesiger, richly described the entanglements of culture and nature. Thus, the physical experience of walking and ground-truthing connected me to a sense of place and time in the same way as Dakyns' walking tour had connected me to Flaubert's Rouen.

These surveys were linear paths through the landscape, fixing experience to the act of walking. The evidentiary photographs created from these walks were similarly grounded, and the product of a horizontal perspective which is "calculable, navigable, and predictable", allowing space to be traversed and linear time conceived (Steyerl and Berardi 2012, p. 18). However, the inherent limitation in this linear perspective is that it is inevitably subject-specific, as the walker is "mirrored in the vanishing point, and thus constructed by it" (Steyerl and Berardi 2012, p. 19). The walker is at the centre of what they see, and the experience cannot be fully shared, other than to say this is the picture I have composed to represent the experience. Such a narrative is unicursal describing the journey the artist, or geographer experienced, as the earth-bound photograph indexes the horizon from a specific time and place.

Thus, two ontological models were employed in this type of research, describing the world in fundamentally different ways. The first, a systems-based view, creates a simulation of the world, and the images generated are algorithmic and spatial. From this view, the world is flat and seen from above. The view of the satellite image, where scale and hierarchies disappear, and everything becomes connected and equally available. In discussing the flat ontology within the geographic context, Marston et al. suggest it is where, "the dynamic properties of matter produce a multiplicity of complex relations and singularities that sometimes lead to the creation of new, unique events and entities" (Marston et al. 2005, p. 422). In this complex system or assemblage of things, the world can be read in multiple different ways, and the temporal dimension melts away as the relational nature of nature is foregrounded.

In contrast, engaging with the world through walking is affective as it marks a linear path through time. A walk is also personal, and the images created through walking are a composed tableau which frames the horizon from the walker's perspective. So, on the one hand, the system-view offered multicursal but impersonal access to the world through the algorithmic image. On the other, the walk offered a unicursal, but personal experience of the world documented through photographs. The dissonance between these two perspectives shifted my interest from geographic survey to art, as I sought to create a mental model which could accommodate these two perspectives.

4. System Walks

Walking has become a central aspect of my art practice, and its employment derives from my experience with Geographic Information Systems and Ground-Truthing, as well as an understanding of the wider employment of walking within art. Each walk is described as a System Walk, as this compound term encapsulates the two core aspects of this project. Firstly, the designation of Walk makes explicit the focus of the activity is a geographical location traversed on foot. Secondly, the designation of System makes explicit that the work is both created through the application of system rules, and the completed artwork can be functionally described as a system.

This dual understanding of systems derives from Geographical Information Systems, but also Systems Art of the 1960s, which employed the concept in two distinct ways. Firstly, there was the application of the term systems to denote that a work of art was created through the application of production rules. This procedural approach can be traced back to Richard Long in the creation of walk-based works, and Sol LeWitt's drawing instruction works, as both artists employed rules to create works which were part performance and part material artefact. Secondly, the term system is employed to suggest the artwork is expanded across a number of interacting components, and these are conceptually held together in a descriptive system akin to an information system or ecosystem. The Systems Artist Alejandro Puente in 1968 described these two distinct, but complimentary employments of the term as generating systems and systems as totality, respectively (Behar Ionit 2015). In the case of System Walks the components of the system include the conceptual idea underpinning the walk, the walk itself as a form of performance and the material outputs of the walk, such as notes, photographs and drawings. Thus, the System Walk is a compound artwork which includes a range of inputs, such as satellite imagery and mapped information, and outputs such as drawings, photographs, and colour fields of colours sampled during the walk. Margaret Iversen described such works as Graphic Traces, as they combine the indexical information of the sampled data with the diagrammatic representation and abstraction of the drawings and maps (Iversen 2017, p. 76). This can be illustrated in Figure 1 from a repeated walk across Holy Sands to Holy Island in Northumberland, as the final work contains colour samples, photographs, and plein air paintings and drawings. In this example, satellite image data was also accessed and manipulated to map the relationship between the remotely sensed data and the ground-truthed data collected on the walk.

