Creative Automata
Dreaming about Art in a Post-human World

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Abstract

We know from everyday experience that technology is changing the world at great speed and in ways we cannot effectively predict or control. Each of us has different thoughts and feelings about this vertiginous journey we are all in. Art as a micro-cosmos reflects the different stances towards technology that can be found in society at large. In this context, working with generative systems becomes interesting because it is a way to engage with the complexities of technology in a way that goes beyond mere fascination or aversion. It is a way to explore what a human artist and a non-human semi-autonomous system (or automaton) can do together, in a sort of creative collaboration where productivity and agency are distributed in variable ways.

We explore some basic ways in which generative practice departs from the traditional image of the artmaking we inherited from modernity, as epitomized by the ideas of the "masterpiece" and the "genius". Far from an ideal of perfect control of mind over matter, generative art is about setting in motion an unpredictable process and "letting go": granting the automaton its freedom.

Since the first flint axe, humans have been shaped by the tools they make. Generative art is also a way to reckon with the agency of inanimate things, and welcome them into the process of making art. They have, of course, always been there; the paint and the brush since ever alive and rebellious in the hands of the painter, but for too long we have struggled to subordinate their autonomy to human will, like they were passive repositories of our ideas and intentions.

We inquire into the curious back-and-forth that takes place between a human mind and a rule system, machine or

algorithm as a new generative work takes shape, in a process of exploration and trial-and-error that happens in the space between the affordances of two very different agents. We also peek into the uncanny landscape that opens up as the digital automata become more complex and more autonomous, turning human participation ever smaller, raising the spectre of a future where it is eliminated from the formula altogether.

In short, we would like to imagine what art can be or become (if anything) in a post-human world, where we finally let go of the illusion of being the only active force imposing order on passive matter, to take back our place in a universe where everything happens in a complex network of interlocked agencies–and our very survival can depend on slowing down, paying attention and understanding their subtle balance.

1. Introduction

As we all know from everyday experience, technology is changing our lives in many, fundamental ways, which we can't yet fully comprehend or control. It feels like technological change is *happening* to us, and there is not much we can do beyond accepting it and trying to adapt as well as possible. We are all passengers on a train heading at full speed towards an unknown, but probably very strange destination. We don't have much of a choice about taking part in this vertiginous journey, but we do certainly have different thoughts and feelings about it.

Some people believe the machines will only bring upon us unhappiness and de-

humanization, and ultimately the destruction of the natural environment, the dissolution of social bonds and the end of civilization. Some others, however, are confident our growing integration with artificial systems will take care of all our problems, release us from the need to work on things we don't like, and be the foundation of a more perfect and happy world.

The case is, we don't know yet. Technophiles may be right - or maybe it is technophobes. For the time being, the situation appears to be more complex. Many contradictory forces are at play. Let's think of an example we all know very closely: the smartphone. It confers on us what not long ago we would have called superpowers, radically increasing our ability to communicate, access information and act on the world. In many regards, we can do a lot more with one of those devices than we were able to do without one. But it is also a source of endless distraction, a sink for our time and mental energy, and it literally makes us more stupid: several studies have found that, just by being at hand, and even when silent, our smartphone exerts a subconscious demand on our attention that takes a toll on our capacity for concentration and problem-solving. [1]

In other words, it would be overly simplistic to just decide that smartphones are "good" or "bad". The fact is, they change the way we think and act and connect with our surroundings in complex and fundamental ways. They change *what we are*. Similar things could be said about the Internet, Artificial Intelligence, gene editing, and almost every other one of the technologies that are now permeating more and more the very

fabric of our lives.

The encounter with an alien species, that scenario so many times anticipated by science fiction, is happening right now, before our eyes, inside our homes. It is just that the aliens haven't climbed down from an UFO; they are not coming from outer space. We invented them: they came out of our own hands and brains. They have conquered the world under the cover of being our own creations. As such, they should be familiar, something we can easily comprehend and control. But that's certainly not the case. The situation we are going through now has all the markings of a change of epoch, a clash of civilizations. As we sit in front of our computers or pick up our phones, a close encounter of the third kind is taking place–its consequences unfathomable.

