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Finding Pictures in the Sky: Machinic Vision of Cloudscapes

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Within cultural and art theory, there has been an emergence of attention placed on machine vision technologies as introducing a new regime of images and ways of seeing. This paper addresses this subject in the context of environment and nature through an inquiry into machinic ways of seeing cloudscapes. Attention is placed on how the cloud form presents a challenge to the logic of machine vision thereby introducing a potential for exploring machinic modes of perception. I look at the work of contemporary artists Daniel Lefcourt, Shinseungback Kimyoungyun and the collaborative group, Forensic Architecture who each, in their own way investigate various forms of machinic representation of the cloud. These cloudscapes are referenced here as theoretical and practical sources to explore a techno-aesthetic that is constituted by a confrontation between the machinic logic of advanced visual technologies and the organic form of the cloud. In different ways, the works explored here each bring to the fore, latent layers of representation of a machinic vision. The visibility of these layers foregrounds its productive capacity in a meaning production which is both open and speculative. These artistic and collaborative engagements provide critical points of departure through which to explore contemporary visualisations of the environment and a production of meaning within a cultural and political realm.

Cloudscape. Machine vision. Anthropocene. Contemporary Art. Representation. Evidentiary Aesthetics. Environmental Visualization.

1. INTRODUCTION

Within cultural and art theory, there has been an emergence of attention placed on machine vision technologies as introducing a new regime of images and ways of seeing. This paper addresses this subject in the context of environment and nature through an inquiry into machinic ways of seeing cloudscapes. Attention is placed on how the cloud form presents a challenge to the logic of machine vision thereby introducing a potential for exploring machinic modes of perception. I look at the work of contemporary artists Daniel Lefcourt, Shinseungback Kimyoungyun and the collaborative group, Forensic Architecture who each, in their own way investigate various forms of machinic representation of the cloud. These cloudscapes are referenced here as theoretical and practical sources to explore a techno-aesthetic that is constituted by a confrontation between the machinic logic of advanced visual technologies and the organic form of the cloud. These artistic and collaborative engagements provide critical points of departure through which to explore contemporary visualisations of the environment and a production of meaning within a cultural and political realm.

The technology of machine vision was first implemented in operations of inspection within the industrial factory, as a technical extension of the labour of looking. What we find today is the increasing development and implementation of machine vision systems— with the inclusion of algorithmic forms of perception— in operations of inspection outside of the controlled environments of the factory and increasingly applied at a planetary scale, monitoring global environments for purposes of climate monitoring and surveillance. These forms of environmental visualization are made possible through the technology of 3D spatial mapping, satellite imaging, automated recognition algorithms, data driven simulation, indexical differentiation and other types of computational imagery. T.J Demos discusses these technologies as producing an aesthetic of the Anthropocene, an era that centres human activity as the primary source of environmental change, and how much of the present visualization has foregone photographic forms of representation and instead rely on data, sensors and forms of automated measurement and statical analysis that are invisible to the human eye. (Demos, 2017, 13) Demos argues that much of this imagery presents itself as self-evident and, ‘...seem hyper-legible but are in fact are far from transparent.’ (Demos, 2017, 17) I explore these machinic forms of

representation and its legibility through an inquiry on the techno-aesthetics of machine vision images in the context of artistic and evidentiary practices.

Aside from the contexts of its contemporary implementation, the processes by which a machine can see, often through algorithmic processes of recognition often remain invisible for us yet are particularly interesting to analyse from a visual culture perspective and through art practices. This is because they have the ability to both define and reconstitute an understanding of vision and visibility. Artists working with machine vision also experiment with the parameters of its application outside of the contexts for which it was designed, exploring further possibilities and potentials of the technology and revealing its salient cultural implications. I approach the phenomenon of machine vision both conceptually; as a source of theoretical inquiry as well as examining its practical form. Both approaches are embodied in my use of the term, 'machinic' which refers to an assemblage of human and machine interaction. Referencing John Johnston, a machinic vision is, 'an environment of interacting machine and human-machine systems...a field of decoded perceptions that, whether or not produced by or issuing from these machines, assume their full intelligibility only in relation to them.' (Johnston, 1999, 27) My focus, here is on an inquiry into the visibility of a machinic vision and the ways in which the technology can produce new perspectives from which a human could not otherwise see from or occupy and how these perspectives intervene, produce and/or reinstate cultural, political and aesthetic meaning.