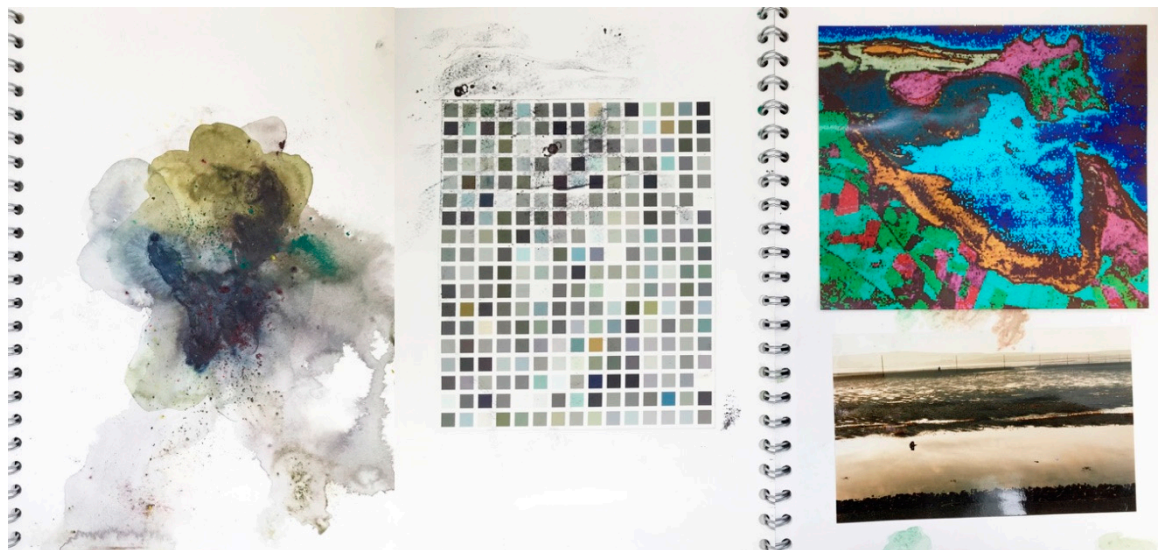


Figure 1. Holy Sands Notebook: painting, colour samples, Satellite image (photograph), and photograph. Created by author.

I have made *Systems Walks* in Northumberland and Cumbria in England, and the Scottish Borders, and Highlands. Some walks have been undertaken only once, although most walks are repeated two or more times. Repeating a walk is of particular importance, as it allows the play of difference between different walk events to be foregrounded within a work. For example, how a landscape is altered through time, with the changes in light and seasons, or more deeply how environmental and social impacts can be mapped through observable changes. This serial methodology again draws inspiration directly from Systems Art and Minimalism. Bochner's work, for example, demonstrated how the obscured production rules operating within his work could be made visible through repetition.

Each System Walk starts with an idea or subject which can be investigated through walking and the photographic images created through this process are an emergent quality of the given walk system. The original idea for a walk may come from many areas, including memories, a book or film, and this idea of spatially and relationally remapping a text or memory of something derives from the Flaubert walk in Rouen. This reconfiguration of work to foreground the spatial dimension over the temporal dimension of the text employs, in Deleuze and Guattari's terms, the processes of deterritorialization and reterritorialization (Deleuze and Guattari 1988). That is, the text held together by the narrative is deterritorialized temporally and reterritorialized spatially, and this new assemblage is experienced through the walk, which forms a new path through the text.

Each walk enables the collection of material and information which can be employed in the production of new work, such as the photographs, and a physical, affective engagement, which reactivates a connection with time and place. The conceptual idea, the walks, and the associated materials taken together can be understood as a system. Whilst the mental and physical engagement required to make the walk and the material and information collected can be seen as critical inputs, and the photographs can be understood as system outputs.

