

## From concept to algorithm – self-reflections on the personal artistic practice

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**Abstract:** The article proposes reflection on the practical and theoretical investigation characteristic of generative and interactive art, exploring the relationship between corporeality, technology and creative processes. Through a series of critical reflections and case studies focused on the installations *Neural Eye*, *Frequency* and *Echos*, it aims to analyse how biological data, unconscious signals or body movements can be translated into visual and sound expressions with the help of digital systems. The article brings into discussion contributions from media theory, philosophy of perception and interactive aesthetics to outline a perspective in which the artist becomes the architect of an algorithmic process, and the work develops in real time through the dialogue between body and system. More than a presentation of works, the text offers a conceptual framework for understanding generative art as a form of knowledge, in which artistic intuition is mediated, extended and reconfigured by technology.

**Keywords:** generative art, interactive art, corporeality, algorithmic processes, biological data, media theory, real-time interaction.

### 1. Introduction

#### The machine as a creative tool. Who or what is the creator?

Starting with the 1960s, with the introduction of the television in the gallery, undergoing analogical modifications, a way was proposed to combat and criticize the way of propagating mass information. Later, with the appearance of the computer in the gallery, with the exploration of the first forms of algorithmic art, art critics asked themselves the question of whether or not it was art and who (or what) was the creator. Galleries also asked themselves the question of selling these works, which contained the components of the computer as objects, to the extent that the computer was already a mass-produced object.

We can speculate that the transition from the analogue to the digital approach of generative art is marked by the year 1965, when three engineers, without knowing each other, exhibited computer-generated experiments: George Ness (exhibiting in Stuttgart, Germany), Michael Noll (exhibiting in New York), and Frieder Nake (exhibiting at another gallery in Stuttgart). The experiments of the three mathematicians had a common element, which was the polygon – a geometric figure formed by a finite number of connected line segments.

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It is important to mention the effort of the three artists to transform a mechanism configured for calculations into an artistic instrument, while still being limited to generating straight lines between two points. We can observe in the activities of these artists the technological constraints in the context of the period, but also their creative transcendence. From this point of view, we can look much more creatively at the process, configuration and use of the computer than the result itself. In other words, how to draw when your instrument is not made for drawing?

In the case of analogue modifications of television circuits that distort or modify the image, as addressed by artists such as Nam June Paik, the artist's creative intention manifests itself at the end of the technological process. In other words, video artists could not control the input of information (the live broadcast), but rather the result. In the case of algorithmic art, similar to generative art, artists create the infrastructure for making the image, without having direct control over the final result. Although Ness, Noll and Nake had the polygon as a common object of work, the generation models are approached in different ways. For example, George Ness describes the pseudo-code that dictates to the computer what to generate: “Start anywhere inside the given square format of the figure and draw a polygon made up of 23 straight line segments. Alternate between horizontal and vertical lines of random lengths. Horizontally, go either left or right (choose randomly), and vertically, go up or down (also random). To finish, connect the start and end points with a slanted straight line”<sup>1</sup>.

Although the question “the artist or the computer, who is the creator?” is still common today, naturally, when the first experiments in algorithmic art appeared, galleries and art critics began to dispute where the creative centre of the process is located – at the level of man, code or machine. Because the device is the element that is introduced into the artist-work equation, raising questions, we can create a parallel with the moment when Friedrich Nietzsche, one of the first authors to use the typewriter as a writing device, noted that our tools participate in writing our ideas<sup>2</sup>. We can see this idea from two perspectives, the first, in the literal sense, that without the use of a pencil or a typewriter in the process of translating ideas into a visible form on paper, the writer's efforts are in vain. The second perspective is an observation that the thinking and attitude towards the writing process and, therefore, the content are influenced by the tool you use. Even if the writing changes, not only mechanically, but also mentally, the human remains as the author of the work, because the tool does not write anything by itself. It should be specified that, in this case, the computer is not a tool, like a pen or a brush, but a device designed to automate some calculations, and the thing that the two have in common is that they

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<sup>1</sup> John McCormack (2012). *Computers and Creativity*, Springer, London, p. 69.

