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On Reenactment: Concepts, Methodologies, Tools

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Reenacting Human-Algorithm Relations: Computational Art Between Today and Yesterday

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Francesca Franco (Media Art Curator and Historian, UK) and Daniel Temkin (Artist and Writer, New York) discuss their concomitant research. Franco's interest in the history of early Computational Art and its pioneers (Ernest Edmonds, Manfred Mohr, Vera Molnár, Roman Verostko) blends with Temkin's practice of visualising the mathematical patterns of computers to enhance our understanding of the role and impact of Computational Art in contemporary art practice. Franco's exhibition of *Algorithmic Signs* that reenacted early works of Generative Art together with the pioneers of this artform and Temkin's evolution of the often interactive *Dither Studies* through a ten-year process of what can also be considered as a series of reenactments shed light on a little known part of the digital world and its history.

FRANCESCA FRANCO: I have been passionate about the history of early Computational Art since my post-graduate studies, and I have been able to expand my knowledge and passion for this subject through a series of research projects that I have carried on over the years.

It all began ten years ago, when I joined the Victoria and Albert Museum in London to research their digital

Fig. 1. Ernest Edmonds, *Growth and Form* (2017). Generative interactive installation, part of the exhibition *Algorithmic Signs*, installation view, Fondazione Bevilacqua La Masa, Venice (2017)

art collection, which had just been acquired at that time. Today, it is one of the largest computer collections in the UK. I realized that not much research had been done on the pioneers of Computational Art – in particular from an art historical point of view. So, I decided to concentrate my work in studying their art and in giving visibility to these artists.

One of the results of my research was the publication of *Generative Systems Art*,[1] the first monograph about a pioneer of Algorithmic Art, Ernest Edmonds. I was particularly interested in understanding the intersections between the recent developments in Computational Art and past traditions, such as Constructivism and Systems Art. So, what I wanted to accomplish with this book – and in my career on a more general scale – was to integrate Computational Art into traditional art historiography. From this point on, I expanded my area of research and considered an international group of pioneers of Computer Art known as "The Algorists". In 2017, I curated an exhibition on the history of this movement entitled *Algorithmic Signs* at the Fondazione

1. Francesca Franco, *Generative Systems Art: The Work of Ernest Edmonds* (New York: Rutledge, 2017).

Bevilacqua La Masa in St. Mark's square. It was the first exhibition after the 1970 Biennale to bring early Computational Art and some of its most prominent pioneers back to Venice, my hometown.[2]

The idea with *Algorithmic Signs* was to explore the history of early Generative Art and its contribution to contemporary art from the 1960s to the present. To do so, I invited five artists – Ernest Edmonds, Manfred Mohr, Vera Molnár, Frieder Nake, and Roman Verostko – to show over sixty of their artworks and four site-specific installations (*fig. 1*). The first work we installed was a sequence of fifteen elements of painted steel that Manfred Mohr made in 1993. These elements are usually arranged as a text, as parts of an alphabet, but when Manfred saw the space he decided to arrange the pieces in a matrix, and he was very pleased about that. Vera Molnár's site-specific installation was inspired by her variations of Mont Sainte Victoire; Roman Verostko's *Lifting the Veil* echoed Saint Mark's Apocalypse and was specially created for the exhibition; Ernest Edmonds' *Shaping Space* filled a separate room as an immersive, interactive artwork.

Edmonds' work was particularly interesting as it took an unpredictable turn and generated some "happy accidents". It is an interactive generative installation that takes data from a camera which, on the occasion of the exhibition, was directed into the space in front of the viewer. While a generative software connected to the movements of the participants in the room was elaborating some data, two back-projected Perspex screens gathered those stimuli and transformed them into different patterns of colours. So, *Shaping Space* developed and changed over time, giving this kind of sense of a rarefied experience of floating into a saturated coloured field. But, because of the shape of the room where the work was installed, we got some unexpected reflections on the walls passing underneath the Perspex sheets. Although these reflections were not part of the original artwork, the artist, who participated in the installation

2. *Algorithmic Signs* introduced this dynamic and almost unexplored field of contemporary art to a new and wider audience. Francesca Franco recorded hours of interviews with the artists that, together with other documentation material, were collected in her book *The Algorithmic Dimension: Five Artists in Conversation* (New York: Springer-Nature, 2017).

process, was happy with the results and decided to keep this unexpected solution.

