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# A transient image in the Creative Commons

A digital algorithm that manifests physical tools for novel image creation

Master's thesis in Fine Art (MFA)

Supervisor: Alexandra Lesley-Murray

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## ABSTRACT

By exploring an object's ability to move between digital and physical space, this project aims to highlight the importance of the democratisation of access to tools and technologies by circumventing traditional channels and formats. This is achieved through the parameters of The Creative Commons licensing system. Nested within the open source legal framework, this project, the algorithm: *Numerical Control Device Generator*, enables the creation of drawing plotters. These machines are then set to target images from digital historical archives as a source material for the production of drawings. The plotter allows for a slower paced approach to image interaction as a means of addressing image value and vulnerability. Taking a conservationist approach to image reproduction through the use of digital archive databases allows for a reevaluation of image significance and attributed value. Both physical and digital image forms are constantly subject to decay. This project engages with the interplay between drawing and photography, navigating the dynamics between the digital and the physical. It offers a perspective on images as encapsulated knowledge within a novel medium; a self-contained, evolving system that comes from and returns, full circle, back to the Creative Commons.

## **Chapter 1: Images - value attribution and decay**

*“While images may be actively circulated, they are just as often forgotten or discarded, lost in an archive as static relics yet still imbued with the potential to be repurposed and sent back into circulation.”<sup>1</sup>*

### **A state of transience**

The term "transient image" refers to an image that appears or exists temporarily. In the context of technology or visual perception, it could also refer to an image that changes rapidly such as a film or slide show. A further context of "transient" also relates to an event or phenomenon leaving lasting impacts of producing effects even after the initial event's conclusion.<sup>2</sup>

It is possible to conceive of all images within this context. An image has the potential to make a lasting impact on the viewer. Any image, regardless of its notoriety, will someday be viewed for the last time. No permanent state of image or information storage currently exists. All formats, whether digital or physical, are guaranteed to fail on a long enough timeline. The life expectancy of a digital image is, perhaps somewhat unintuitively, shorter than that of a physical print or drawing. For all the redeeming merits of digital archives, the challenge of the medium's inherent volatility persists as a complication.<sup>3</sup> There is no such thing as too many backups.<sup>4</sup> With this in mind a hybrid method of storage methods across a variety of mediums should, statistically, decrease the probability of knowledge loss. Therein lies the dilemma of attributed value; *what information is worthy of conservation and who is to determine its assigned value?* Commercial interests would have this decision process be perceived as democratic. The information which creates the most engagement (likes, retweets, views, etc.) clearly holds the greater value. Yet all these things are for sale at the right price. A digital black market has emerged where engagement is bought and sold in bulk.<sup>5</sup> Furthermore, not every interest or demographic is represented equally within the digital sphere. Certain age groups and cultures are more active and skillful in its use. This leads to variance in influence among participants within digital communities and platforms.<sup>6</sup>



*Digital decay: the image that eats itself* Guus Baggermans (2021)

This logic can be extended beyond the digital mediums into physical ones. It could be said that all images, regardless of medium, are in a transient state. Let us take the anecdote of Norway's most prized national treasure, *Skrik (The Scream)* by Edvard Munch. The international repute and astronomical cultural value of this work can simply not be disputed. This can even be done without discussing the aesthetic, let alone, the potential monetary value of the object. Yet even the physical matter that such a work consists of is subject to the same ceaseless atrophy as everything else. The work is currently on display in a windowless room on the 4th floor of the MUNCH museum in Oslo. It is present in three iterations, each one concealed behind sliding doors and layers of protective glass. Every fifteen minutes the currently visible version will be automatically concealed behind its doors and the next image in the rotation will be revealed. All under the gaze of dapper guards. Despite these elaborate mechanisms and precautions, it is no match to my own dear mother simply neglecting to deactivate the flash on her iPhone, inadvertently exposing the work to a small dose of ultraviolet radiation.<sup>7</sup> This is a scenario repeating itself daily in museums across the globe; a conservator's waking nightmare. At a certain point every fibre of canvas and speck of paint will degrade until not a single molecule of the original work remains. This is counteracted by the efforts of conservation and restoration. Will we still attribute the same value to this new image?<sup>8</sup>



### Value and vulnerability

Putting this idea in the context of the images we make daily, they don't have the same cultural value or perceived significance attributed to them. As digital cameras have become ubiquitous and integrated into devices carried daily in billions of pockets, the price per megabyte of storage has simultaneously decreased.<sup>9</sup> These factors are then coupled with a social expectation that banal everyday events are worthy, if not mandatory, to broadcast across the internet to anyone who desires to view them. Cumulatively circumstances have lowered the threshold for what subjects and situations can be considered valuable enough to capture in a picture. Such a streamlined ease of capture results in a dilemma of vulnerability. Simply dropping a device can result in a catastrophic loss of data. This issue can, on the individual level, be resolved through external storage devices or home servers. The more common solution lies in storing copies of the data distributed across a network of machines. If data is lost, in part or in its entirety, it can automatically be restored and reconstructed from one of many sources.<sup>10</sup> This is a service provided to individuals by large platforms such as Google, Apple, and Amazon web services at no monetary cost.