<sup>2</sup> Frieder Nake (2012). *Construction and Intuition: Creativity in Early Computer Art*, “Computers and Creativity”, Jon McCormack, Mark d’Inverno, Springer, p. 72.

are part of the process of creating a work. Returning to the idea above, Nietzsche's statement that the use of the typewriter (an important technological advance at the time) influences thinking remains completely valid. It's just that the transformation of the process of writing cursively letter by letter is reduced to pressing buttons, writing becomes typing. As in the case of art, this transition from digital to analogue occurs, without cancelling each other out, but as an additional practice, with different results – from using the magnet to alter the image in the case of Paik to using lines of code to generate images in the case of Ness. Digital has the advantage of precision, but also of standardizing the work process. If drawing a line by hand from one point to another on a sheet of paper requires a certain process such as “from here to here”, to achieve the same thing on the computer the process will use “precisely these coordinates”. The activity changes, the artist is no longer the immediate generator of the line, but becomes a mediator of the conditions that the computer must respect when generating the line. Frieder Nake describes this difference in process as “drawing with the brain instead of drawing with the hand”.

### **The body as a source of data – instrumentalisation and interpretation**

In contemporary art we can draw a diagonal between corporeality and technology, exploring the complexity of the relationship between human and algorithmic processes, taking as an example Frieder Nake, who formulates an analysis of this relationship, emphasizing that although the human body can be considered a generative system, it does not automatically identify with the nature of algorithmic systems used in art. We can recognize the human body as a generative system due to its capacity to produce movements, emotions, ideas and reactions, and this intrinsic generative character is influenced by internal factors, such as emotions, perceptions and intuition, as well as external factors, such as the social and cultural context. However, Nake argues that this form of generativity is fundamentally different from that specific to algorithmic systems.

Unlike the body, algorithmic systems are governed by strict rules and programmed autonomy, with the option of being operated independently by the artist after the initial parameters are defined, which gives them a predictability that the human body lacks. In this context, we can view creativity as a process in which the artist becomes a process designer rather than a direct creator of the artwork. This aspect is essential in generative art, where the artist creates a set of rules or a framework for the algorithms that generate the final work, and therefore the relationship between the artist and the creation becomes indirect, process-driven and mediated by technology. This approach is substantially different from traditional art, where the artist was perceived as the sole author of his creation. New notions have been introduced into the contemporary technological framework, such as that of emergence, in which creative results are more than the sum of the parts involved in the process, from which the idea emerges that technology extends creative capacity and fundamentally transforms

it, opening up new ways of exploiting the relationship between the body and the artistic environment.

Marshall McLuhan, in his work “Understanding Media: The Extensions of Man”, explores the concept of the extension of the human body through technology, from which we can take as references some of the theories in order to argue and understand the role of systems within generative art. He argues that technologies are not just external tools, but extensions of our sensory systems, transforming the way we perceive the world and the nature of human creativity. McLuhan introduces the idea that every technology is an extension of the human body, whether it is the wheel that extends mobility or digital media that extends the central nervous system. “Today, after more than a century of electrical technology, we have expanded our central nervous system into a global embrace, abolishing both space and time as far as our planet is concerned.”<sup>3</sup>

New media art uses these technological extensions to explore new ways of interacting between the body, technology, and artistic space, where interactivity integrates the body into technological systems, transforming the viewer into an active participant – a process that reflects McLuhan’s idea that technology not only extends sensory functions, but also influences socio-cultural relations. The use of algorithms and mathematical rules to generate autonomous artworks becomes a collaborative process between artist and system, implementing technological advances as an active partner. For example, in generative artworks, the body can be integrated into the creative process through sensors that monitor the movements or biological signals of the artist or viewer. Thus, the body becomes part of the algorithmic process, and the final result reflects the direct influences of bodily interaction integrated into the rules of the system. These technologies have also transformed spatial and temporal perception, offering new forms of immersion for the viewer: “the electric speed of bringing together all social and political functions in a sudden implosion has heightened the human consciousness of responsibility to an intense level”. This idea highlights the fact that in the case of works that are part of the digital arts, especially immersive ones, the user overcomes his condition of passive observer and becomes an active actor in a redefined artistic space.