2. Automata at play

Art is a microcosm of society. Indeed, we can find in art the same stereotypical attitudes towards technology that can be seen elsewhere. There's no shortage, in particular, of critical, dark or apocalyptic visions about our future in a world dominated by machines. There are also currents in art that are based in the glorification of new technologies and the unfolding of their powers for never-ending amazement and fascination. It is also true that much of contemporary art is simply not concerned with technology at all, taking care instead of other subjects and worries.

In the varied landscape of possible relationships between art and technology, the work with generative systems occupies a particularly interesting spot. It doesn't look at machines and digital devices from a critical distance that renders them hostile and foreign. But it doesn't either succumb to the fascination of their more obvious and dazzling effects. Rather, it works closely with the device to explore the possibilities that are contained in it but not yet visible; to find out what it can do, but also to know its limitations.

It is not about falling in love with the device, but not about fearing or hating it either. A generative system is neither slave nor master, but rather a sort of colleague or playmate. The system can be software, a robotic or mechanical contraption, a chemical process, a manual procedure, a game or social dynamic, etcetera. The technology involved is not necessarily digital. How the system is materialized is important, but its soul is in the *rules* it embodies. The key lies in the fact that, at some point, it can act with *autonomy*: that is, beyond the immediate control of the artist. That's why we choose to call it an *automaton*.

The automaton can be regarded as a sort of game. A game exists because of, and is defined by, a set of rules, which we might also call an *algorithm*. All games are generative to a certain extent, even those totally unrelated to art, because their rules set up a landscape of possibilities. That abstract domain is larger or smaller, has few or many dimensions, depending on the complexity of the rules involved. A subset of those possibilities is actualized each time the game is played.

Working with generative systems is not about playing a given game, but more like

inventing new games all the time. Each match is not important, the possible variations of the rules are. It is about creating interesting automata that can make interesting things when put in action. It is about experimenting with the potentials and limits of the agency of non-human entities.

3. The idea of an artist

We can perhaps grasp with more precision what is different about this way of making art if we contrast it with other, more traditional ideas. There's a classical view of what art is and how it is made that we inherited from centuries past. It has certainly been put in question, attacked, and left for dead many times and in multiple ways since the beginning of the twentieth century, but despite every effort on the contrary, it is still the standard mindset against which we still understand and weigh every novelty and rebellion. Think, for example, about one of the great artists of early modern times, like Rembrandt or Velazquez. What was their relationship to their work? There are a few things we could probably assert with some confidence. First, there was a physical immediacy: everything that was visible in the painting was coming from the hand of the painter. Of each stroke on the canvas we could say "the artist was there", like every single one of them was a signature, conveying their particular way of giving form to matter. (The great masters had, of course, assistants, but their role was to become invisible, to pretend they were never there).

Second, the artist was thoroughly accountable for everything the work was. Everything that was right or wrong with it was their merit, or their fault. The work was an expression of their will, and of that only. If the work was bad, the reason was perhaps that the artist was not talented enough: they couldn't (yet) exert the necessary command on their media. Art was all about *control*: perhaps the most refined form of dominance of mind over matter.

Third, the work itself was unique and unrepeatable, a very special thing resulting from the confluence of the talent and inspiration of a particular person, in a particular time and place. It was a singular *event*, dated and signed. Especially in the case of the masterpiece, nothing else was quite like it. There was no meaning, therefore, on asking about any rules at play behind it, about anything like an algorithm for its production. There were certainly many norms, techniques, and traditions at play in classical art, but everything that made the work unique was precisely what went beyond all those constrictions, everything about the work that was *unexplainable*.

4. The machine that makes the art

Now, while keeping our baroque artist in the gallery of our mind, let's put a different character next to it. We can perhaps invoke a figure we might consider the patron saint of generative art: Sol LeWitt [2]. His famous lemma, "The idea is a machine that makes the art" [3], condenses in a few words many things we have said. As far as we know, LeWitt did not touch a computer in his life. He didn't need it: "the idea is a

machine" because, once defined, it can be executed "mechanically" by people other than the artist and therefore, so to say, "proceed on its own". So, "the idea" is here something quite different from the fathomless inspiration of the traditional artist. It is, on the contrary, something very explicit and concrete: a set of rules, a small program.