*"If something is free, you're the product."*<sup>11</sup>

The value attribution is not so much to the images themselves, as it is to what the image and metadata discloses about the user. This be as it may, there are many open source databases existing neither to the private, nor the public sector. This data belongs to the commons, much to the dismay of private interests.<sup>12</sup> The physical portion of my master project, the output of the *Numerical Control Device Generator* (NCDG), deals within the



scope of open source hardware in conjunction with datasets in an archival or historical context. A concerted effort within the Scandinavian museum sector to digitise its archives is currently underway. This growing data set is publicly available through the DigitalMuseum platform.<sup>13</sup> The surface layer of access to the image sets is through the Graphic User Interface (GUI) of a website. By navigating to the domain in a web browser, one can input search queries and manually interact with the results. A layer exists below this, known as the Application Programming Interface (API).<sup>14</sup> On this layer a user can send requests to the server containing the image sets and retrieve information in an automated fashion through scripting. A script is a small program that automates a task. This is the interface methodology that this project employs to create novel image expressions. As admirable and viable this digitisation of archives is in perseverance of knowledge, it is a limited format, susceptible to its own vulnerabilities.<sup>15</sup> The methodology I am exploring within the NCDG can be viewed as a hardcopy backup for digitally stored image information. Distributing the proverbial eggs into several baskets.

## **Chapter 2: Drawing parallels between past and present states of image reproduction**

### Drawing 2.0

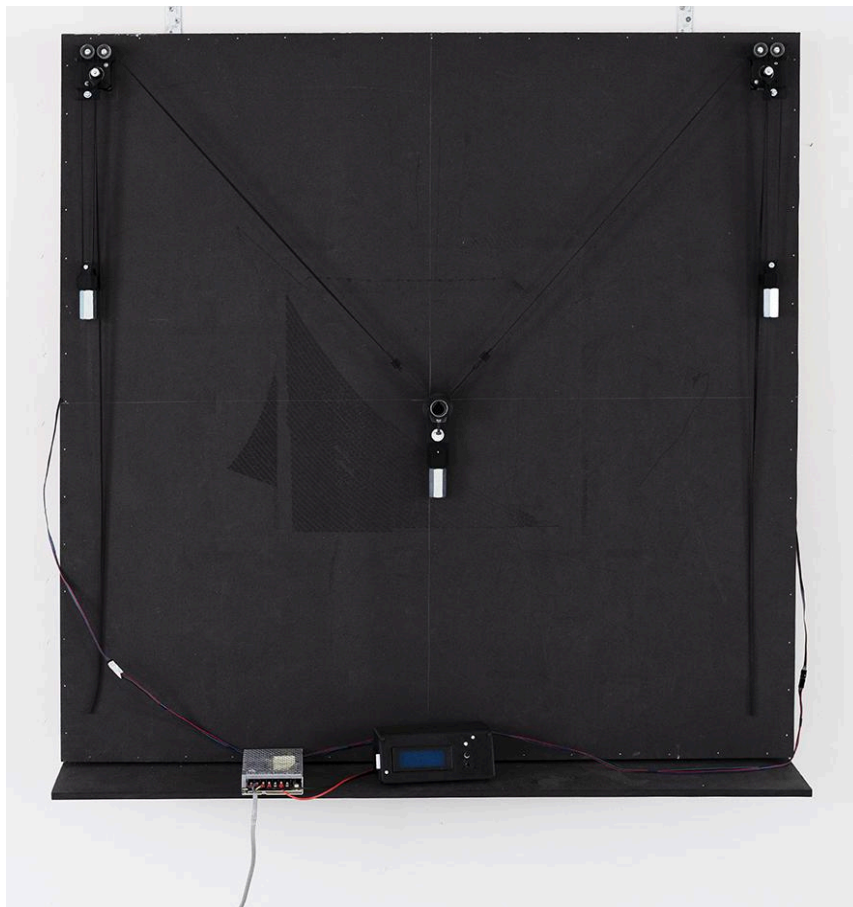
*“Artists can engage with automated processes to expedite certain aspects of their work, allowing them to channel more energy into ideation and experimentation. Just as the advent of photography didn't render painting obsolete but rather encouraged painters to explore new realms of subjectivity, automation can push artists to redefine their roles and the boundaries of their creative exploration.”<sup>16</sup>*

It has been almost 200 years since Nicéphore Niépce, in 1826, created the oldest surviving image that could be conceived of as a photograph.<sup>17</sup> Ever since, critiques have attempted to declare other forms of manual image creation obsolete.<sup>18</sup> Anyone can independently determine that this indeed is not the case. Drawing remains, perhaps, the most universally accessible manual method for image creation available.