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The work “Neural Eye”, which is part of a trilogy of installations designed by me, aims to explore the concept through which the viewer's mind becomes the main generative factor of visual creation. In this sense, the project represents an interactive video installation that transposes the viewer's cerebral activity into an animated graphic construction in continuous transformation.

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<sup>3</sup> Marshall McLuhan (1994). *Understanding Media: The Extensions of Man*, MIT Press, Cambridge, p. 259.

The installation functions as a symbolic extension of the brain, projecting outward the dynamics of the user's mental states, in a process of visual self-reflexivity. Thus, the viewer contemplates what their own brain generates, this act directly influencing their inner state. "Neural Eye" thus becomes a "mental eye" whose culmination is introspection on their own presence and cognitive activities.

In contrast to the work created in a first version – where the installation acted as an external catalyst for evoking memories – the work "Neural Eye" proposes an inversion of the relationship: the viewer's thinking is what produces the visual image, marking a transition from the outside to the inside as a source of artistic expression.

From a technical point of view, the data stream from brain waves is used as a set of variables in the generation of visual content. The development process of the work had a significant experimental component. The first versions of the installation were characterized by a random visual expression, lacking perceptible coherence. Later, the need for a clear "reading key" emerged, so that the abstraction of biological data would become intelligible and accessible to the public.

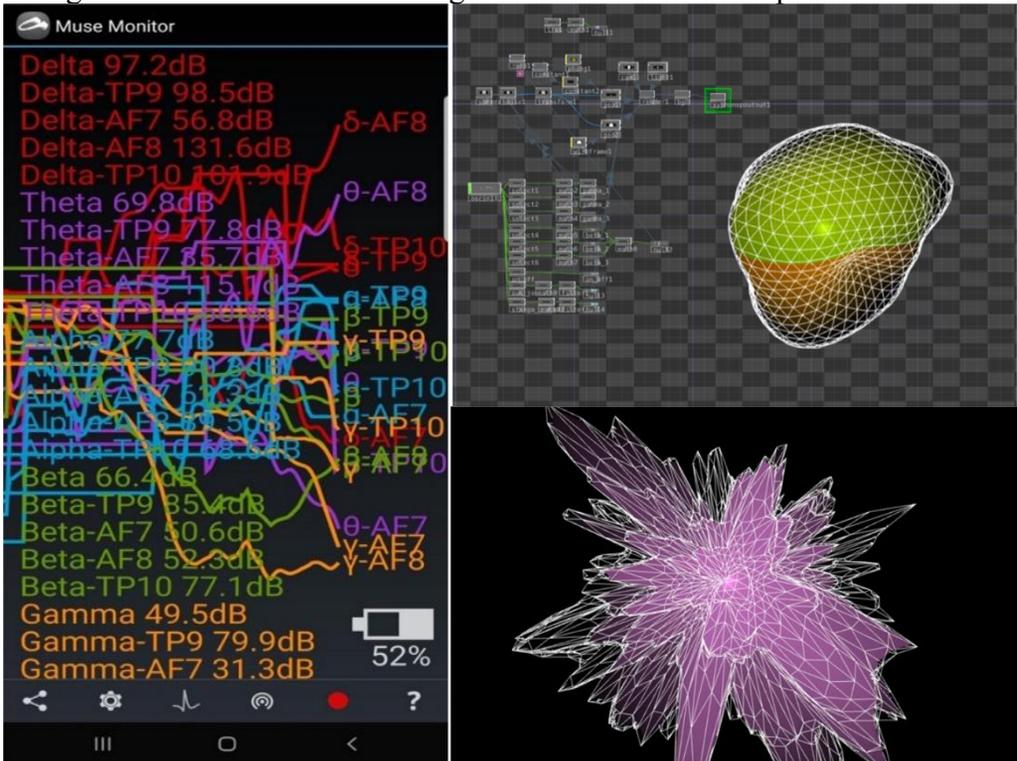


Fig. 1, 2 Screenshots of the operating processes of the facility. On the left, the data flow of the celebration waves received by the EEG sensor, on the right, the process of transforming and interpreting the data into visual instances