In the case of many LeWitt works, the idea was at once the title and the recipe for its execution. Things like "Ten thousand lines, about 10 inches long, covering the wall evenly". [4]

Fig. 1: Sol LeWitt, 1971, **Wall Drawing #86: Ten thousand lines about 10 inches (25 cm) long, covering the wall evenly.** *(detail)*

So, LeWitt's work gets rid of everything that was essential to the traditional way of making art we just described. He didn't paint or draw his works himself: he didn't even have to be present when they were "executed". The physical immediacy between artist and work was therefore broken. The actions of the assistants that actually made the piece introduced a degree of uncertainty in the final result. Certainly not by mistake or lack of ability, but deliberately, as a part of the plan. On the other hand, as the product of a simple, explicit rule, the work becomes repeatable. Every time the same instructions are followed, the transition from idea to materialization takes place anew, and none of those instances is more "original" than the other. There is no "unique event" to be seen.

This is, of course, just one of the many ways the paradigm of classical art got in trouble during the twentieth century. But I believe the shift in the conditions of artmaking that LeWitt represents is synchronized with other, deeper turns in occidental culture (which is nowadays worldwide). Namely, a change of focus from material objects and their production, classification, and management, to the systems as abstract informational models, accounting for many different instances of materialization, which become therefore contingent and secondary.

A whole imaginary world has been lost in the transition: the artist as a privileged being, the inspiration as a bottomless mystery, the shine of the exceptional event, the work as an auratic object, distinct from all others. For some people, the pain of so many losses is just too much to bear, and they will try to avoid it by simply denying that LeWitt, and others like him, are making anything that deserves to be called "art". But the fact of the matter is art cannot be any more what was for Rembrandt and Velasquez, not only because of the historical imperative to move on and make something different, but because we live in a very different world. The questions have changed.

5. Non-human partners

In 1968 the artist, critic and curator Jack Burnham published and essay that is an important reference for us. Its title was "System Aesthetics" [5]. Among other things, he asserted that "we are now in a transition from an *object-oriented* to a *system-oriented* culture. Here change emanates, not from *things*, but from *the way things are done*".
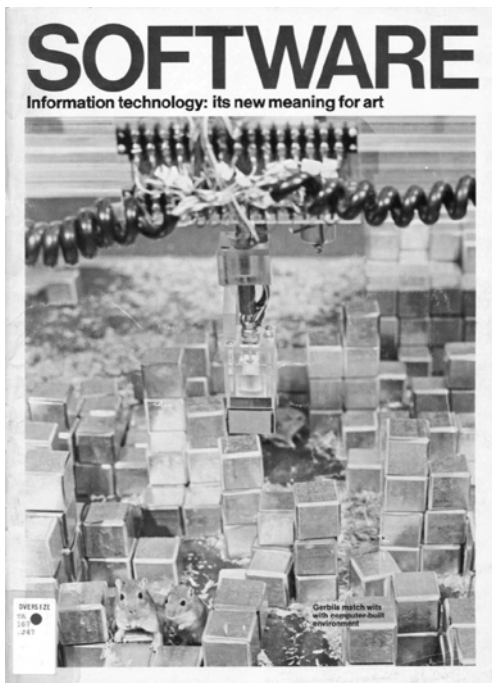

*Fig.2: Catalogue cover for **Software**, group show, Jewish Museum, New York, 1970.*

Shortly after that, in 1970, he curated a group show at the Jewish Museum in New York. It was called "Software", and it gathered conceptual and new media artists around the idea of, precisely, software, defined in a broad sense as a program, situation or set of instructions designed by an artist and executed by a computer, a machine, or members of the public. The idea behind the show was that software had become more important than hardware, the "hidden order" in the dynamics of a system more essential than its perceptible presence as a thing in the world.