It is these dialogues between two modalities, drawing and photography, that I am exploring within the scope of this project. Specifically the relationship and tension that exists between the digital and physical properties as they pertain to the perceived cultural values attributed to these mediums. Access to creating photographs has over the last few decades undoubtedly increased with the advent of ubiquitous low cost digital cameras. You would be hard pressed to find a phone that does not have at least one integrated camera lens. Despite its meteoric rise, digital photography has not displaced drawing as a favoured medium for image creation. These technologies, with their varying applications and aesthetics, coexist by fulfilling different cultural roles. The context of a current technology can certainly be disrupted by the sudden emergence of a novel method, yet it is not by default immediately relegated to the trash heap of antiquity. It is by engaging with both these approaches within the twilight between the digital and analog realms, I hope to learn more about the complex relationship and correlation between them.

While I am choosing to use drawing as the medium for creating physical manifestations of digital images, it must be noted that I am not referring to drawing in the conventional sense. In an effort to create a bridge between analog techniques and technology I am utilising a drawing plotter.

The plotter is driven by what's known as a stepper motor. These motors have a set number of steps in a full 360 rotation of their drive shaft. The software used to operate them can detect and determine their position based on their previous movement(s), i.e. it can keep count of the steps taken. These steps can be equated to a resolution such as megapixels in a digital camera, or pixel density of a screen. The motors move a toolhead (which holds a drawing tool such as a marker, pen, etc.) along 2 axes, X and Y, with the aid of a timing belt. A third axis, Z, is controlled by a servo motor with a 90 degree limit to its rotation. The Z axis is binary, it employs two states: engaged and disengaged (drawing or travelling). This enables the machine to begin and end lines anywhere within the confines of the X/Y plane.

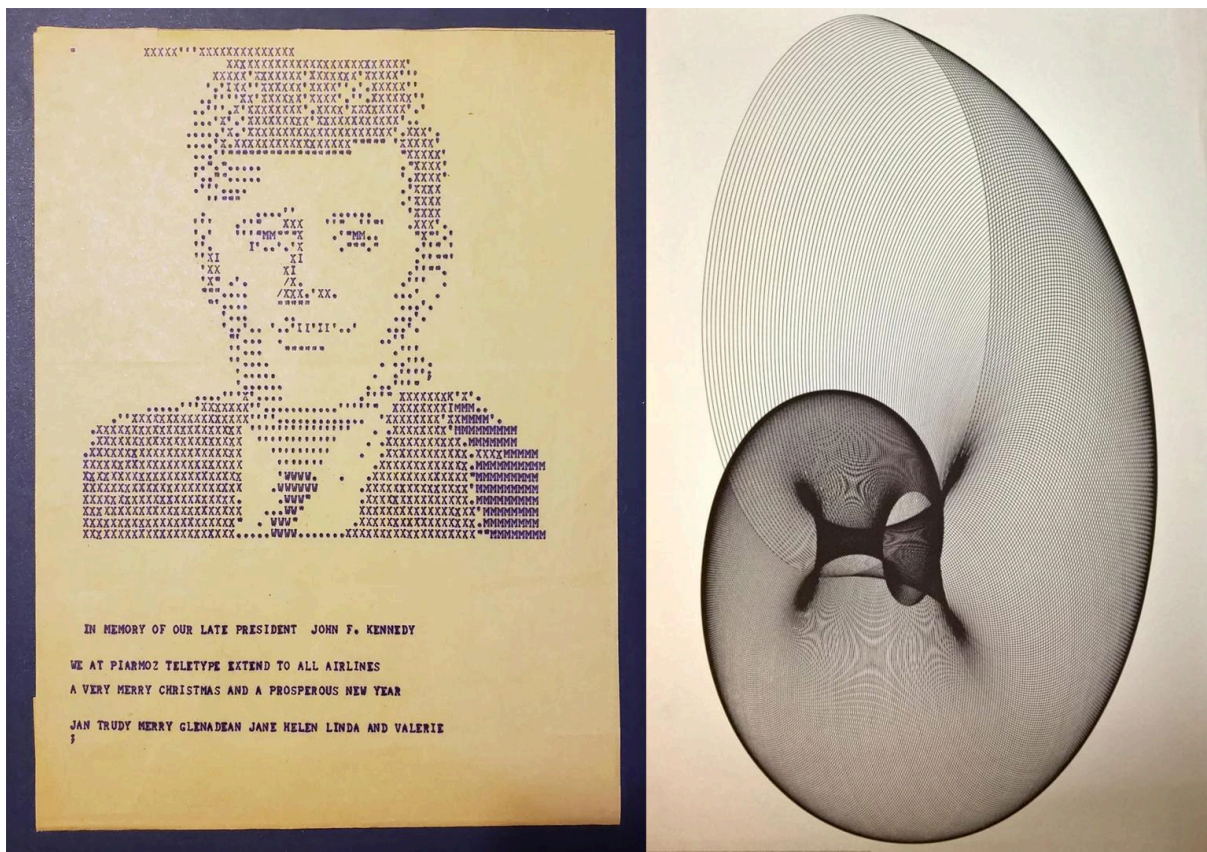


*Drawing Robot Plotter, Marius Reed (2010)<sup>19</sup>*

### Closing the gap

*“But the «image as such,» if we can speak of such a thing, is not itself a material thing, though it must always appear in or on some material support- a statue, an embodied perceiver. An image is a relationship and an appearance: it might be better, in fact, to think of images as events or happenings than as objects, in order to register their often fleeting temporality.”<sup>20</sup>*

