Chapter 1

Generative Art and Media Translations

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Abstract

The definitions and taxonomies of Margaret Boden and Philip Galanter are used in this study to explore the interaction between the artist and the artwork that takes place during the creation of generative art. In this study, digital examples of generative art that enable media translations are featured through the works of Escher and Sol Lewitt in order to comprehend the algorithmic structure of these works. The production relations are attempted to be described by Boden, Galanter, and Bense's descriptions of generative art, which also highlight the information aesthetics or algorithmic aesthetics that permit this.

This research, which is the second section of my master's thesis called "Type Generating the Smooth Society," is also a cornerstone of my methodological approach. Understanding the user relationship encompassing the common, artificial intelligence-supported generative models that are currently on the increase requires a study of production relations in generative art systems. In order to assure the viability of a further understanding of the issues that have arisen around generative AI and authorship, the goal of my model is to illustrate the objective, mathematized, generative process between the creator and the artwork by a model.

Introduction

Deriving from the Latin origin "-gene," generativity refers to the ability to procreate. This procreation used to connote with the natural forces, conditions, and substances during the 1560s. With the contribution of technological developments that humankind has achieved since then, in the present day, we use this term not just in reference to biological processes but also to computers. Understanding the occurrence of this transformation in terms of the word's usage is important since it designates how society and technology are related.

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With the roots in the Latin word genus, generativity means to be able to procreate. The words Latin origin "generatus" is denoting as a means of procreation of natural forces, conditions, and substances. However, with technological developments over the last five centuries, this characteristic, previously attached to natural forces, has been transformed into a characteristic of machines.

Today when we use the term "artificial intelligence," the term stands with its distinct generative characteristic, which I mean by its ability to reproduce into endless variations. Regarding the obligation for a human catalyst to give a start to the generative process for the present day, a completely autonomous artificial intelligence seems impossible. Thus, in this study, the arguments of artificial intelligence have been taken under the term generativity.

Fig. 1 Mosaic tiles of Alhambra

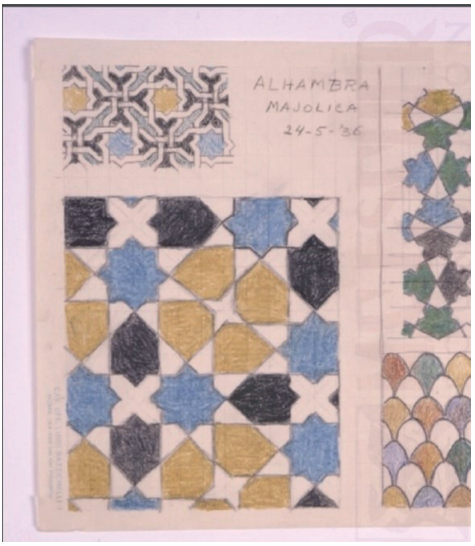

Fig. 2 The etude of the tiles by M. C. Escher

1.1 A Brief History of Generative Art

With the term generativity in the scene of arts, I mean the production of a set of rules defined by an artist, which are both iterative and applicable to different materials or disciplines. We cannot limit generative art to a historical period or a current movement, style, or period. The usage of the term in the present sense is connoting with computers. However, as Professor Philip Galanter (Galanter, 2008, 2022; Paul, 2016) posits the traces of generativity or AI in the domain of the arts are as old as the concept of the art itself.

Because in Galanter's manner, generative art is to operationalize a defined set of rules on different materials, and in Lev Manovich's manner, the pattern of AI as a technique also appears on more mechanical steps of art training, generativity in arts is not a characteristic of the modern world but it is a relation that can be traced back to antiquity.

In this manner, the relationship between M.C. Escher and Islamic geometry is illuminating. This shows us the continuous existence of the attempt to apply a systematic abstract idea in various mediums in history (Paul & Galanter, 2019). M.C. Escher's interest in tessellations started during a trip in Spain to Alhambra. Tessellations were a bunch of mathematical operations cast in an Euclidean plane visualizing a series of his choice of any category, such as birds, reptiles, and dancing clowns (Wieting, 2010).

