From code to object: issues, approach, and problematic of the reified algorithmic artwork.

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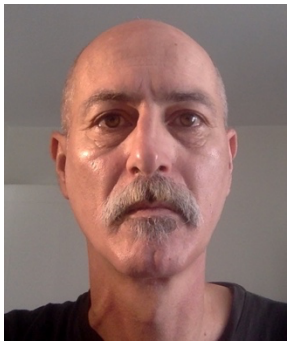

Abstract

This paper proposes to expose and analyse the path of the algorithmic artwork[1] from its source code to its embodiment in a fixed material form. This is what we mean here by the term “reification”, which is understood in its most literal sense of “transformation of an abstraction into a concrete object”.

The reification of an algorithmic artwork raises numerous questions that are at once technical, poietic and aesthetic. The answers we propose are based on the analysis of a personal work entitled *Signs* and its passage from the screen to the wall.

Firstly, reification is placed in a historical perspective that highlights the difference in its scope between the sixties, where it is an imperative step, and the contemporary context, in which it is an artistic choice.

We then examine the motives that may lead an artist to engage in reification, which are related to reflections on the process of creation and the deployment of a work of art through multiple iterations.

These considerations lead to think a specific approach to reification, which salient features are the preservation of the constitutive qualities of the algorithmic artwork: the automation and mutability of image production.

The last part focuses on the concrete translation of these orientations during the production process. The choice of dimensions, techniques and materials used is a crucial element and fully participates in the creative process.

In conclusion, this path leads to a reconsideration of the notion of aura and to a reflection on the way reification modifies the status of the algorithmic artwork.

Filiation and contemporaneity

The reification of the algorithmic artwork necessarily refers to the origins of computer art. However, its inclusion in the contemporary context responds to very

different concerns. For the pioneers of the sixties, Georg Nees, Frieder Nake or again Manfred Mohr, the output on screen is not conceivable, the execution of the code in real time not an option. Simple access to a computer is in itself a challenge, as shown by the “imaginary machine” method used by Vera Molnár in the period 1960–1968. [4]

Even if Mohr or Nees experimented with different manufacturing processes, respectively the light beam plotter on photosensitive paper[2] and the computer-controlled milling machine[3], even though John Whitney created animated films on an IBM 360 connected to a graphic terminal as of 1966[4], output on a plotter dominated the period.

Embodiment in a material form is then the only way to bring the code into the sensible universe, to express the aesthetic potential emerging from the calculation of blind machines. The physical modalities and plastic parameters of these representations are not, in themselves, the real issue in these artists research.

The question is quite different in the contemporary context, where the screen is so intrinsic to the computer that we forget its identity as a peripheral device. The visual dimension of a program is now expressed natively, in motion and in real time, on the screen. That this image is virtual does not make it any less real or concrete. The decision to reify in tangible form the immaterial figures of an algorithm thus becomes an artistic choice whose motives and implementation methods must be questioned.

This difference between imperative and choice likely extends well beyond the debate we are opening here. The question of reification is perhaps also symptomatic of an evolution in the very practice of programming.

In the sixties, programming is a necessary condition for the use of computers. With the rise of home computing, this necessity ceases to be imperative. It becomes a choice. A precisely artistic choice, as David-Olivier Lartigaud [2] points out. It expresses the will to regain control of the machine, to free oneself from the dominant software and its normative aspects[5]. [3]

Signs

The work presented in support of this paper assumes both this heritage of computer art and its anchorage in the contemporary context. Entitled *Signs*, it consists of four images generated by a program written in *Java* with *Processing3*, then laser-engraved on matt black anodised aluminium in 50 x 50 cm format (see the Artworks section of these proceedings).

Intentions

Stemming from a reflection on the articulation of language, writing and code, this is above all a work of transfiguration, between translation and encryption, which, by substituting an exclusively pictorial sign for the alphabetical sign, breaks the relationship between the text and its meaning to reveal the intrinsic rhythms of writing.

Processing

Initially, the algorithm uses eight fundamental lines inscribed in a square: three horizontal, three vertical and both diagonals. All the combinations of these eight lines constitute an alphabet of 255 signs—the empty one being excluded.