For this paper I focus on the specific element found in nature of clouds and the rendering of cloudscapes by artists through technologies of machine vision. Upon researching the resurgence of landscape as an image genre considering contemporary visual technologies, the most elusive and intriguing images



Figure 1: Georgia O'Keeffe. *Above the Clouds I*, 1962-1963. Oil on canvas, 36 1/8 x 48 1/4 inches.

I have come across, have been of clouds. Cloudscapes as an artistic genre, are in a sense,

aerial landscapes, which extend the gaze upwards from the land or in some cases downwards when seeing clouds from above, made possible for example from the perspective of a plane.

Clouds represent a figure which is, by its material means the most difficult to capture. They elude statistical analysis and resist typification – two operations through which machine vision operates.

In my previous research at the intersection of visibility and machine vision, I have found that often the images produced through machine vision systems are ghostly; blurred, multi-layered and obscure. (Lee-Morrison, 2019) Yet clouds in themselves, are ghostly in their formlessness and transparency with the characteristic of a constantly shifting shape. As such, machine vision perception of clouds can be seen to do the opposite, in its process of representing the cloud as something solid, measurable and concrete.

As much as clouds may provide a limit case for the processes of perception by machine, they have also existed as a constant motif for five centuries in European landscape painting and have been a primary object of representation for landscape painters, most notably in the work of John Constable. This prolific attention to cloud rendering has led to the production of cloud atlases, which categorize the visual characteristics of clouds, providing for types which appear with more regularity such as cumulus and cirrus clouds. (Fig. 2) Furthermore, the art critic John Ruskin constructed a cloud grid which provided a kind of cartesian perspective of the internal structures of cloud formations. (Fig. 3) These categorisations show attempts to concretise the cloud form for purposes of artistic representation.

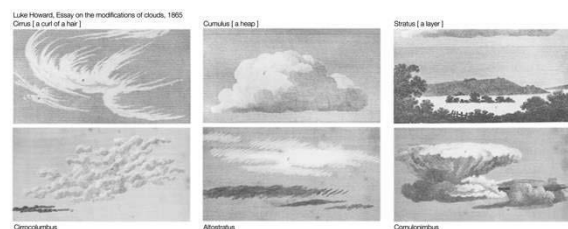


Figure 2: Luke Howard, 'Essay on the modifications of clouds' 1805 in *Forensic Architecture, Cloud Studies*, 2021. Video still. 26:09.

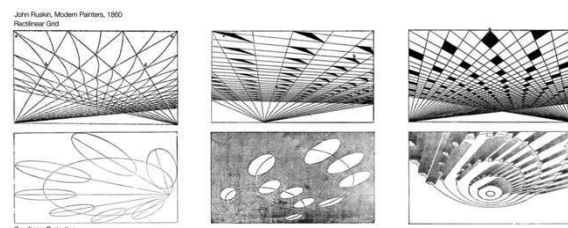


Figure 3: John Ruskin, 1860, *modern painters in Forensic Architecture, Cloud Studies*, 2021. Video still. 26:09.

These atlases provide for two different levels of representation of the cloud; an external, visible representation of its form as well as an internal layer which corresponds with a geometric logic. These multiple layers of representation are further explored in the following contemporary works in relation to a machinic vision of the cloud.