Generative art is about making a system that makes art. The automaton, as a sort of middleman, dissolves the intimate link between artist and work that was at the core of traditional art, while it also "devalues" both. The artist is demoted from their high place as a gifted creator because the work is not any more a pure manifestation of their talent. The work is not that unique thing that stands apart from all others, because it can be repeated, and in any case it is significant only as a token or visible evidence of the abstract system it comes from. It is just what remains from one time the game was played.

Something non-human infiltrates the usually all-too-human cycle of artistic production. As that happens, the very definition of "human" is altered. All along the first stretch of modern age, everything that was not a human was considered as essentially passive, an available material, in waiting to be used and formed in accordance with our will. Man (a definitely male man) was alone in the world: the relationships to everything else were asymmetrical. Animate and inanimate beings were equally subordinated to his plans and decisions. Nothing could get level with him or look him in the eye.

Fig. 3: Hans Haacke, **Blue Sail**, 1964-1965.

The automaton, however, is an active non-human. It might be quite simple, like the fan that moves the fabric in Hans Haacke's *Blue Sail* [6]. The artist, in any case, takes a step back to make room for the uncontrolled action of that foreign agent, and with that little movement, everything changes. What was hierarchical becomes horizontal, the active and the passive trade places, and the will to control is tempered by a very different attitude, which Brian Eno beautifully called *surrender*. It is about letting the things do their thing, lying back and just watching.

There is usually a two-time rhythm in the generative process. First, a stage of system design. Second, a moment when the automaton springs into action, like the stormy night when Doctor Frankenstein's unholy creature received the spark of life. The former is an instance of imaginary projection and careful execution, more classical in its outline. The latter is the novel scene, when the artist retreats, becomes a spectator of their own work, and watches as events unfold. One possible measure of the success of the generative process is to what extent the automaton proves capable of surprising

its own creator: how rebellious or unpredictable the creature becomes when set in motion.

This two-time cycle can take place just once or go over many iterations, becoming a trial-and-error procedure. The artist and the automaton become involved in a sort of dialogue: with each run the system does things that compel the human to change some things that make the system do different things, and so on. This back-and-forth drives a process of evolution, or at least semi-random drift, in a space of possibilities, towards a destination that could not be foreseen by the artist (or the automaton) beforehand. They could only reach there together.

In short, generative art can be regarded as a creative collaboration between a human and a non-human agent. The outcome is something neither of them are capable of doing on their own: a hybrid work, which is not the mere display of the technical capabilities of a given apparatus, nor the direct exteriorization of a human intention, but something in between, in tension between the human and the non-human, like an artistic cyborg.

6. Machines and systems

We have used the word "machine" a few times to talk about the automaton. But that might be misleading: in any case, the automaton would be a very particular sort of machine. First, because the word "machine" makes us think of a concrete, heavy, complex piece of matter that is taking up space somewhere. But the essence of the automaton is in the

software, not in the hardware. Its soul is given by the rules it embodies. Second, the power of the machine is typically doing the same many times, with great speed and efficacy. But the automaton does things that are all different.

During the Industrial Revolution, machines enabled a quantitative explosion in the production of goods that transformed the world radically. We all know that. However, there is an associated fact that might be less obvious: namely, the qualitative reduction in the variety of objects around us. Suddenly, our coats and carpets and cups and chairs were all identical. The diversity and individual character that comes with crafts and handmade work was lost. The industrial machine is linear, predictable, and transparent in its operations, because its very nature lies in *repetition*. We expect from it to behave exactly the same every time, and when it doesn't, then we are in trouble: the machine is broken. Machines brought forth an age characterized by the multiplication of the identical.

On the other hand, the automata or, in Burnham's terms, the systems, are recursive, opaque, and variable. Their inner workings are often too complex for thorough explanation. When set in motion, there are feedbacks, interactions and non-linear processes that render it unpredictable. The gears and levers are not plain to see: it tends to be a *black box*. Its output is equally variable. The systems open before us a new landscape: the automated production of difference, the explosive multiplication of the unique. The "mass production" of the industrial age is converging now on the production of the particular that was

typical of the artisan's shop.