The algorithm then uses the French definition of the word “alphabet” given by

Fig. 1: The eights fundamental lines used to generate the signs.

Wikipedia. It analyses the text to identify the different characters—upper case, lower case, numbers, punctuation—and randomly assigns one of the 255 signs to each.

At each run, a new random draw is made that changes the correspondence between the characters in the text and the signs. The probability of such a match occurring again is so low as to be insignificant. Each image produced is therefore unique, but can also be seen as a multiple of the same matrix: the program.

Editions

In parallel to the four editions presented, a study is underway, in collaboration with a stonemason, for a single copy engraved by sandblasting on a pink sandstone plate in the format 80 x 80 x 4 cm. Although based on the same algorithm, these two reifications are the result of different considerations and objectives, which are expressed in the choice of materials and techniques used.

Motives

Despite the spectacular irruption of NFTs in the art world with the record sale in March 2021 of *Everyday: the First 5,000 days*[6], by the American artist Beeple, the art market remains reluctant to show and negotiate so-called immaterial digital artworks. In this respect, reification has a significant advantage: embodied in a tangible form, the work becomes easier to exhibit and sell, two aspects that strongly condition the viability, and therefore the perpetuation, of artistic practice.

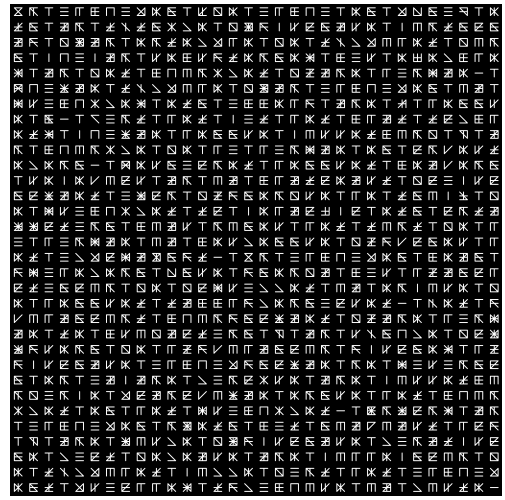

Fig. 2 Signs, source image from one of the four editions on aluminium.

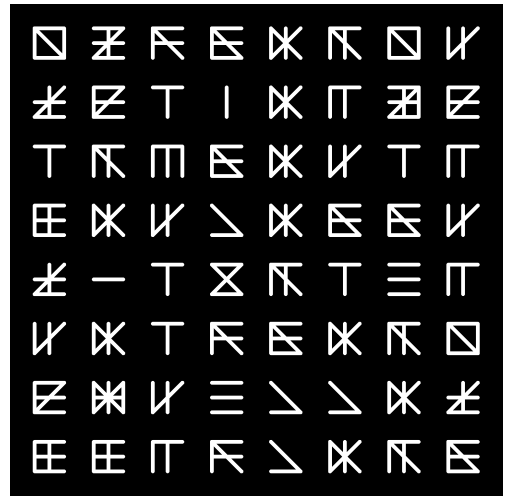

Fig. 3 Close-up of Fig.2

But these pragmatic considerations alone cannot constitute a sufficient motive. The reasons leading to the reification of an algorithmic work are, first of all, related to a disruptive strategy. That of “art-oriented” programming within a device whose

processes and purpose are clearly inappropriate to the principle of artistic creation.

The artistic use of code in fact calls for a singular imagination that diverts programming from its productive purposes to inscribe it in forms that are a priori unprecedented, unexpected, even unpredictable.

The very will of searching for fixed images within a fleeting, screen-based flow is already a paradox in itself. The transitory nature of the images resulting from a series of computer operations is indeed opposed to the perennial and autotelic status of the artistic image.

In this sense, reification completes, by increasing, the timelessness of the artistic image. It crystallises its “durability”. It is not confused with a stage version or a simple control “exit”. It visually and haptically concretises a state that has become definitive and then refers only to itself.

Alongside these considerations, which are related to the plastic and physical nature of the artwork, we must also consider the singularity of this form of freeze-frame of a process. The reification of an instant captured in a sequence of states bears the mark of an in-between.