The interface of the drawing plotter echoes the origins of the internet. The first terminals used to access information across networks were absent of a screen, something we associate directly with the means of information interaction. These first terminals consisted merely of a keyboard and a dot-matrix printer. Information received across a network would be printed out in hard copy - this was the era of teletype.<sup>21</sup> Teletypes were used to produce text, primarily, but the symbols could be used to represent basic images and transmit them. Concurrently, the emergence of plotters on the consumer market primarily enabled image transmission.<sup>22</sup> Rather than a combinations of characters resembling an image, a set of coordinates representing points and paths were used to produce images specifically.



Left: A graphic of John F Kennedy produced by a teletype.<sup>23</sup> Right: A graphic produced by one of the first commercial plotters.<sup>24</sup>

The use of a drawing plotter is a means of returning to image creation through the terminal. In lieu of controlling it through a GUI or an image editing software such as Photoshop, the control software is executed in the command line; by text input. Rather than accessing a webpage through a browser and manually scrolling and viewing images, the underlying web server is targeted through its API. This is a communication occurring closer to the computer's own language, by stating the desired outcome in a script.<sup>25</sup> The computer is then instructed to run this code and carry out actions on the user's behalf. What returns is the digital instructions for the mechanical operation performed by the plotter on the physical drawing plane.

In this sense the drawing plotter harks back to the origins of printing images from a network. The basic mechanics of each of these devices are similar, yet each possess an aesthetic of their own. The NCDG is being used to reproduce archive images in a more interpretative manner than their digital counterparts. It can thereby be viewed as an alternate information medium in which knowledge is generated about image making.

### Dialling down the pace

The NCDG allows for interaction with images at a slower pace. In the previous infrastructure of the dial-up modem era, telecoms infrastructure strongly limited the amount of data that could be transmitted per second. The frantic unending image experience we know today, often referred to as doomscrolling,<sup>26</sup> simply would not have been feasible within these constraints. Like bandwidth being paid for on a per minute basis, or the limit of 24-image film roll, the NCDG gives room for pause in determining what image to engage with, and thereby informing what value is assigned.

This slower approach to image engagement and the use for the plotter that I am employing stems from a conservationist perspective and recontextualization of image value by working primarily with historical image databases, archives, and with images seen as information in the sense that digital images exist as binary data at the machine level. I am transmuting the intent or application of an image, from a documentation tool to an expressive tool. As previously discussed the digitisation of archives, as a means of the perseverance of information, is susceptible to vulnerabilities. By creating a new hard copy, through the method of drawing as executed by the NCDG, I am providing these stored data sets with a new medium in which they can be embodied, an altered state. This enables the information contained within the images to move from pure documentation to a form of expression. Our current relationship to photography is removed from the hardcopy print. We engage with photography through the medium of a screen. A liquid crystal display backlit by a light-emitting diode array. By its very origins, the word photography, photo- meaning “light” and grapy- “something written” alludes to an entirely different experience altogether. Rather than a flickering projection of light viewed optically, it is a record of light viewed statically. The plotter device provides a modality in which the image can employ multiple states simultaneously.

The scope of the project goes beyond just the interaction with the image and images databases and applies to the manifestation of the plotting tool itself. Through information I have accessed in online communities I have been able to build the plotter from scratch. The current state of the internet would have us believe we are disempowered or alienated from technology, however there exists an alternate layer to which information sharing and the democratisation of technology<sup>27</sup> is integral.

## **Chapter 3: The Creative Commons, transcending from the digital to the physical**

### Tapping into shared resources

*“...cultural artifacts and informational goods are transformed into investment instruments for the expansion of capital much like real estate, bonds, stock, licences, franchises, precious*

*metals, and so on. Furthermore, capital generated by tangible productive property or investment instruments frequently is expanded through investments in intellectual property and the means of disseminating it.”*<sup>28</sup>

The inception of the World Wide Web (WWW),<sup>29</sup> and the golden age of peer to peer (P2P)<sup>30</sup> sharing soon thereafter, marked the beginning of files of every conceivable format to be shared directly between individuals. It was a digital revolution granting unprecedented access to information, communication, software and knowledge to any person able to access and navigate the technology. However, the existing copyright systems of the time, imagined for more physical media, were ill-suited to governing this new digital structure. This resulted in disproportionate crackdowns by corporations on private citizens, leveraging obsolete laws and restrictions to extract unpayable fines. From the growing pains of the entry into the new millennium the The Creative Commons organisation came into being. The Creative Commons (CC) is a licensing system that allows creators to share their work with the public while retaining certain rights, allowing for greater access and reuse while still protecting the originator's rights.<sup>31</sup>