2. DANIEL LEFCOURT: CLOUD AS CODE

The artist, Daniel Lefcourt produced a series of landscape paintings under the title, *Terraform* (2018) which bring spatial measurement technologies such as 3D mapping and topographical algorithms in confrontation with the space and material of the painted canvas. In one of his pieces titled, *Terraform (Cloud Base)* 2018 (Fig. 4) washes of iron oxide pigment and a greyish blue tonal wash appear at the centre of the canvas. This central organic and gaseous form resembles a floating cloud. The title of 'cloud base,' references a spatial index technology used to measure the altitude of clouds, based off their lowest visible portion. The measurement is taken by bouncing light beams off the base of the cloud and measuring the distance above a certain mean sea level or other planetary surface. The painting is layered by a visible grid consisting of single- and double-digit numbers that overlay the entire surface of the canvas. Lefcourt's process of producing these paintings treats the initial washes and tonal stains as the catalyst for coded, numerical measurements. Each number is representative of the average tonal value of the aqueous colour it lays on top of. The grid presents a computational layer of the painted cloud transformed into data. Yet this grid also presents a dual perspective. In contrast to the use of cloud base technology which measures upwards from the ground, the tonal measurements here are measured from above, that is from an aerial perspective of the canvas. This contrasts from the perspective that is visible for the observer of the painting, which at first appears in the form of a horizontal landscape. The representational layer of data which overlays this painting recalls an historical event of the first rendering of the planet Mars, taken aboard a NASA spacecraft in 1965 with a TV camera and transmitted by binary code. NASA scientists on the ground, produced a tonal chart with a very strictly defined value range to correspond with each number sequence, creating the first image of Mars by a veritable, paint-by-numbers, pointillist rendering. (NASA Science, 2019) This event marks a meeting of scientific and artistic modes of representation in creating a representation of what was essentially imaginary, that is, the unforeseen and unknown planet of Mars. These aspects are present in Lefcourt's cloudscape with its visibility of the number sequences which construct the image. His work reveals the layer of representation through which unknown environments have been historically

mediated and through the spatial parameters of a machinic visualization. In this way it exposes a play between layers of representation which can render something as amorphous and full of the imaginary as a cloud, in a mapped and measured form.

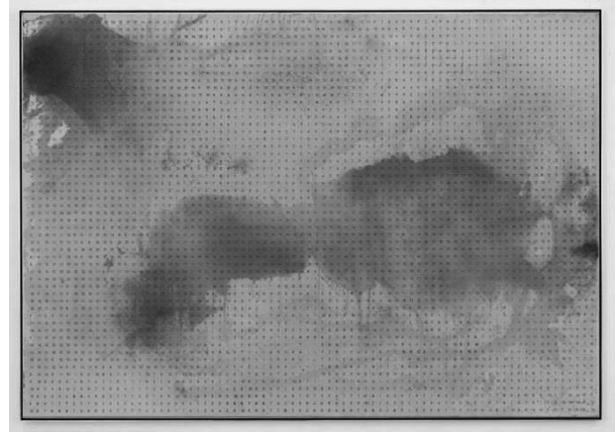


Figure 4: Daniel Lefcourt, *Terraform (Cloud Base)* 2018. Pigment and acrylic polymer resin on canvas 56 by 80 in. 142.2 by 203.2 cm.

Lefcourt's addition of the layer of representation which transforms the cloud into numerical code and vice versa, presents the possibility of multiple, simultaneous forms of representation of the same subject/object. These visible layers of the cloudscape bring to mind W.J.T. Mitchell's analysis of landscape images as constituted by layers of representation. Mitchell puts forth the argument that landscape paintings, always inherently involves a 'secondary representation.' He states, 'Landscape painting is a uniquely centred medium that gives us access to ways of seeing... but as a representation of something that is already a representation in its own right... Before all these secondary representations landscape is itself a physical multi-sensory medium (earth, stone, vegetation, water and sky, sound and silence, light and darkness, etc.) in which cultural meanings and values are encoded, whether they are *put* there by the physical transformation of a place in...or *found* in place formed, as we say, 'by nature'.' (Mitchell, 2002, 12-13) In referring to this kind of primary representational mode of landscape, Mitchell refers to the natural elements as a medium, a kind of multi-sensory means of communication. Lefcourt's painting visualises this process of *encoding*. He mentions, how in the process of making a painting, that drawing— that is, the initial stage of sketching— eventually gets hidden underneath the paint. In his work, he intentionally places this overshadowed layer on top, making the 'sketch' visible, in a style of deconstruction. (Lefcourt, 2021) The automated and computational sketch that structures a machinic translation of the cloud form is brought out of its latent position and made visible in way that