In particular, it provides an opportunity to examine the intersections of various more or less well-defined categories of art—algorithmic art, generative art, rule-based art, conceptual art—in the light of Pierre-Damien Huyghe’s reflection:

“An intersection can be thought of as a dividing line between two environments. It is an elusive place of contact, a simple imaginary line in a drawing, a caesura between shots in a film. The intersection is as such undefined: it belongs to neither of the environments that separate in it, yet it is both at the same time.”[4]

This question agitated the twelve years of existence of the *Nove Tendencije* current [5] of which Zagreb was the epicentre from 1961 to 1973. More than forty years later, Philip Galanter can only observe that, if there is indeed a border between rule-based art and generative art, this border is blurred and porous, and that “Some works exist in the grey zone of either or both” [6]. The same observation applies when we confront conceptual art with algorithmic art, but also all the combinations of these two categories with the previous ones.

The work undertaken with *Signs* seems to us to illustrate the porosity of these demarcations. Depending on the aspects we consider, it falls under the four aforementioned appellations, and unfolds in the continuum they mark out rather than in one or other of the territories they would delimit.

To put it another way, conceptual art opens up a fertile field for reflection on the scope of reification. The juxtaposition of the object, its image and its definition that Joseph Kosuth makes in 1965 with *One and Three Chairs* has a certain echo with the path of reification, from code to screen images and from the latter to the material object. Rather than considering them as the necessary steps of a teleological process, these three states can be envisaged as different modalities of expression of a whole greater than the sum of its parts, of the same ideal object that would be the algorithmic artwork.

Approach

Two aspects are central to *Signs*, and more broadly to generative art: the automation of image production, and their mutability at each program launch. The

preservation of these constitutive qualities of the work in its reification is at the heart of the approach we adopt.

The mutability is translated by the edition of strictly unique copies, a character whose emphasis and scope vary according to whether or not the piece is part of a series. The juxtaposition of the four editions on aluminium highlights the singularity of each copy while ostensibly displaying a kinship that implies a common origin. Different, but conforming to the same prescriptions, these reifications invite us to consider the a priori paradoxical notion of "multiple-unique" which underlines their way of being identical in another way.

The single-copy edition on stone relegates the algorithmic matrix to the background. The reification presents itself as an original in the common artistic sense of the term. But it is enough to imagine a simultaneous exhibition of the two editions to question this notion of original with regard to its inscription in what can be understood as a metaseries. Each iteration of each edition would then only be a manifestation of a larger work.

The automation of image production has its roots in the rejection of the figure of the romantic artist, the genial and infallible demiurge, brilliantly illustrated by Marcel Duchamp's ready-made, and which François Morellet translates as early as 1965 by the refusal "[…] in the making of works of art [of] this arbitrary choice at every moment, while at the same time machines are appearing, electronic brains that are more and more perfected, which could replace the artist in a large part of his work". [7]

By making the "choice of cybernetics", Morellet intends to move away from the traditional prerogatives of intuition or inspiration in order to better redefine the role of the artist, who would then be dedicated to "feeding these machines and setting them a goal". [8]

In the same way, reification is not an opportunity to display any kind of virtuosity, but to think about the development of the algorithmic artwork by seeking a coherent and significant articulation of technique, material and purpose. The making of the reified artwork, despite the problems it may present, is not important in itself. It is merely the realisation of choices made upstream, the execution of another program and, as such, must exclude any non-automated intervention that would bring at this point a subjectivity that would contradict the objective pursued.

It should also be noted that reification implies, by its very nature, a freeze frame. In the case of *Signs*, this character is present at the source, the code being written to produce a still image at each execution. But it is common in algorithmic art to encounter programs that generate animations, for example the *Processes* that Casey Reas designed from 2004 to 2014. [9]

The first stage of reification then consists of making a selection among all the images produced. This can be based on choices with an assumed subjectivity, as with Reas, on random draws, on an aesthetic evaluation program—of which Galanter lists and, above all, points out the limits [10]—or on a combination of these different possibilities. Whatever the method, the extraction of one or more images from a continuous flow confers on them new qualities of suspended moment and "decisive instant" referring to photography, and which the embodiment in a perennial material form reinforces.

Translation

The edition of strictly unique copies is a sign of the singular character of these suspended figures and leads to the use of appropriate editing modalities.