The insane productivity of the automaton is a source of fascination, but it can also become a problem for the generative artist. There is often an "embarrassment of riches" that leaves us with the difficult task of *choosing* what, from an overly abundant output, are we going to actually show as a work. The work is, in a certain sense, the entire space of possibilities created by the system. But that cannot be shown. It is sometimes so vast that even we, as artists, can only explore a few trails and regions of it, descend on it in limited incursions guided by chance and instinct. We can choose to present the automaton as an interactive application that users can navigate, and thus, so to speak, pass on the problem to the public. But many times we find ourselves in the situation of having to capture and select particular instances of the countless things the system can do, and that always feels arbitrary, like an undue human intrusion on the wild freedom of the automaton. As we noted before, those captures are just samples standing as representatives for the rich world of the possibilities they come from.

7. A second nature

Of course, nature itself is "generative" in the sense we have been describing. It is indeed the epitome of generativity. No two trees are exactly alike, no two leaves of the same tree are identical. However, we don't usually speak of trees as "generative", because that's a qualification we reserve for human creations. Art is a human affair, and generative art is too. We could say the "creative collaboration" between a human

and a non-human agent is, at the end of the day, not really horizontal, not a gathering of equals. There is an essential asymmetry, because the automaton is made by a human, and it only springs to life when and for as long as the human decides. The naked truth is, the human is still in *control*.

All that is true. Generative art is, in a certain sense, still all too human. But even a short moment of *surrender*, a small space for the autonomy of the system, is enough to change everything. As we tried to show, the canonical places of the artist and the work in the traditional paradigm of artmaking are brought down by this intrusion of the agency of non-humans. All of a sudden, art is not any more about making beautiful or sublime or radical objects, but about exploring systems: going for a walk in the universe that lies beyond the limited realm of human stories, wishes and fears.

Generative art is also part of the process by which technology strives to resemble nature more and more–moving away from the rigidness and obdurate insistence on the same of industrial machines, towards the adaptability and variability of complex systems. Step by step, human inventions acquire for themselves characteristics that were the privilege of life. As this happens, the balance of power in the "creative collaboration" changes. Automata become more autonomous. Human participation becomes ever smaller. It is perhaps not so crazy anymore to think of a future when automata don't need us at all to live their lives and develop their creations. At that point, technology would become a sort of "second nature", and art would cease to be an exclusively human
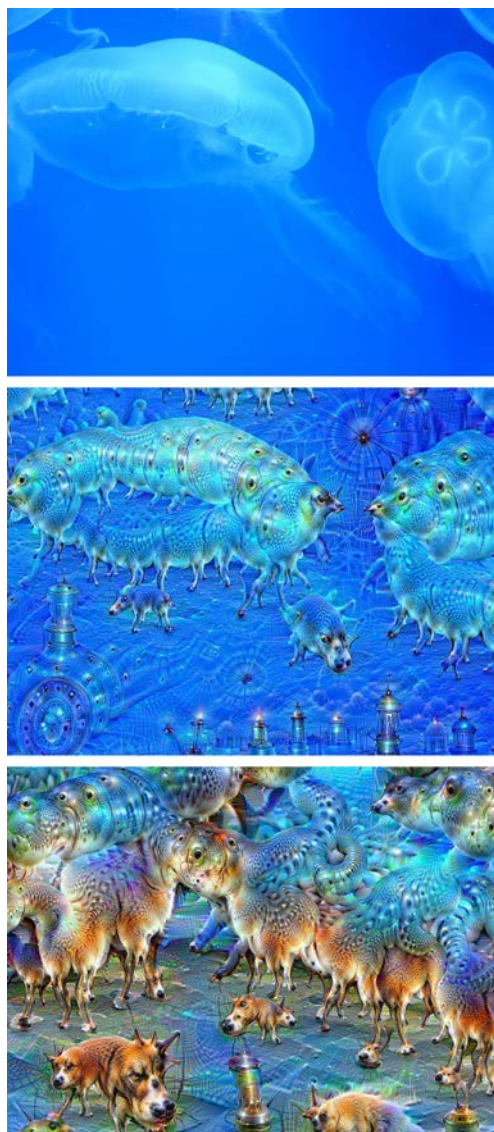
affair.