foregrounds its productive capacity. Lefcourt's processes of rendering an applied visibility of numeric calculation applied to something as amorphous as a cloud, highlights a correspondence between computation and indeterminacy; between the machinic and organic layers of representation. As such, Lefcourt's work brings forth a machinic way of seeing which is both speculative and generative, merging the layers of representational constructs that formalise a machinic perception.

3. SHINSEUNGBACK KIMYONGHUN: CLOUD AS MEDIA

In 2005, the founder of the British Cloud Appreciation Society, Gavin Pretor-Pinney published a book of cloud images titled, 'Clouds That Look Like Things,' that included a collection of some of the strangest anomalies of photographed clouds. (Pretor-Pinney, 2005) Each of these collected cloud images point towards a recognisable form such as an animal, a human face, and other everyday objects. Through the act of recognising forms in these cloud images, the book positions the reader, as John Durham Peters describes, 'as a projector rather than a discerner' and as such draws on a kind of collective imaginative capability of human visual perception to find form in an otherwise fluid medium. (Peters, 2015, 254-55) Rather than categorising types of clouds, as in the cloud atlas, this book instead could be seen to categorize visual forms from which clouds are perceived to correspond to. In relation, the artistic duo of Shinseungback Kimyonghun in their work titled, 'Cloud Face' (2012) extends this imaginative capability of projection on to cloud, by mode of visual perception by machine. The members of this collaboration, computer scientist, Shin Seung Back and artist, Kim Yong Hun record moving images of clouds in the sky and then apply an automated facial recognition algorithm (AFR) to scan it and carry out its operation of finding faces. In doing so, the use of AFR is employed to project rather than function in its designed capability to recognise or discern. The duo then collects stills of the moments in which the AFR system has recognised a face and produce large composites.

In 'Cloud Faces' the AFR technology scans cloud formations for faces, instead of random objects as a human would, when cloud gazing. Indeed, the AFR system can see only faces by design, even where there are presumably none. In this way, the artistic duo rely on the excesses of the algorithm's operative function. Yet it is this excess capability— this error — which the artists bring to the fore and which allows this potential of the technology to relate to a distinctly, human capability of imagination, that is in an ability to see something as other. Clouds are forms which can communicate this otherness abundantly. Peters further elaborates on this in his thesis on elemental media. Peters defines media



Figure 5: Shinseungback Kimyonghun, *Cloud Face* (selected image), 2012.

as, 'the means by which meaning is communicated' and describes how an original understanding of the term was based on a reference to the natural elements such as water, earth fire and air as a kind of media. (Peters, 2015:2) Peters describes media in much the same way as Mitchell describes a secondary representation in landscape, when he elusively states that the technical media that we understand today, 'sit atop layers of even more fundamental media that have meaning but do not speak.' (Peters, 2015:2) This aspect of muteness of the elements of nature describes a lack of intentionality and an understanding of nature as not able to self-present, that is its representation seems to always imply a reflexive motion where it exists as something for someone. Yet, as seen through the cloud in Shinseungback Kimyonghun's work, the muteness of natural elements as media, also provides a site of its potentiality in a process of a visual, imaginative capability.



Figure 6: Shinseungback Kimyonghun, *Cloud Face* (installation view), 2012, Pigment print on Cotton Rag Paper, 200 cm x 80 cm.