This approach excludes in particular the existence of intermediate matrices—and therefore techniques such as silk-screen printing or linocut—which would compromise the desired uniqueness of each piece, and instead turns to processes such as digital printing, laser engraving or even 3D printing.

The only operation required is the conversion of the file generated by the program into the format required by the machine, an automatic and practically instantaneous operation that does not alter the processed image in any way.

It should also be noted that the file generated by the program is a vector image; as such, the notion of size is foreign to it. The reification imposes a decision on dimensions, a choice that is not without consequence, as Sol LeWitt remarks: “Determining what size a piece should be is difficult. […] The question would be what size is best. If the thing were made gigantic then the size alone would be impressive and the idea may be lost entirely. Again, if it is too small, it may become inconsequential.” [11]

The point here is to appreciate a scale that is coherent with the purpose, but also compatible with the constraints imposed by the technique or the material used. This is the method adopted for the two editions of *Signs*.

The fixation of the furtive image on a perennial support is more than a transposition. It is a transfiguration that must underline the passage from one state to another. From the casual image to the icon.

This is what we wanted to achieve with the two different editions of *Signs*. While the engraving on anodised aluminium, through its evocation of the industrial world, places the images in a contemporary context and highlights the production process, the choice of stone underlines the semiological background of the work, and refers to the *Rosetta Stone* and the origins of writing.

The first, through the use of means usually dedicated to signage, expresses the functional coldness commonly attributed to algorithms, the minimalist austerity of a pseudo-modern fresco or the rigid and autistic dullness of a robotic message. The second, by using the noble and archaic material of stone, speaks of the antiquity of algorithmic art and suggests a connection with the so-called Major Arts.

These discourses that these proposals intend to convey through matter and technique would obviously be inaudible under the glass of a screen or in the light of a projection.

These implementations do not only aim to fix the finite image of a whole that can move in infinite configurations; they contribute to significantly “eternalise” the reincarnation of an algorithmic state into a definitive aesthetic object.

Its weight, its dimensions, the duration of its shaping, its cost, the use of a workshop and collaborators—everything contributes here to the edification of a paradoxical project where the distance between the digital model and its metamorphosis would like to appear at its height.

Openings

Algorithmic art is permeated by dualities—the time of writing and the time of execution, the confrontation of the process and the product, its conceptual and performative dimensions—which bring in their wake questions about what makes an artwork. Should we consider the pieces produced as originals, or as instances of the original that would be the program? What is the status of the file generated in relation to the former and the latter? These questions raise interrogations about the nature of the material or ideal objects of these works, about their regime both allographic and autographic.

Reproducible identically by simply copying a file, the source code is obviously allographic in nature. The same is true of the image produced by the program when it is saved as a file. But let us imagine the program running indefinitely and delivering every second to the screen, and without recording, an unprecedented configuration that nevertheless conforms to the set specifications.

Given the combinatorial explosion, each image displayed in this way could legitimately be considered unique, regardless of how long the program has been running. These ephemeral images would then fall under an autographic regime because of their deliberately organised singularity and the impossibility of their reproduction.

The reification into multiple but unique copies would tend to support this autographic reading. But this obliterates the relatedness of these images, which constitute a whole greater than the sum of its parts, a brotherhood whose display implies filiation. By thus updating the notion of aura to the detriment of the multiple character of the artwork, does this autographic reading not threaten the algorithmic identity that founds the origin and originality of this work?

We propose here to understand these works through the idea of “polygraphy”, i.e. images that can be written in multiple ways. This idea nuances the notion of artistic multiple, by taking into account the variability of renderings within the established constraints and by underlining the existence of a unique matrix producing multiple exemplars, each of these multiples being unique in itself.

Neither a synthesis nor a new category, this notion acknowledges the coexistence in these works of antagonistic regimes and recognises, in the light of the dialogic dear to Edgar Morin, “the reality of their opposition and the necessity of their linkage”. [12]

We can therefore envisage that this polygraphic dimension is a distinctive feature of an algorithmic art that is actualised in ever singular recommencements, and whose paths—*iter*—the artist takes which, by dint of repetition—*iterare*—lead him away from the expected to walk adventurously—*erre*—in a form of psychogeographical drift of the order of “itererrance”.[7]

Notes

1- We consider that the appellations of algorithmic art and generative art designate mostly the same artistic current. The nuance introduced by this difference in denominations seems to us to be less about the essence of the works than about the aspect that is highlighted: the process in the case of algorithmic art, the product in the case of generative art.