Fig. 4: **Deep Dream.** *Original image, and results after 10 and 50 iterations (Source: Wikipedia)*

These days, this trend is visible in the quick succession of amazing developments happening in the field of the so-called "Artificial Intelligence".

Neural networks and deep learning technologies are conquering territories that were, not long ago, undisputed human domain. They can now drive cars, diagnose cancers, speak and listen, beat any of us at chess and go, write texts that make sense, etcetera. A few years ago, the Deep Dream experiment by Alexander Mordvintsev [7] surprised many of us by showing they can also do something that feels intimately human. They can *hallucinate*: that is, see things that aren't actually there, but that they are trained to see and can reinforce in a feedback loop, producing images that are not a representation of anything external, but a strange visual record of the "ideas" that are somehow encoded in that digital mind.

Shortly after that we were presented with a related system, "Style Transfer", which was able to pick up typical patterns and palettes from a set of images and apply them to any other one. You could have a photo of your cat rendered in the "style" of Van Gogh or Picasso. There's something uncanny going on there because, what could be more human than style? Was not that precisely the most personal, the most unexplainable thing for classic art? The style, like a signature, was intimately tied to a particular artist, it was that which *made* them an artist, which made them unique and different from all others. And now a lowly machine has somehow grasped the van-goghism of Van Gogh in a fairly convincing fashion, and is applying it to a picture of my cat. The summit of humanness reduced to an algorithm– albeit to one we can't directly see or analyse.

Fig. 5: Style Transfer. The same image, rendered in the styles of Van Gogh, Picasso and Munch.

So, it is true that automata are made by humans, but that's not *the whole* truth. Because humans are also made by their automata, their machines, and their tools.

They are shaped and defined by them. Their affordances, their bodies, and the ideas they have about themselves are changed by the technologies they use. We should also ponder if we are really in control. We certainly like to think we are but, as we remarked at the beginning, we are all aboard the unstoppable train of technological change, and nobody seems to be guiding it. The billionaires at Silicon Valley, they have a lot of power when it comes to deciding which technologies are developed and which of them reach the market, but they don't see the future. Even they don't know what the automata will end up becoming, how will humans be transformed and what world, if any, are we going to build together.

We need to think about the complexities of the times we are living beyond both the acritical enthusiasm and the paranoid rejection of technology. Machines and digital systems are not pliable slaves, but they are not evil masters either (not yet, at least). The work with generative systems in art is a way to begin thinking about a universe where humans are not the centre and origin of everything that matters, but one more node in a complex network of human and non-human agents. It pushes open the doors of that mysterious enclosure that was artistic creation, letting chance, uncertainty and lack of control in. While doing that, it shifts the attention from the work itself to the space of possibilities defined by the generative system and its unlimited capacity for variation. It is an open experimentation that addresses at once the growing powers of automata, the very nature of that thing we call "art", and possible new ways of living, doing and being human in the ever more diverse, complex and perplexing world we are all

heading to together: objects, plants, animals, people, machines and artificial intelligences.

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Notes

[1] See for example https://www.theatlantic.com/technology/archive/2017/08/a-sitting-phone-gathers-brain-dross/535476/

[2] Solomon "Sol" LeWitt (1928-2007), American artist whose work has been linked to minimalism and conceptualism.

[3] Sol LeWitt, *Paragraphs on Conceptual Art*. Artforum magazine, June 1967. Available online at http://www.rednoise.org/pdal/uploads/Paragraphs.Conceptual.Lewitt.html

[4] Sol LeWitt, *Wall Drawing #86: Ten thousand lines about 10 inches (25 cm) long, covering the wall evenly*. First installation at The Bykert Gallery, New York, June 1971.

[5] Jack Burnham, *System Aesthetics*. Artforum magazine, volume 7, no. 1, September 1968.

[6] Hans Haacke, *Blue Sail*, 1964-1965. Currently at SFMOMA, San Francisco, USA.

[7] Alexander Mordvintsev, artist and researcher. Currently engineer at Google. Personal website: https://znah.net/