The symmetrical tessellations of M.C. Escher follow a set of predefined divisive rules, as shown in photo 3. His symmetrical series are iterations of different divisive rules to the Euclidean plane. Each divisive rule establishes a model, which is operable on any selected visual object, such as fish or reptiles.

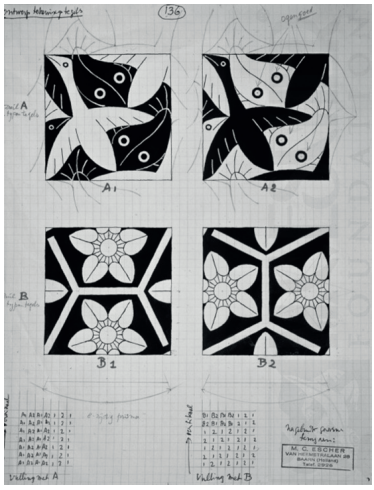

Fig. 3 Tesselation sketch by M.C. Escher

Fig. 4 Tesselation practise by M.C. Escher

With the motivation of breaking "the rules of Euclidian space and Cartesian understanding of spatiotemporality," (Kurt, 2014:163) M.C. Escher has chased infinity as an optical illusion. As Kurt posits, this sense of optical illusion can be defined "either as a potentiality in Aristotelian sense or a hidden, non-obvious presence in actual reality" (2014:162). As Escher

is highly inspired by mathematician Coxeter's article "Crystal Symmetry and its Generalizations", he later developed a method by placing the center of the variations to a center of a circle and then positioning the tessellations following a path repeated of spirals from the inner center of circle to the outer border of the plane. His Circle Limit Series are formulations searching for fitting the infinite iterations on a single plane (Wieting, 2010).

Escher's pursuit of capturing infinity on a flat plane led him to develop algorithms that made his work capable of producing numerous variations, even after his death. These algorithms have inspired contemporary artists to use Escher's methodology, rather than his style, to create new images.

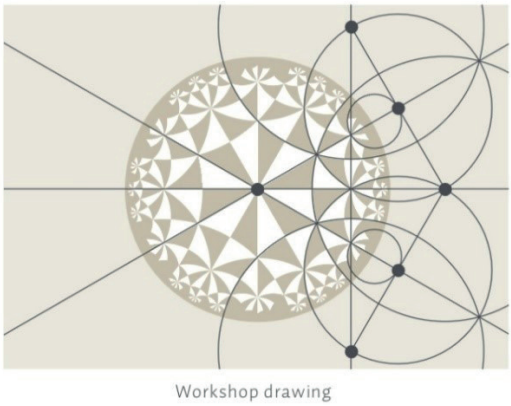

Fig. 5 The geometrical plan offered to M.C. Escher by mathematician Coxeter, illustration from Wieting's article. (Wieting, 2010)

One such artist is Douglas Dunham, who created the SubTile series using Escher's algorithm as a starting point. The SubTile experiment utilizes a modified version of Escher's methodology, generating patterns by repeating and rotating a set of simple geometric shapes similar to Escher's tessellations. However, Dunham's work represents a departure from material to digital since it's made with a computer. (Dunham, 2013.)

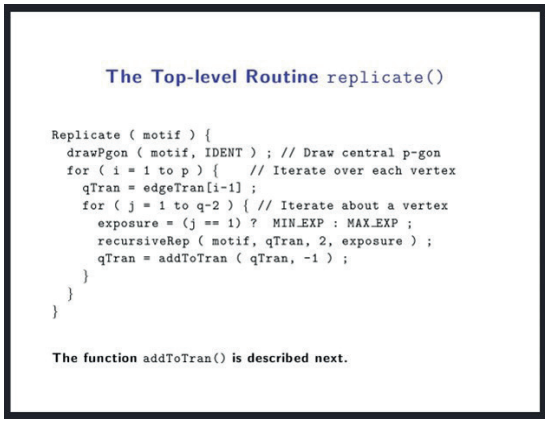

Fig. 6 SubTile Project: The output of Dunham's CG work influenced by Escher (Dunham, 2013)