The documentation of Digital Art is another big interest of mine. Edmond's *Shaping Space* gave me the idea to document all the phases and all the incarnations that it had assumed across the years: from 2012, when it was first shown at Site Gallery in Sheffield, up to 2017, when we exhibited it in Venice.[3]

This takes me to my current research. At the moment, I am researching aspects of documenting Digital Art thanks to a grant from the AHRC–Arts and Humanities Research Council in the UK. I am working with the University of Exeter and other partners, such as LIMA in Amsterdam, the Photographers Gallery in London, and the Venice Biennale, to look for novel ways to document aspects of Generative and Digital Art.

This is how I got in touch with you, Daniel. Your work opened the door for me to a much younger generation of artists influenced by early Computer Art. We met three years ago when I came to New York to visit your studio, where you showed me all of your work influenced by early pioneers of Computer Art. On this occasion, we started to discuss the idea of creating a new work inspired by Vera Molnár. This is an example of early work by her, in which she uses computational methods to place colours in a specific grid. I think this is the starting point of our collaboration.

DANIEL TEMKIN: Yes, one thing that I love about this piece is that Molnár did it when she did not have access to a computer. So, she had to simulate the function of a computer system, and she gave us her notes on how she calculated this. Although the notes here are a little bit hard to follow, we can understand that the picture is very systematic in terms of how many layers each of the colours she uses is defined by the pixels around it to come up with this particular pattern. What is interesting to me is that her process is not really about technology – it is not about screens or resolution or anything similar – it is rather about the human

3. The conversation between Franco and the artist set the basis for an article included in the volume *Museums and Digital Culture: New Perspectives and Research*, ed. Tula Giannini and Jonathan P. Bowen (New York: Springer-Nature, 2019).

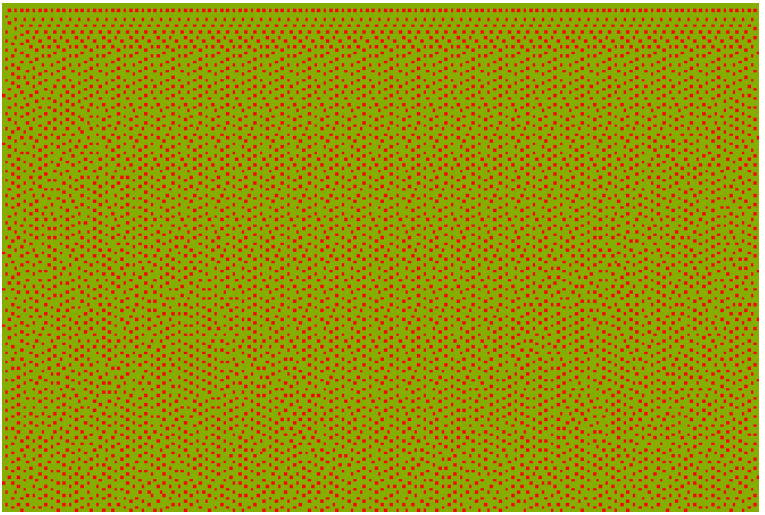

Fig. 2. Daniel Temkin, *Dither Studies* (2011)

and the algorithm. In other words, it is not really as much Digital Art, it is more about Computational Art.

I think that something interesting happens when human beings carry out these algorithmic processes. These very simple rules can lead to very complex results, which is also what makes early algorithmic work so fascinating. I have been thinking about it when I started the *Dither Studies* project that I have been working on and off since 2011.[4] It really began when I generated an image very similar to the one we are showing here (*fig. 2*), which is one of the early versions of *Dither Studies* made by accident in Photoshop. I had a series of images and I was trying to match the colours between them. I took an image of one solid colour, and I brought it into a small palette and whilst I expected it to just be rounded off to the closest colour that was in the palette, I got this very complicated pattern instead. That really piqued my interest and pushed me to ask myself why Photoshop had generated this very complicated pattern out of seemingly nothing. It turned out that what I was doing