The photographs are recorded with a time-lapse camera, whilst a GPS receiver records the positional information. Additionally, a notebook is used to record observations, and a map or book may be referred to for directions or context. The photographs are captured automatically at a given interval, and as the camera is worn on the chest, the authorship or framing decisions are shifted from the eye to the body, as the path of the walk determines the captured frame. The final photographic events produced from these walks are algorithmic in two senses. Firstly, they are a product of the rules employed in the production of the walks, and not the product of a conscious picture-making process. Secondly, they are digitally constructed by mixing several photographic data streams and consequently have an indexical relationship with the processes of their production.

At the heart of this practice is a fascination with the triangulation between the real but withdrawn material world, the world affectively experienced through walking and breathing, the virtual world created in the digital simulations of information, and the spectral dimension of reality which populates the landscape like traces or ghosts.

This triumvirate of the withdrawn material world, its virtual simulation, and the spectral trace are central to this practice, and each term requires a brief definition. The withdrawn reality is the material world, the true nature of which is so complex and multidimensional that we cannot be sure that the aspects of material reality we experience are shared with others, due to the limitations of our senses and experience. Slavoj Žižek encapsulates the complexity of reality, the extent of which remains withdrawn in the following passage,

[R]eality is much too rich and complex for our abstract categories, we will never be able to deploy a notional network adequate to reality in all its intensity and diversity. [...] We start to realize that we cannot clearly distinguish the inconsistencies of our notion of an object from the inconsistencies which are immanent to this object 'itself'. The 'thing itself', in other words, is inconsistent, full of tensions, struggling between its different determinations, and the deployment of these tensions, this struggle, is precisely what makes it 'alive'. (Hallward et al. 2012, p. 163)

The virtual in this context is the simulations of the withdrawn world, and these simulations are constructed from models and data, including maps, geographic information systems, satellite images, and ecological models. Whilst data can be understood as having a relatively close connection with the subject it signifies, such as the measure of rainfall, for a given location over a given period. The maps, models, and simulations of the world, which are built on this information are necessarily abstract and have an indexical relationship with the underlying algorithms. This can be illustrated with the satellite images of Holy Sands and Holy Island, Figures 1 and 2, as these algorithmic composites promise more information than being on the ground, but due to their perspective and the physical and

conceptual distance from the subject amplify the sense of the uncanny. As they shift our perspective from the embodied experience of moving towards the horizon to the vertiginous floating above which forces the eye to roam across vast stretches of embedded information etched into the surface of these virtual spaces (Steyerl and Berardi 2012). I was originally drawn to the satellite images of Holy Sands captured at low and high tide (Figure 2), as they as graphically prefigure the effects of climate change and consequently operate as symbols of sea-level rise.



Figure 2. Holy Sands notebook: satellite images (photographs). (Left) to (right): Low-tide and high-tide. Photographs created by author of Landsat TM satellite data.

The spectral dimension in this context are those events within art, literature, and social history which haunt real locations in the world and, therefore, reside in the mind, as traces or ghosts. Although the terms trace and ghosts are employed here to mean something similar, they have different antecedents, particularly in a photographic context and this should be noted. The concept of the trace derives from Sigmund Freud's *A Note upon the 'Mystic Writing Pad'* (1925), and the idea that the mind retains a trace of things which have been experienced, particularly things experienced at an unconscious level (Freud 2006). Thus, the unconscious thought in this context is the spatial dimension of the literature, which is invariably subjugated to the narrative. This spatial dimension is activated through walking, creating a relational web constructed from the experienced material world, and the world mentally constructed from the text.