2- *High Resolution Light Beam Plotter Drawings* are a series of 30 unique images on 12 x 12 cm photo paper generated by the program P-018 in 1969. http://www.emohr.com/collabexp/kemmy1969.html [Accessed November 8, 2021].

3- *Sculpture1* is a wood sculpture generated between 1965 and 1968 with Siemens-systems 2002 and 4004, programmed in EXAP-1 for a Sinumerik milling machine. Its actual location seems to be unknown. https://www.heikewerner.com/nees_en.html [Accessed November 8, 2021].

4- First artist in residence at the firm, Whitney realised *Permutations* on an IBM 360 connected to a 2250 vector graphics display in 1968. But the cost of this equipment was prohibitive, and artists who had access to it were extremely rare at the time.

5- This choice between "computer-assisted" art and art "with the computer", according to the distinction proposed by Lartigaud, is similar to that made by Pierre-Damien Huyghe between "use" and "exercise" of an apparatus. See [3].

6- Sold online by Christie's for $69,346,250, it is the most expensive digital artwork ever traded. https://www.christies.com/features/Monumental-collage-by-Beeple-is-first-purely-digital-artwork-NFT-to-come-to-auction-11510-7.aspx [Accessed November 8, 2021].

7- French "errance" means wandering.

References

[1] AMIC, Sylvain and BABY, Vincent, 2012. *Vera Molnár : une rétrospective*. Press kit. S.l. Musée des Beaux-Arts de Rouen.

[2] LARTIGAUD, David-Olivier, 2011. Retour au code. In: *Art++*. Orléans : Hyx. Script. pp. 15-23.

[3] HUYGHE, Pierre-Damien (ed.), 2005. *L'art au temps des appareils.* Paris : L'Harmattan. Esthétiques.

[4] HUYGHE, Pierre-Damien, 2003. *Définition du concept d'appareil* [online]. 2003. Paris : Presses de la Sorbonne. p. 6. [Accessed November 8, 2021]. Available at: http://pierredamienhuyghe.fr/documents/textes/huygheconceptappareil.pdf

[5] ROSEN, Margit (ed.), 2011, *A Little-Known Story about a Movement, a Magazine and the Computer's Arrival in Art: New Tendencies and Bit international*, 1961–1973. Karlsruhe, Germany; Cambridge, MA: ZKM/Center for Art and Media; MIT Press.

[6] GALANTER, Philip, 2016. Generative Art Theory. In: PAUL, Christiane, *A Companion to Digital Art*. Hoboken: John Wiley & Sons. Blackwell's companions to art history, 9. pp. 146–180.

[7] MORELLET, François, 2011. *Mais comment taire mes commentaires* ? [3rd ed. augmented]. Paris : Beaux-arts de Paris, ed. Ministère de la Culture et de la Communication. Écrits d'artistes. p.28

[8] *Ibid*. p.21

[9] REAS, Casey and GALLERY DAM BERLIN, 2010. *Process compendium, 2004–2010* [online]. Los Angeles: REAS Studio. [Accessed November 8, 2021]. Available at: https://drive.google.com/file/d/0B9h469--G5OwOGVfVmUxZUQ5VzA/view

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[10] GALANTER, Philip, 2012. Computational Aesthetic Evaluation: Past and Future. In : MCCORMACK, Jon and D'INVERNO, Mark (eds.), *Computers and Creativity*. Berlin, Heidelberg: Springer. pp. 255–293.

[11] LEWITT, Sol, 1967. Paragraphs on Conceptual Art. In: *Artforum* [online]. Summer 1967. Vol. 5, Nº. 10. [Accessed November 8, 2021]. Available at : https://www.artforum.com/print/196706/paragraphs-on-conceptual-art-36719

[12] MORIN, Edgar, 1980. Au-delà du déterminisme : le dialogue de l'ordre et du désordre. In: *Le Débat*. Vol. 6, Nº. 6, pp. 104.