The liberal sharing principles of The Creative Commons, which includes open source technology, forms the foundation of the NCDG. The inception of the plotter device from its most fundamental level as a digital cad drawing was created utilising the open source software OpenSCAD.<sup>32</sup> The knowledge required to understand and operate this software was gained from the open source community. The manifestation of the cad files into a physical form was executed through 3D printing, a technology that owes its very existence to the Creative Commons. The firmware driving the plotter at the circuit board level is, likewise, available freely.<sup>33</sup> The NCDG in its entirety is uploaded to GitHub and returns to its source,<sup>34</sup> a full circle back into the commons. A contained self expanding system, reflecting the founding principles of the internet on which it lives. It is through the endeavours of individuals collaborating within this community that projects of this nature are possible.

The image archives that serve as the subject of the plots are no exception. Not only are the images open source, they are encouraged to be utilised and interacted with, the existence of the server API stands as testament to this. A curatorial work has transpired in the manifestation of these data sets. Images have been chosen and discarded by human gatekeepers, and thus a cultural value has been assigned to them.

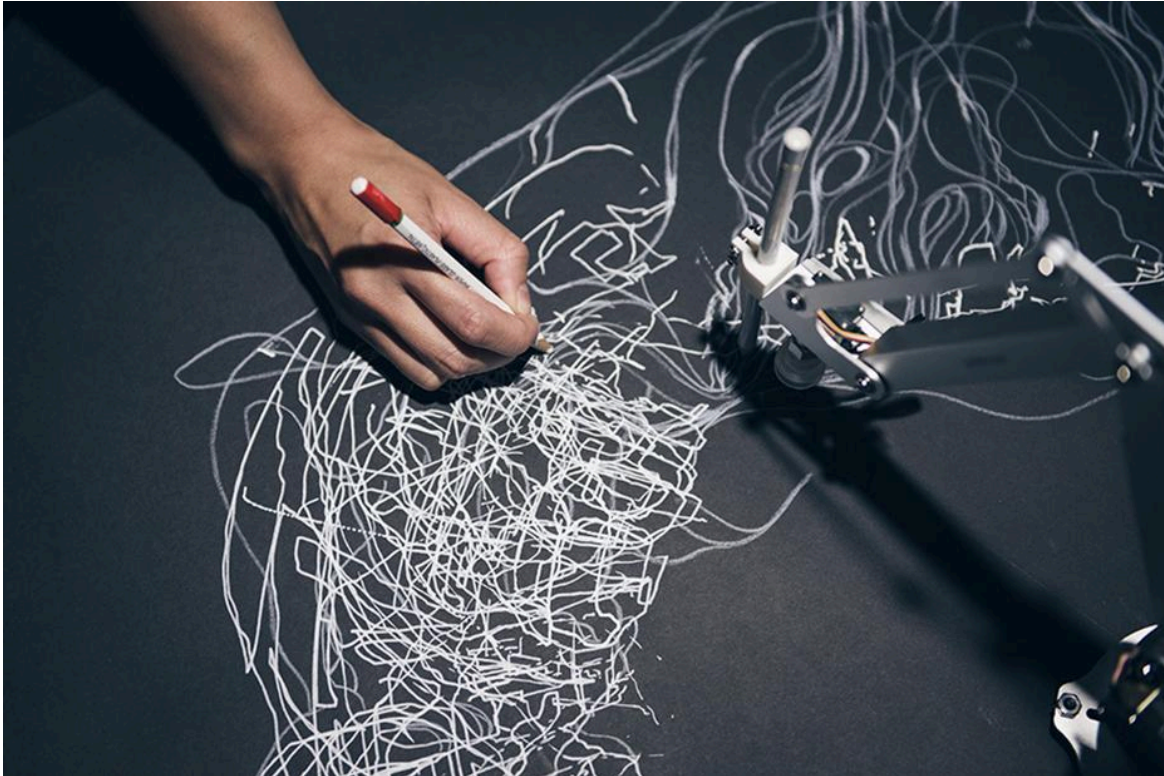
### The democratisation of technology and creative practices

The expanding philosophy of the commons penetrates an array of fields, including the arts. There are an increasing number of visual artists adopting open source information and knowledge shared by the commons into their creative processes. Many of whom are employing innovative uses of the information available to them.

Take for example Sougwen Chung, who similarly explores the intersection of technology and arts in a drawing and mark making process. In her project *Drawing Operations* a robotic arm mimics her drawing gestures in what becomes a synchronous collaborative performance. Chung's movements are captured through an overhead camera and analysed through computer vision software that allows the robotic arm to mimic her movements in real time.



This approach examines the performative and collaborative aspects of the human/machine exchange.