Whilst the idea of the ghost, is related to the trace and derives from Jacques Derrida's conception of the hauntological, which he described as "spectral" and "is neither substance, nor essence, nor existence is never present as such" (Derrida 2006, p. xvii). This is employed here to denote how the spectral layers of ideas, memories-fictions and the virtual layers of simulation create a multiversal relationship with the material world, and in particular how this hauntological dimension displaces our conception of time. Thus, the act of walking is an attempt to reassert the lived experience in our increasingly simulated and data-driven culture. Additionally, the term ghost is employed in the context of the algorithmic photographs created on these walks as they exhibit a spectral quality. That is, the constructed images in the following discussion operate as recordings of events which could not be directly observed during the walks as they are fundamentally algorithmic, or virtual in origin.

5. Ghost Photographs

My practice has sought to balance the seductions of the algorithmic photograph with a direct engagement with the physical world through walking, and thus explore a dialectical relationship with place, which is material and virtual, physical and mental, and affective and technological. Ground-truthing, walking, and, in particular, the art practice of System Walks disrupts the idea that

the world can be fully contained, mapped, and photographed, as the experience of being somewhere reasserts the multidimensional but ultimately withdrawn nature of a material place.

I have taken this idea of the haunting and spectral trace as a starting point to make both walks and photographs. I have created walks which have been repeated, sometimes days apart and others many years apart. The Ghost Photographs are created by double-exposing the first series of photographs from a walk, with the second series of photographs from the same walk when it is repeated. These uncanny photographs exhibit the spectral differences between the two photographic events operating within the frame. As Morton suggests, “the uncanny exists because we’re always somewhere. Repetition, with its play of familiarity and difference, is thus possible” (Morton 2012, p. 52).

I have been particularly interested in walking in semi-wild locations as these most fully demonstrate the relational interconnectedness between human culture and wider nature. In a city, it is easy to feel that society and nature are distinct systems with limited interdependence, with nature a location to be visited. Bruno Latour described this false dichotomy between the natural and the social as the ‘Great Divide’, suggesting,

We are the only ones who differentiate absolutely between Nature and Culture, between Science and Society, whereas in our eyes all the others [. . .]—cannot really separate what is knowledge from what is Society, what is sign from what is thing. (Latour 1993, p. 99)

Thus, I am very interested in the borderlands both metaphorically between nature and culture and geographically where England meets Scotland. As this region demonstrates the dialectical relationship between nature and culture, as layers of human impact mark the territory, before being enfolded back within the landscape. This is demonstrated in the Neolithic standing stones, or stone carvings through to the disused railway lines, or the ruins of abbeys, Peel towers and Bastle houses on both sides of the contested border. There is something overwhelmingly eerie in these landscapes as they trace past lives. As Mark Fisher notes,

A sense of the eerie seldom clings to enclosed and inhabited domestic spaces; we find the eerie more readily in landscapes partially emptied of the human. What happened to produce these ruins, this disappearance? What kind of entity was involved? What kind of thing was it that emitted such an eerie cry? (Fisher 2016, p. 11)

I have sought to walk and engage with a landscape which is shaped by these dual interdependent natural and social processes. Figure 3, for example, is a walk, repeated six months apart, which captures the waterfall and the Neolithic cup ring markings at Roughting Linn, Northumberland. The double-exposure demonstrates the different path which had to be taken between the two walk events, due to fallen trees during a winter storm. In contrast, Figure 4 is a photograph of Holy Sands and Holy Island, Northumberland. The two photographs were taken twenty-seven years apart, recording my first visit to the Island and my most recent, and the double-exposed photograph captures the eerie persistence of this liminal space between land and sea. Fisher suggests this quality of eerie helps us perceptually see beyond the surface rhythms of the everyday suggesting that the eerie,

can give us access to spaces beyond mundane reality altogether. It is this release from the mundane, this escape from the confines of what is ordinarily taken for reality, which goes some way to account for the peculiar appeal that the eerie possesses. (Fisher 2016, p. 13)

Part of the uncanny quality of such photographs is how the recorded scene becomes fixed in the past, instilling a sense of nostalgia and otherworldliness. Roland Barthes suggests this results in,

a perverse confusion between two concepts: the Real and the Live: by attesting that the object has been real, the photograph surreptitiously induces belief that it is alive, because of that delusion which makes us attribute to Reality an absolutely superior, somehow eternal value; but by shifting this reality to the past (‘this-has-been’), the photograph suggests that it is already dead. (Barthes 1993, p. 79)



Figure 3. Paul Goodfellow *Roughing Linn* (2018–2019). Photograph created by author.