4. See the artist's website: https://danieltemkin.com/DitherStudies/About/ [accessed 23 January, 2022].

Fig. 3. Michelangelo, closest colour in palette

Fig. 4. Michelangelo, dithered

was "dithering": a technology developed in the 1970s that has not really changed very much since then. It is used to take a greyscale or coloured image to a small palette of colours or to reproduce it with larger pixels. If we were going to represent the other two pictures presented here (*figg. 3-4*) on a screen that had only black and white pixels, and the pixels were rather large, we would turn all the darker pixels into black and the brighter ones into white. Dithering gives a way to bring back some of the details. This technology was developed for early computer screens, and it really has not changed very much since then.

What I do with *Dither Studies* is basically the same thing as the last example but, instead of giving the software a photographic image, which is what the technology is designed for, I give it a solid colour in order to make visible what is usually hidden within the image. The dithering patterns become the only content of that image, and it recalls some Fluxus works. Think about Nam June Paik's *Zen for Film* (1965): the dust and scratches that sit on the film leader become the content of the movie. There are some differences in what we call "dithering algorithms", which are basically just coefficient sets. What is happening in the pictures is that I started with a shade of green – somewhere between yellow and blue – I rounded it off, and eventually, when it rounded one direction, the software distributed the error to the pixels around it. Only a few different coefficient sets are used – the Floyd-Steinberg's one is used for Photoshop, and Atkinson's was designed to work better with mid-range

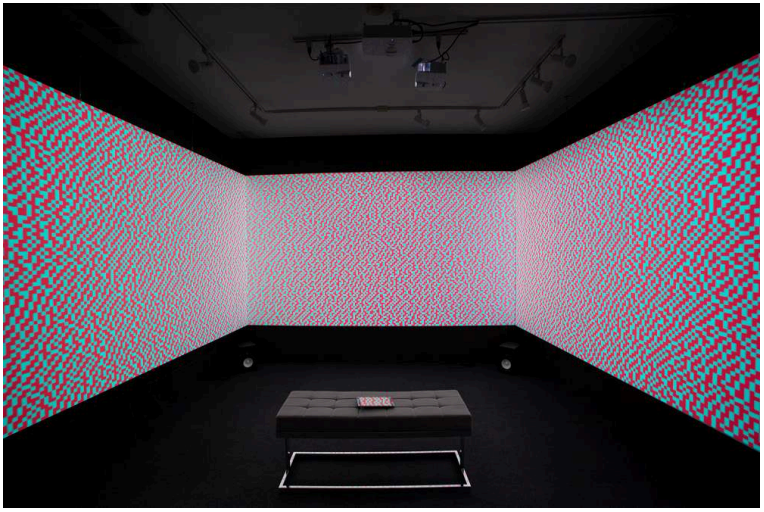

Fig. 5. Daniel Temkin, *Dither Studies*, installation view, part of the exhibition *TRANSFER. Download*, Thoma Foundation, Art House Santa Fe (2018)

greys in a black and white image. But even if they are all very simple maths, it is interesting to notice that by using them we are ending up with these patterns that feel kind of irrational. As I have shown, this process changed in several different ways during the last years – a video, a gradient, an installation at Carroll Fletcher Gallery. It is a very simple pattern that you can adapt to a variety of different methods. Ultimately, I decided to hand render these and, going back to the way that the early algorithms worked, I tried to remove the computer from the equation and carried out the instructions by myself.