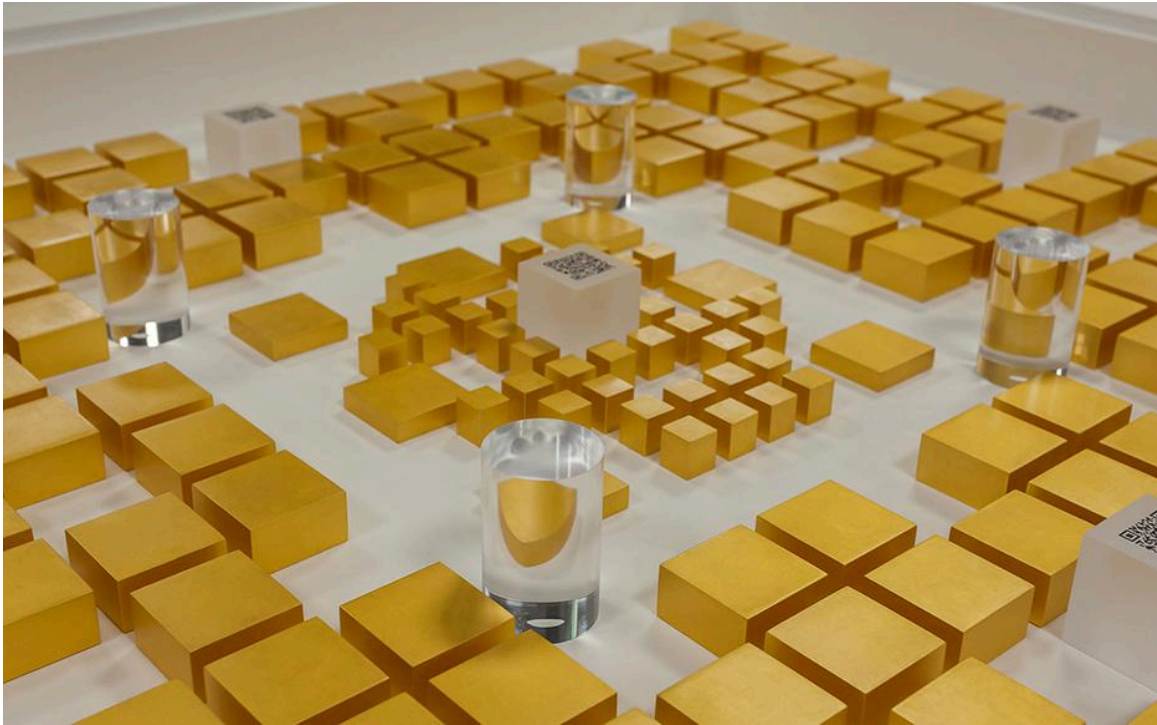
Drawing Operations Unit: Generation 1, 2015 <sup>35</sup>

Zach Lieberman is an artist who makes work using code, often focusing on creating experimental drawing tools. He was a member of the core development team behind the project EyeWriter. The goal of the project was to develop a low cost open source tool that would enable a paralysed graffiti writer to continue to draw using his eyes alone. It combines computer vision software and the use of cameras to track the user's eye movements as input, thus creating drawings as an output.



EyeWriter<sup>36</sup>

While these projects speak to the open source, technological aspect of NCDG, it is the work of Michael Takeo Magruder, and in particular the project *[re]Encoding the Archive* that appeals to the tension between the physical and the digital in my own work. Magruder's project explores The National Archives' (UK) journey into the digital age, by looking at "many of the evolving challenges and transformational possibilities surrounding archives in the 21st century".<sup>37</sup> He examines how conserving historical documents is affected by a world in which the digital and physical are becoming increasingly entwined. His piece *Portrait of the Dark Archive* is a physical manifestation of the archive's digital repository in the form of a sculpture of its data on a given date. The design is said to echo the magnetic core memory units of early computers, at the same time that the use of 24-carat gold refers to perceptions of value.



The sculptural visualisation of archives Michael Takeo Magruder's work *[re]Encoding the Archive*

## Conclusion

The goal was not only to create a tool, but also to map an approach to tailoring it to fit the given use case; a means of engaging with the sea of images available through a rapidly expanding global network. By shedding light on a perceived boundary between physical and digital space, it demonstrates that the wall is porous and, perhaps, not a border at all. At no other point has the path to obtaining knowledge, from any plethora of sources, been so close at hand. Be it through the transmutation of digital photographs into hardcopy drawings or an array of cartesian vector points being sliced and manifested in composite material. These are merely two sides of the same coin, the same material existing in different states. Segregating ideas and methods can be beneficial in communicating concepts, in explaining what one means, but it does not adequately represent the experienced reality. The NCDG mirrors principles of the start of the internet, it addresses the nature of images as transient, questions their attributed value, and allows for the physical manifestation of shared information.

## Notes:

1. Eric Freedman, *Transient Images: Personal Media in Public Frameworks*, 13.
2. "Transient," *Merriam-Webster Online Dictionary*, s.v. "Transient."
3. René an Horik, *Longevity of digital raster images*, 10.