Figure 4. Paul Goodfellow *Holy Sands* (1991–2019). Photograph created by author.

In the case of the Ghost Photographs, there is a double haunting, as two irretrievable pasts are intersecting in the image. Likewise, retracing the steps of a book or film creates a multi-layered assemblage of ideas, narratives, and images which can be mentally etched into the landscape. This sense of the uncanny and eerie was present in the Flaubert walk of Rouen, as we were retracing the steps of the author, and his ghost and those of Emma and Charles Bovary were traced in the sensations of

place. Thus, there was something uncomfortable in the experience of walking a path of another, as it folds time, and gives the uncanny sense that our life is intersecting with that of the author, and the virtual lives of the characters, Emma and Charles. Derrida described this as hauntology suggesting that there is no single arrow of time, or “reassuring order”, and he employs Shakespeare’s conception of “time being out of joint”, described in Hamlet, to imagine multiple overlapping layers of time (Derrida 2006, pp. 1–34).

6. Algorithmic Photographs

In addition to the double-exposed Ghost Photographs, I have repeated walks three times to create three-channel Algorithmic Photographs. As with Krzysztof Kiesłowski’s film *Blind Chance* (1981) and Tom Tykwer’s *Lola Rennt* (1998), in which minor differences impact upon a narrative repeated three times, at the heart of these repeated walks is the idea of chance, random difference, and the unrepeatability of a journey.

The sets of photographs from the three walks are amalgamated into algorithmic images: created photographic events. Each set of photographs is processed into a single colour channel: red, green or blue (RGB). When blended with images from each of the other two sets, a full-colour spectrum image is produced—a new photographic event which represents the underlying process and three walks, but also creates something altogether new in photographic terms. These photographs foreground the differences between the three original photographic events. For example, if the grass is overlaid from all three walks, then the colour values will combine to create the appropriate colour. Whereas, if there is a definite spatial and temporal shift between the repeated walks, then the channels will not blend accurately, and there will be stark compositions and discrete blocks of colour. Thus, these images have a complex indexicality, as they reference the three photographic spatio-temporalities, as well as the underlying algorithm.

Thus, these algorithmic images are haunted in iconic terms; not in reference to the supernatural or an inaccessible past, but the virtual, as they photographically present a scene that has never materially existed. Fisher described this haunting as the “agency of the virtual”, or “that which acts without (physically) existing” as these algorithmic images intermix the digital information between several walks and in so doing suggest the trace of relations between different times and places (Fisher 2016, p. 18). This can be illustrated with several photographs of stones in Northern England. The first photograph, Figure 5. *Duddo Stones* (2017–2019) presents the same location Duddo the Neolithic stone circle in Northumberland, on three different occasions, in 2017, 2018, and 2019. Whilst, the second photograph, Figure 6. *King Stone/Battle Stones* (2019) has the iconic appearance of a single stone, but the image was created from the sensed reflectance values of three standing stones, found in three separate locations across Northumberland. The algorithmic photograph, in this example, constructs a virtual stone from the intermixing of the three channels of data. Finally, Figure 7. *Found Stones* (2018–19) is a composite image of three photographs of stones. *Found Stones* is an ongoing project which documents a single stone from each walk, usually selected when I have paused to absorb a new vista. Each stone is scanned by taking thirty or more photographs, and these are then algorithmically stitched together using photogrammetry software to create a three-dimensional model that lives in an archive of 3D computer stone models. The reconstructions are imperfect three-dimensional images of the original stones as they have gaps in both the geometric and surface data which must be completed by the algorithm. Consequently, the final models have a dual iconic appearance-of both the original stone and the algorithmic process. These newly found stones also have dual indexicality-as they have a relationship to the (digitally sensed), material world and the algorithm which reconstructs them.