From a technical point of view, the installation uses a communication system between an EEG sensor, positioned on the participant's head, and a visual programming environment, through the OSC (Open Sound Control) protocol. This technological framework allows the conversion of neurophysiological data into variables that determine the generation of visual instances in real time. The EEG sensor monitors the activity of different brain regions, allowing the interpretation of the intensity of the user's cognitive processes. Thus, the installation can reproduce two extreme cognitive states: in the case of a state of deep meditation, brain activity is minimal, which leads to a simplified visual representation; on the contrary, during an intense mental activity, such as solving a complex problem, a sophisticated and densely structured visual image is generated.

The three-dimensional object generated within the installation is defined by three essential attributes, each corresponding to a dimension of brain activity:

1. Complexity – refers to the number of polygons that make up the three-dimensional shape. Low brain activity results in a low number of polygons, resulting in a simple shape; conversely, high activity leads to an increased number of polygons and the emergence of an elaborate and complex visual structure.

2. Movement – indicates the fluidity of the development of forms. In a state of cognitive relaxation, the movement of the object is smooth and continuous, while increased brain activity causes discontinuous movement, generating sharp, tense visual forms.

3. Colour – functions as a gradient that reflects the level of neuronal activity. The colour palette is organized so that the transition of colours (red – yellow – blue – purple) signals the transition from a state of relaxation to intense cognitive activation.



Fig. 3 QR code for the video presenting Neural Eye

A significant theoretical contribution to the understanding of the contemporary artistic context is provided by Ahmedien's research, entitled

*Analysing Bio-Art Epistemic Landscape: From Metaphoric to Post-Metaphoric Structure*. In this work, the author analyses metaphor as an essential cognitive mechanism for conceptualizing and understanding complex phenomena. Metaphor is defined as a tool of cognitive translation, which can be expressed both linguistically and visually, allowing the articulation of an abstract concept through a figurative association with a concrete concept.

Ahmedien describes this relationship in terms of a “target domain” – representing the abstract idea – and a “source domain” – a concrete and well-defined reference that facilitates understanding. The projection of the characteristics of the source domain onto the target domain is called the “mapping process”. This process provides a cognitive framework through which a systematic correspondence is drawn between the two domains, making it possible to understand the abstract domain through the prism of a concrete model.

The importance of this theory lies in the fact that metaphor does not operate by simply identifying formal similarities, but by establishing structural and functional correlations between the two domains involved. Therefore, metaphor becomes a rigorous methodological tool, which presupposes the existence of a systematic relationship between the elements of the source domain and those of the target domain. The impact of this translation lies in its capacity to reconstruct the meaning of a primary (abstract) system in terms of a secondary (concrete) system.

The mapping process is achieved by relating the biological system (source domain) to the visual representation system (target domain). This relationship aims to highlight, through artistic means, the processes and conclusions generated within scientific research. Thus, art becomes an intermediary space for the translation and interpretation of biological data, contributing to a form of interdisciplinary knowledge in which science and artistic expression intersect<sup>4</sup>.

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The second installation, entitled “Frequency”, explores the unconscious dimension of the viewer through the heart rate, which it transposes into visual and sound spatial coordinates. The work proposes an immersive experience in which the heartbeat becomes the generating element of the perceptual space, and the viewer is invited to become the inhabitant of his own heart.

Conceived as a metaphorical simulation of a cardiac chamber, the installation transforms the biometric pulse into a source of activation of the surrounding environment. The projection of an aorta, located on the ceiling of the exhibition space, is animated in real time by the participant’s heart rate. Thus,

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<sup>4</sup> Ahmedien, D.A.M. (2023). *Analysing bio-art’s epistemic landscape: from metaphoric to post-metaphoric structure*, “BioSocieties”, 18, pp. 308-334.

the visual and sound space are triggered and shaped by this biological impulse, offering a dynamic representation of an intimate interaction between the body and the environment.

Throughout the experience, the viewer witnesses perceptual fragments of reality, filtered through this symbolic representation of the circulatory system. The installation transforms the physical space into a living entity, whose inner rhythm reflects the physiological state of the user, generating a framework of deep introspection, artistically mediated.