4. A combination of local digital storage, remote storage, air-gapped redundancy, and hardcopy may provide additional operational security, although no truly secure system exists to date.
5. Mihály Héder, *A black market for upvotes and likes*, 20-25.
6. “The future is already here — it’s just not very evenly distributed.” - William Gibson.
7. David Saunders, *Photographic flash: threat or nuisance*, 66-72.
8. “...originality is valued for its repeatability, though a closer look might reveal that this value is rather intrinsic to the work.” Christopher Bartel, *Originality and value*, 77.
9. John C. McCallum, *Price-Performance of Computer Technology*, 4.1-4.18.
10. Nick Antonopoulos, and Lee Gillam, eds. *Cloud Computing: Principles, Systems and Applications*, 219.
11. Andy Grundberg interviewing Richard Serra, *Video Is Making Waves in the Art World*, C34.
12. An ongoing lawsuit against the Internet Archive. Chris Freeland, *What the Hachette v. Internet Archive Decision Means for Our Library*.
13. “DigitaltMuseum,” DigitaltMuseum, accessed March 22, 2024, <https://digitaltmuseum.org/>
14. “What is an API (Application Programming Interface)?,” Amazon Web Services Inc, accessed March 22, 2024, <https://aws.amazon.com/what-is/api/>
15. Mary Baker, Mema Roussopoulos, Mehul Shah, Petros Maniatis, Prashanth Bungale, David SH Rosenthal, and T. J. Giuli, *A Fresh Look at the Reliability of Long-term Digital Storage*, 8-11.
16. Wun Ackermann, *Unleashing Creativity through Automation in the Arts*, 348.
17. Henry Baden Pritchard, *Nicephore Niepce*, 142.
18. “From today, painting is dead” - Paul Delaroche.
19. This is a wall-mounted, bi-polar plotter running Marlin on a RAMPS 1.4 mainboard.
20. William John Thomas Mitchell, *Image science: Iconology, visual culture, and media aesthetics*, 30.
21. James Purdon, *Teletype: Writing, Medium, Machine*, 126.
22. A plotter is a mechanical device, driven by electronic motors, that draws onto a page; akin to a printer. It differs from a typical printer in that it typically uses pens or markers to draw precise lines, rather than printing with toner.
23. Artist Unknown, *JFK portrait*, December 1963, accessed March 20, 2024, [https://www.reddit.com/r/whatisthisthing/comments/8e5gqb/found\\_a\\_teletype\\_ascii\\_art\\_portrait\\_of\\_jfk\\_from/](https://www.reddit.com/r/whatisthisthing/comments/8e5gqb/found_a_teletype_ascii_art_portrait_of_jfk_from/)
24. Kerry Strand, *The Snail*, 1968, accessed March 20, 2024, <https://www.rastall.art/british-and-european-art-for-sale/p/kerry-strand-the-snail>
25. “Scripting language,” Wikimedia Foundation, accessed March 25, 2024, [https://en.wikipedia.org/wiki/Scripting\\_language](https://en.wikipedia.org/wiki/Scripting_language)
26. “Doomscrolling,” Wikimedia Foundation, accessed March 25, 2024, <https://en.wikipedia.org/wiki/Doomscrolling>
27. “Democratization of technology,” Wikimedia Foundation, accessed March 25, 2024, [https://en.wikipedia.org/wiki/Democratization\\_of\\_technology](https://en.wikipedia.org/wiki/Democratization_of_technology)
28. Ronald Bettig, *Copyrighting culture: The political economy of intellectual property*, 36.
29. The Advanced Research Projects Agency Network, or ARPANET, is widely considered the precursor to the internet as we know it today. The early user bases of this network consisted primarily of governments, researchers and scientists. From its founding the network was non commercial, and in this sense free, yet there were

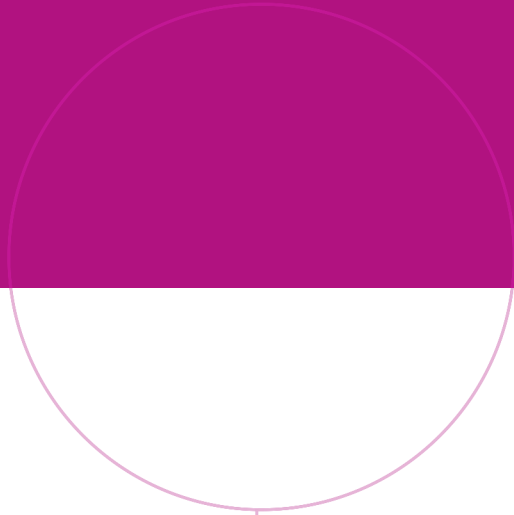
restrictions on who was permitted to access the system. Commercial networks began emerging in the late 1980's enabling businesses and private citizens access to these information structures. Johnny Ryan, *A history of the internet and the digital future*, 30, 107.