Another version of *Dither Studies* is the interactive one on my website.[5] There you can choose the two colours you want to work with, and, with a drop-down that shows the different coefficient sets, you can drag the slider and turn the image to the colour you prefer. But I wanted to bring this installation into the physical space letting people interact with it. I also wanted them to understand the feeling of having control over the setup of the dither, to see the complexity of the results from it, and eventually to be able

5. See https://danieltemkin.com/DitherStudies [accessed 23 January, 2022].

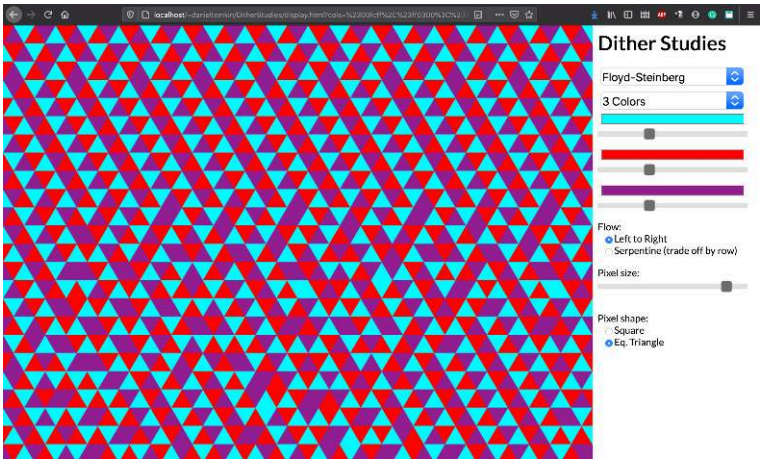

Fig. 6. Daniel Temkin, *Dither Studies* (2020)
©Daniel Temkin

to document and revisit it. The installation view of *Dither Studies* in the following picture (*fig. 5*) gives an idea of how the space functions in the interactive version. There is a kiosk where people can control the settings for the *Dither Studies*, and two walls have the actual dither on it, while the other two have a very simple visual explanation of what is happening and how these cells have been calculated. The aim is to give the audience something they can grasp and manipulate to understand how it is affecting the overall pattern.

I also wanted to get away from the square pixel as a technological default. We work with squares because our screens have an orthogonal array of pixels, or we work with hexagons because, when we print, printer dots are arranged hexagonally, and there are hexagonal dithers that are designed for printing. The starting place for this new set of *Dither Studies* (*fig. 6*) is the equilateral triangle, the simplest shape that is not widely used in our display technology. Going back to Molnár's piece, it is not about the development of display technology, rather about the relationship between these mathematical patterns and our understanding of them – so that even a little bit of logical complexity can feel irrational to us, because human beings are irrational and have such a strange relationship with logic.

You can use more than two colours and deal with vectors instead of numbers: they describe a kind of three-dimensional space in which you can work to define the relationship of the colours. Finally, without totally getting away from the square pixel, you can do some experiments by creating patterns that are intriguing or finding what coefficient set works best with other shapes. So far, I showed the ones that were developed for the square pixel or for hexagonal patterns, both of which work well with the equilateral triangle.

FF: I think this is particularly exciting when we think about audience interaction as something that would give an active audience the opportunity to not just play with colours but also try to understand what the algorithm behind it is. What is really fascinating about this project is that, even though everything starts from simple algorithms, it generates a number of variations that are almost infinite. Not only can the audience play with the interface, but it can have the opportunity to print the results or screenshot the codes and patterns. The process is quite interesting and stimulating at the same time.

DT: Yes, it gives an idea of what I have done so far, but this is a very early stage of the project. In terms of work that is left to do, there is obviously to determine what other shapes are going to work well with this, figure out these coefficient sets that work well with these shapes, and then check the way to make the process of interaction very clear. The remaining work might be a little animation of how each pixel is being calculated and how that is being carried over to the pixels around it, or there might be other kinds of visualization tools that will have yet to be developed for this. But it is a different kind of challenge than the sort of purely generative one of building the work itself. What is important on this level is to make the process very clear to an audience that might not be super mathematically inclined but who should be able to understand this and be empowered to use it.

FF: We are in this unique time in history where we can start seeing the history of Computer Art growing – it has been

over fifty years now – and at the same time, we are still able to talk to its pioneers. I find your work a great way to link two different generations together.

DT: Yes, it is exciting to collaborate with an art historian who understands that algorithms can bring a new perspective to the art and become readable to an audience who may know art but still are a little bit uncomfortable with the digital world.

FF: I think we raised some questions on the role of Generative Art today and the impact that pioneer artists of the field have had on contemporary art practice. This is one of the main challenges we set, and I hope we have achieved it.