Figure 5. Paul Goodfellow *Duddo Stones* (2017–2019). Photograph created by author.

Barthes suggested that the long shadow of painting haunted the photograph, as we perceive the photograph in pictorial and tableau terms (Barthes 1993). It could also be argued that the algorithmic image is haunted by the photograph. Like satellite images, the constructed algorithmic images described here have the iconic appearance of photographs, but are not indexical records of a single event, or optical records of something that has taken place in the world. Instead, they are constructed through the application of production rules and algorithms. They are, therefore, both an index and iconic representation of the underlying algorithms and the walk, in much the same way that a satellite image is the product of the underlying algorithms. As Hoelzl and Marie observe neither the satellite, the computer, nor the camera is capturing the external reality, but an algorithmic event:

The camera does not capture the visual forms of an event but instead creates the visual form of a photographic event. It depicts a moment that has never actually existed, and which has therefore never been perceived or recognized or photographed as such. The photograph does not reveal the optical unconscious, but rather the photographic uncanny: It shows what does not exist prior to the photographic event, that is, the photograph. The photograph is uncanny not because it reanimates the past, but because it creates ghostly references. (Hoelzl and Marie 2015, p. 54)

The algorithmic photograph performs this uncanny state at a morphological level, as these images do not attempt to represent the optical unconscious, as there is no single optical perspective, instead, these images capture the systems unconscious. That is, these constructed photographs reveal something about the underlying system employed in their production, and in doing so, reveal something about the systems represented within the photograph. They have an uncanny or eerie quality as they point to the systems in operations in the world. As Morton states, “when you feel raindrops, you are experiencing climate, in some sense. In particular you are experiencing the climate change known as global warming. But you are never directly experiencing global warming as such” (Morton 2013, p. 48). Likewise, when you photograph a ruined abbey, you are not photographing conflict, but a trace of it remains within the frame.



Figure 6. Paul Goodfellow *King Stone/Battle Stones* (2019). Photograph created by author.

This trace within the photograph can be understood from a geographic information perspective as the visualization of difference. As Fyfe and Law state, “A depiction is never just an illustration. It is the material representation, the apparently stabilized product of a process of work. And it is the site for the construction and depiction of differences” (Pickles 1995, p. vii). Thus, these algorithmic images visually materialize the difference between moments in time and point to layers of connection and relation operating in the world. These constructed images make visible the passage of time between the contained photographic events and allow the viewer to speculate on the future trajectory of these virtualized landscapes.



Figure 7. Paul Goodfellow *Found Stones* (2018–2019). Composite image created by author.

7. Conclusions

Thus, the algorithmic photograph points to the wider distribution of invisible forces, such as ecological and social processes, climate change, and conflict operating within the image and the wider world. The appeal of the photograph, which is partly melancholic is that it can only partially capture aspects of the complex systems operating in the world. If we think of *Duddo*, these are not merely stones in the landscape but are part of a more extensive network of social and historical relations, and a single photograph, map, story, or literary history cannot capture their nature or complexity.

The algorithmic image points to the multiversal rhizomatic, but ultimately withdrawn and inaccessible nature of any given subject represented in a photograph.