30. John Buford, Heather Yu, and Eng Keong Lua. *P2P networking and applications*, 1.
31. There are different types of CC licences that specify the permissions granted to others concerning the further use of the work. Individuals and organisations using Creative Commons licences can specify the level of permissions they grant to others. For transient images, where the intention might be to share something for a limited time or purpose, a creator might choose a licence that allows for sharing and adaptation during that specific period. Creative Commons NGO, <https://creativecommons.org/>.
32. openSCAD, <https://openscad.org/>.
33. Simen Svale Skogsrud, *Grbl CNC controller*.
34. <https://github.com/MariusReed/numericalControlDeviceGenerator>
35. accessed March 23, 2024, <https://sougwen.com/project/drawing-operations>
36. accessed March 20, 2024, <https://github.com/eyewriter/eyewriter>
37. accessed March 23, 2024, <http://www.takeo.org/nospace/2021-re-encoding-the-archive/>

## Bibliography:

- Antonopoulos, Nick, and Lee Gillam, eds. *Cloud Computing: Principles, Systems and Applications*, Springer, 2017.
- AWS. Amazon Web Services, Inc, <https://aws.amazon.com/what-is/api/>
- Baker, Mary, Mema Roussopoulos, Mehul Shah, Petros Maniatis, Prashanth Bungale, David SH Rosenthal, and T. J. Giuli. *A Fresh Look at the Reliability of Long-term Digital Storage*, Association for Computing Machinery, 2006.
- Bartel, Christopher, *Originality and value*, *British Journal of Aesthetics* 25, no. 3 (1985): 66-77.
- Bettig, Ronald. *Copyrighting culture: The political economy of intellectual property*, Boulder, CO, USA: Westview Press, 1996.
- *Creative Commons*. Creative Commons NGO, <https://creativecommons.org/>
- Delaroche, Paul. "From today, painting is dead." Wikimedia Foundation, accessed March 25, 2024, [https://en.wikipedia.org/wiki/Paul\\_Delaroche](https://en.wikipedia.org/wiki/Paul_Delaroche).
- *DigitaltMuseum*. DigitaltMuseum, <https://digitaltmuseum.org/>
- Freedman, Eric. *Transient Images, Personal Media in Public Frameworks*, Temple University Press (2010)
- Freeland, Chris. *What the Hachette v. Internet Archive Decision Means for Our Library*, accessed March 20, 2024, <https://blog.archive.org/2023/08/17/what-the-hachette-v-internet-archive-decision-means-for-our-library/>
- Grundberg, Andy. *Video Is Making Waves in the Art World*, New York Times, November 17, 1984.
- van Horik, René. *Longevity of digital raster images*. Netherlands Institute for Scientific Information Services, 2004.
- Héder, Mihály. *A black market for upvotes and likes*, 2018.

- McCallum, John C. *Price-Performance of Computer Technology*. In *The Computer Engineering Handbook*, edited by V.G. Oklobdzija, CRC Press, 2002.
- Ryan, Johnny, *A history of the internet and the digital future*, Reaktion Books, 2013.
- Pritchard, Henry Baden . *Nicephore Niepce*. *Nature* 16 ,1877, <https://doi.org/10.1038/016142b0>
- Purdon, James, *Teletype: Writing, Medium, Machine*, Open Humanities Press , 2016.
- Saunders, David. *Photographic flash: threat or nuisance*. National Gallery technical bulletin 16, 1995.
- Skogsrud, Simen Svale. *Grb1 CNC controller*, 2009, <https://github.com/grbl/>.
- Gentzkow, Matthew, and Jesse M. Shapiro. *Ideological segregation online and offline*. *The Quarterly Journal of Economics* 126, no. 4, 2011.
- Gibson, William. Interview with Larry McCaffery, *Storming the Reality Studio : A Casebook of Cyberpunk and Postmodern Science Fiction*, Duke University Press, December 1991.
- Merriam-Webster.com Dictionary, s.v. “transient,” accessed March 20, 2024, <https://www.merriam-webster.com/dictionary/transient>.
- Mitchell, William John Thomas. *Image science: Iconology, visual culture, and media aesthetics*. University of Chicago Press, 2015.
- Kintel, Marius. *openSCAD*, openSCAD, accessed March 23, 2024, <https://openscad.org/>.
- Wun, Ackermann, *Unleashing Creativity through Automation in the Arts*, *Global J Technol Optim* 14, 2023.
- “Scripting language,” Wikimedia Foundation, accessed March 25, 2024, [https://en.wikipedia.org/wiki/Scripting\\_language](https://en.wikipedia.org/wiki/Scripting_language)
- “Doomscrolling,” Wikimedia Foundation, accessed March 25, 2024, <https://en.wikipedia.org/wiki/Doomscrolling>
- Buford, John, Heather Yu, and Eng Keong Lua. *P2P networking and applications*. Morgan Kaufmann, 2009.



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