Furthermore, Peters states about clouds:

They do not look like things to bear significance. They are neither icon, index,

nor symbol. Gloriously, clouds pose the problem of the unrepresentable. ...What would it mean to ask if clouds have meaning? (Peters, 2015, 257)

In a way, Shinseungback Kimyonghun's work plays with how the technology of AFR projects momentary bouts of significance onto clouds by seeing faces in its mobile form. It poses this question of projecting meaning in treating clouds as media, as a visual source of communication, in the way that the AFR enacts a kind of machinic interpretation of the cloud, distilling data and information through its form. The work engages with the natural element of the cloud as a means of communication which exploits this operative function of a recognition algorithm in its mutability. The cloud exposes this tension between form and formlessness, providing a medium for machinic projection which transforms the recognition process into an act of projection. The result of 'Cloud Face' is a kind of alignment of a machinic vision with a human imaginative capability, made possible through the elemental 'muteness' and medium of the cloud.

4. FORENSIC ARCHITECTURE: CLOUD AS INDEX

In 2020 Forensic Architecture (FA) presented parts of a work titled, 'Cloud Studies' in 2020 as part of an exhibition titled, 'Critical Zones: Observatories for earthly politics' at ZKM Centre for Art and Media in Karlsruhe. The video was a culmination of projects carried out by FA which all involved the investigation of illegal toxic cloud emissions by various, different state and corporate agencies. My interest in the work of FA here, involve how they utilise various forms of machine vision technology and virtual and digital image production of clouds and include these within the canon of evidentiary images alongside traditional forms such as documentary photographs and video. FA projects involve sourcing multiple sources of data including the historical documentation of maps, statistical information, meteorological data and cross referencing these with digital visualising technologies to construct a holistic image of abuse utilised as evidence. Through their investigations, FA counters a lack of accountability by states and corporations that rely on an invisibility that is, a lack of evidentiary traces of their abusive activity. In 'Cloud Studies', FA's work focuses on recognising how clouds as a form can be invisible and therefore hard to track and as such provide a 'limit condition'; a 'forensics without inscription,' and an 'architecture in gaseous form.' (Forensic Architecture, 2020) The contexts of these clouds as produced by and through lethal means, also provide for what FA refers to as a 'toxic common' once able to be breathed in by civilians. This approach and

translation of the cloud as an index of targeted environmental pollution and destruction of civilian life also presents a holistic view of the cloud as a fully materialised form. Through the use of machine vision technologies such as optical gas imaging, 3D Fluid dynamic stimulation and machine vision classifiers, FA brings the cloud into full visibility and concretises its form as a signifier of atmospheric power relations and abuse.

One project titled, 'Environmental Racism in Death Valley, Louisiana' concerns the historical black communities that live along the Mississippi River in Louisiana between Baton Rouge and New Orleans. This area, which is where historical slave plantations stood, have predominantly been bought out in recent years, by 200 petrochemical industrial companies who in their production activities spew out the most toxic air in the whole of the U.S, holding the highest risks of cancer. One community which lives in this area, named St. James commissioned Forensic Architecture to gather evidence in support of their claims for accountability and reappropriation, by bringing visibility to the lethal air borne pollutants by industrial giant Formosa Plastics. Forensic Architecture utilises the visualising technologies of thermal infrared cameras and optical gas imaging to bring the toxic gas cloud emissions into what they refer to as the visible register. (Fig. 7) They, furthermore, are able to have a record of the amount and exact date of emissions which they cross reference with publicly available data bases of the industrial gases housed in large tanks and marked by internal codes utilised by Formosa. Forensic Architecture are able to then have a visual record of which exact gases that are being emitted such as methane and sulphur hexafluoride. They further cross-reference this info with records of meteorological data from local weather stations that provide the direction and length of wind in the area. Through the use of 3D fluid dynamic simulation, they visualise how the wind carries these toxic cloud emissions to neighbouring communities. (Fig. 8)