Graham Harman observes that most interactions in the universe take place without a human actor (Harman 2016, p. 7). Consequently, *Duddo* would virtually disappear if it was reduced to the role it has played within human history. As Harman states,

To treat objects solely as actors forgets that a thing acts because it exists rather than existing because it acts. Objects are sleeping giants holding their forces in reserve, and do not unleash all their energies at once. (Harman 2016, p. 7)

Thus, the uncanny we feel when engaging with nature or an ancient site is the realisation that our temporal frame is relatively short. Against the geological timeframe of the stones the “subjective human time, the psychologically lived present with its experienced duration” is so brief it barely registers (DeLanda 2013, p. 105). What remains of our engagements with place can be described as spectral traces, which haunt both the landscape and the photograph. The photograph, at least, constructs a picture of the world at a given time and place, aligning with our experience of linear time. As James Gibson suggests, “we perceive the world along a ‘path of observation’”, and the photographic event operates as a record of this (Ingold 2016, p. 87).

However, this record is always partially inaccessible because our experience of the world is conducted upon the fixed axis of time. In *System Walks*, there is a parallel between the encounter with the photograph and the repetition of walking the same site. As the return is spatial, but not spatiotemporal, and there is underlying melancholia when a walk is repeated or when the walk is recalled through the photograph. For Proust, describing the vivid memories provoked by his famous encounter with the madeleine, these recollections are melancholic but also offer “moments bienheureux” or blissful moments. As the irretrievability of the past is bitter-sweet and prompts us to be more fully present in the moment (Proust 2003). Thomas Lennon suggests this feeling is very different from the destabilising quality of *déjà vu* (Lennon 2007, p. 55), in that bienheureux channels truthful sensations from the past. Thus, one could suggest there is an interesting entanglement between the “moments bienheureux” experienced on the repeated walks and the uncanny and eerie traces recorded in the algorithmic photographic events. As although we can never fully return to the same place in space and time, similar phenomenological sensations can be activated through the return: the repeated walk and the photographs. Lennon describes Proust’s activation of the past through bienheureux, “a revelation of something like Platonic forms, but forms that are embedded in time, the object of a special sort of sensation” (Lennon 2007, p. 64). Later he revises his thinking and argues that whilst the revelations were platonic and universal they were also something more profound as Proust found “himself rooted in time” (Lennon 2007, p. 64).

There is then a paradox operating within our engagements with the world, as we are material beings, but we can feel the eerie flow of forces and information. The world has become informationally accessible through technologies such as satellite images and information systems, demonstrating the complexity and interconnectedness of the ecological and social systems operating in the world. The world and its processes are being made visible, but they are so vast as to be perceptually out of reach: “the uncanny stirs because total interconnectedness enables it” (Morton 2012, p. 53). However, we may feel increasingly fragmented by this entanglement with information as it disconnects us from our lived experience.

System Walks is a personal attempt to accommodate this informational and systems reality with a more direct affective engagement with the landscapes of Northern Britain. These open spaces, which have been shaped by natural and social forces have been the site of many repeated walks, as I seek to triangulate between the material landscape, its simulation in data, and the stories which are embedded in the soil. *System Walks* performs my personal need to make sense of the world as it is increasingly mapped and simulated in information and reassert my own experiences of time and place. This paper contributes to the understanding that our experience of the world is being extended by the virtual

layers of data and algorithms, and we need to reassert our lived experience into this entanglement of information. This perspective is important for the geographer who needs to balance access to unlimited secondary data, against their own primary experience of place. This understanding is also important for the artist who needs to negotiate the information excess of contemporary culture.

As systems and the increasingly flat ontology of digital information transform and extend our lifeworld the understanding that we are “rooted in time” is of paramount importance, as without this phenomenological grounding the ‘present’ will be relegated to one-of-many dimensions of hyper-reality. These walks help me negotiate this complexity, and the photographs locate my experience in time. Thus, I have returned to the same places over many years, as the play of difference invoked by the repeated walks refines my inner simulation of the world while affirming the external world’s complexity and withdrawal.

Funding: This research received no external funding.

Acknowledgments: My gratitude to Simon Aspinall for his commitment to fieldwork, lived experience and for the time spent walking together. I would also like to thank the journal’s reviewers for their valuable comments.

Conflicts of Interest: The author declares no conflict of interest.

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