Therefore, “Frequency” functions as a platform for reflecting inner experiences in outer space, configuring a conceptual camera obscura in which the heart becomes both a signal source and a metaphor for bodily consciousness. This reconfiguration of the sound and visual space transforms the installation context into an approach of self-observation.

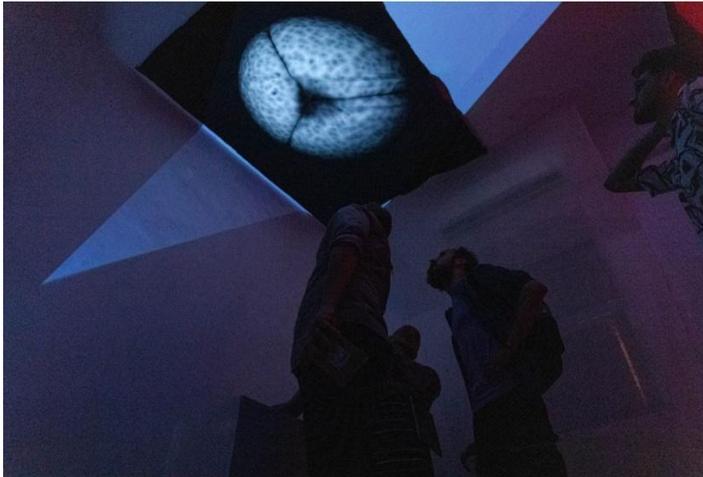


Fig. 4 Radu Marțin, “Frequency”, documentary photography for the presentation of the thesis, Aparte Gallery, 2023

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Unlike the installations “Neural Eye” and “Frequency”, which harness biological data from unconscious processes, the work “Echos” relies on the viewer’s conscious bodily movement as a generative factor of the visual image. Using a Kinect sensor, capable of detecting and mapping body shapes in three-dimensional space through infrared frequencies, the installation transforms real-time movement into an interactive visual flow.

“Echos” questions the relationship between the present and the spatiotemporal dimensions, placing the relationship between the body, action and consequences at the centre of the artistic approach. Each movement of the viewer generates an ephemeral visual moment, and the resulting image becomes

an echo of his action — a delayed projection, a fleeting imprint of presence. In this way, the work proposes a meditation on the ephemeral character of time, in contrast to the accelerated rhythm and pragmatism of the present. Conceptually, the installation offers the viewer a platform for introspection on memory, perception and their temporal condition. The visual elements transform space into a fluid entity, devoid of fixed physical boundaries, configuring a virtual world in which time is reimagined as a sensory consequence and space becomes a construct in perpetual reconfiguration. Thus, “Echos” becomes an artistic territory in which bodily presence leaves traces, and memory is visualized in real time.



Fig. 5 Screenshot from Echos

The three installations – “Neural Eye”, “Frequency” and “Echos” – make up the project entitled “Trinom”, which proposes an exploration of how generative art can articulate an aesthetic of incompleteness and corporeality within generative installations. Although the resulting forms may seem purely formal or decorative in their abstract character, they are expressions of conceptually structured algorithmic processes, the generativity of visual forms being thus guided by a series of parameters that determine a certain type of sensory-ness and way of perceiving space, in constant interaction between the virtual and the physical.

In this context, generative art cannot be understood as a completely predictable process, but as a reconfigurable flow, in which the artist intervenes on the variables and conditions of production. Even if the result is not controllable in detail, its direction is configured by the artistic intentionality and the semiotic direction of the process. Therefore, generative art acquires conceptual valences, becoming an emergent form of expression in which the unpredictable becomes an integral part of the aesthetic discourse.