FA describes how the perception of clouds is always 'doubled' in that they are seen from either the outside in which case they are measured; or by the inside in which case, they are experienced. In this case, FA merge the two through their machinic renderings of toxic cloudscaapes. The 'doubling' can also relate to the representation of the cloud and the ways in which the data visualization represents it. These machinic views provide another level of cloud perception, I argue, which involve the 'ingredients' of the cloud, produced from cross-referencing metadata that visualise what the cloud is made of, for example methane, carbon dioxide, or water and represented through colour. Through 3D fluid simulation. FA thereby extends a machinic visibility of the cloud which contributes to the historical practice of cloudscape categorisation, producing a kind of contemporary cloud atlas which

categorizes (man-made) clouds through metadata of its toxicity and the projected area in which the cloud permeates, both of which is not immediately visible to the human eye. The toxic cloud emissions are invisible yet substantive. The visualisation of the cloud through thermal and optical gas imaging, provide traces of its existence, which in turn eventually affect the physical and material lives of the individuals who breathe in its ingredients. Through this work, Forensic Architecture concretises the elusiveness of the cloud form as well as relate it to the experiential aspect of its protracted toxic trace. The resulting cloudscape acts as index by way of pointing towards the metadata of its ingredients and providing evidence



to support accountability on the part of Formosa Plastics.

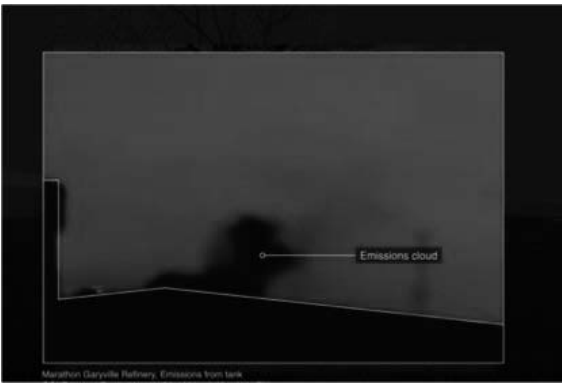


Figure 7: Forensic Architecture, *Cloud Studies*, 2021. Video still. 26:09 .



Figure 8: Forensic Architecture, *Cloud Studies*, 2021. Video still. 26:09.

The cloud and its ingredients are concretised through its image. In this way, FA's machinic cloudscape function within an evidentiary aesthetic, in its representational approach towards the cloud as index.

5. CONCLUSION

The cloud form has presented different challenges in representation historically and within art practices and continues to present distinct challenges to the modes of perception found by machine. The cloud in its non-linear and fractal form, presents a challenge to the modes of perception by machine and the logic by which its processes produce meaning. I argue that these challenges present new potentialities for the technology. In looking into machinic representations of cloudscape, this paper studies a confrontation between a machinic gaze and the organic form. In different ways, the works explored here each bring to the fore, latent layers of representation of a machinic vision. Lefcourt's work exposes a simultaneous layer of numerical interpretation— a kind of computational sketch of the painted cloud form— which highlights a correspondence between code and form, computation and indeterminacy. Shinseungback Kimyonghun draws on the excesses of algorithmic recognition of the cloud, approaching it as a mutable form of media, upon which meaning, and its imaginative capability is revealed. Lastly, Forensic Architecture's approach towards the reading of toxic clouds through digital image simulation and thermal imaging concretises its amorphous form. Through the use of metadata, the imaged cloud becomes an index, functioning through a representational doubling of its visualised form and a record of its toxic ingredients. The visibility of these layers foregrounds its productive capacity in a meaning production which is both open and speculative. In confrontation with the organic form of the cloud, these works explore machinic modes of perception that embody a potential for an imaginative capability. The cloud becomes a perfect object from which the intentionality and excess of a machinic projection can be made legible.

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