Fig. 6 QR code for the video presenting the three installations

### Conceptualizing corporeality in relation to technology

Mark Hansen suggests that technology is “a constitutive dimension of human corporeality”<sup>5</sup>, arguing that the relationship between the body and technology is not an additional one, but a fundamental one. This point of view is based on the concept of the “body schema”, a theory developed by the philosopher Maurice Merleau-Ponty with the aim of presenting the idea of perception of the world as being closely linked to corporeality. From this perspective, the body is not just a physical object, but the very condition of the possibility of having a world. The body schema functions as a preconscious structure that allows the body to integrate and actively respond to the environment. Merleau-Ponty emphasizes that this relationship is not a purely cognitive one, but a deeply sensory and motor one: “the body is the zero point of perception, the place from which all perspectives open and all meanings arise”<sup>6</sup>. For the French philosopher, perception is embodied, unlike the traditional perspective that separates the mind from the body. He argues that human subjectivity is inseparable from corporeality, and our perceptual experiences, be they visual, tactile or auditory, are filtered through the body. In this sense, the body goes beyond the condition of passive receptor, becoming an active “incorporation machine”, which transforms sensations into meanings.

From this perspective, he provides an illustrative example of the idea through the metaphor of the cane which, for a blind person, is more than a simple external tool and becomes an extension of his own body. Through the cane, the blind person perceives the world beyond the physical limits of his skin. Fifty years later, Hansen, in his book “Bodies in Code”, anticipates this idea and states that digital technology is seen as a constitutive element of our way of perceiving and interacting with reality. Furthermore, Merleau-Ponty explores the notion of “flesh”, a concept developed in his later work. For him, the body designates the

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<sup>5</sup> Mark Hansen (2006). *Bodies in Code: Interfaces with Digital Media*, Routledge, London, p. 65.

<sup>6</sup> Maurice Merleau-Ponty (1962). *Phenomenology of Perception*, Routledge, London, p. 70.

profound interconnection between the body and the world, a field of reciprocal relations in which subject and object are interchangeable<sup>7</sup>.

Hansen admits that new media art has had a fundamental role in clarifying the connection between technology and corporeality, and the works of contemporary artists have succeeded in “introducing technical dimensions of corporeality”<sup>8</sup> that were unimaginable for Merleau-Ponty or other 20<sup>th</sup> century philosophers. This is due to the ability of new media art to function as an aesthetic mediation of digital technologies, providing a context in which the two become interdependent. Hansen explores the concept of transduction (the transfer of genetic information from one cell to another) between the technical and the corporeal, demonstrating how algorithmic processes can transform the experience of corporeality, given the immersive and interactive properties of new media arts, which allow the human body to be reconfigured and extended, eliminating traditional distinctions between the material body and digital media.

## Conclusions

The article sought to articulate a reflexive framework in which personal artistic practice, based on interactivity and generativity, is theoretically contextualized through a series of critical concepts and perspectives from the fields of art, philosophy and technology. The approach did not exclusively aim at describing works, but sought to investigate the ways in which new forms of digital art reconfigure traditional relationships between artist, tool and result. By combining personal practice and theoretical resources, it was possible to analyse generative art not only as a visual product, but also as a relational and dynamic process, governed by a complex ecology of factors – biological, cognitive, algorithmic and sensory. This approach can provide a more nuanced understanding of the role of the artist within interactive systems, becoming a producer of forms and configurator of conditions for data flows translated into the form of experience.

At the heart of the investigation was the idea of interaction, transcending the status of simple reaction to stimuli, becoming a form of co-creation between the body and technology. Through this lens, generative art was approached as a territory for negotiating the boundaries between control and randomness, between result and creative process. What emerged from this journey is not just a series of interactive installations, but an attempt to think of artistic practice as a form of situated knowledge, in which artistic intuition meets algorithmic structure, and expression becomes mediated, but not diminished, by technology. From this perspective, the contribution of the works lies in articulating a dialogue

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<sup>7</sup> Maurice Merleau-Ponty (1968). *The Visible and The Invisible*, Northwestern University Press, Illinois, p.9.

<sup>8</sup> Mark Hansen (2006). *Bodies in Code: Interfaces with Digital Media*, Routledge, London, p. 22.

between critical thinking and artistic experiment, between corporeality and code, between presence and abstraction.

Ultimately, what emerges is an open artistic practice, in a permanent conceptual reconfiguration, in which technology overcomes its condition as an environment of expression, becoming a partner in reflection on concepts.

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