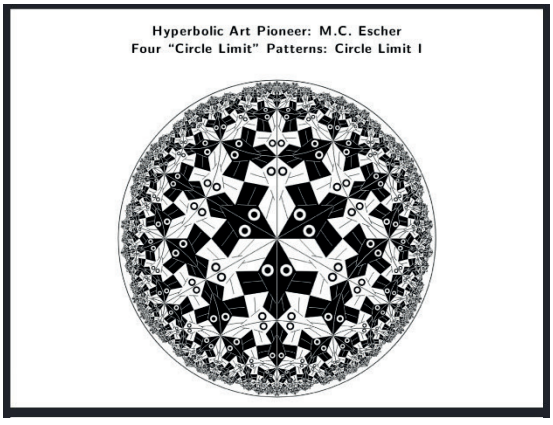

Fig.7 SubTile Project: The codework of Dunham's CG work influenced by Escher (Dunham, 2013)

LeWitt's Drawing Instructions are similar in the manner of endless reproducibility; these instructions aim to create endless authentic works applicable in any place at any time. This series consisted of a set of textual instructions for building the 'artwork'. A team consisting of different people every other time was to interpret these instructions to build the work anywhere. According to Anna Lovatt (2012), LeWitt is inspired by the possibilities of mapping Mallarme's Le Livre (The Book). Mallarme asks his editor to apply a subtle inscription from typography to line spacing, from the book's dimensions to its string.

Mallarme's Le Livre is a series of inscriptions of how the book should be in terms of his search for gathering the form and the meaning together. (Lovatt, 2012) In this case, the book is not only the medium that carries the content in it; the book is the means with its ends.

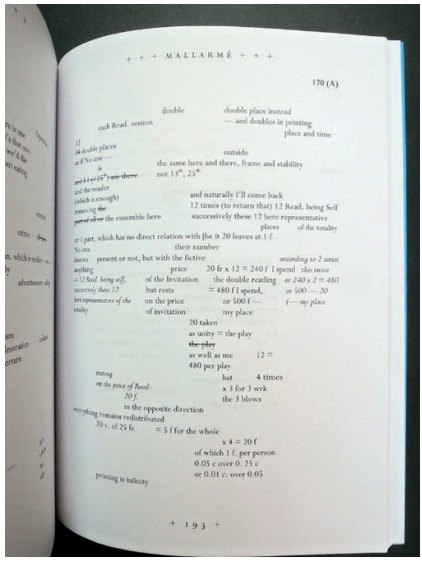

Fig 8 Wall Drawing 118 by Sol LeWitt (LeWitt, n.d.)

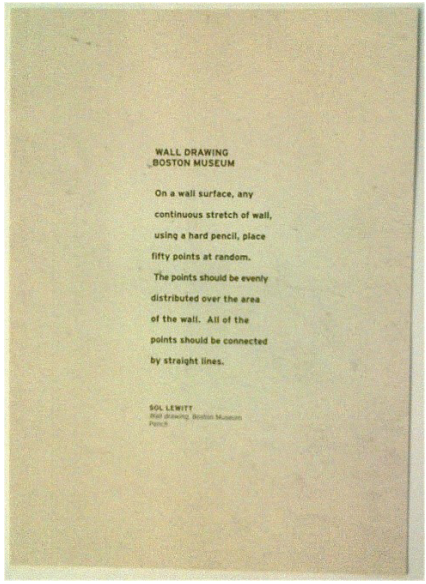

Fig 9 Le Livre by Stephane Mallarme (Mallarme, 2019)

Anna Lovatt (2012) gives us the definition of generativity, without mentioning the concept's name, in her article in which she associates Sol Lewitt's production practice in Drawing Instructions with Mallarme's Le Livre. Although Lovatt does not explicitly use the term, she associates the production practice of Sol Lewitt with Mallarme's Le Livre. She describes it as a "mechanism" or "apparatus" that can be set in motion by an "operator" according to a predetermined plan. This plan is mapped out diagrammatically in copious notes by Sol LeWitt, and the work is executed by assistants in specified locations according to the artist's instructions. Similarly, Mallarme intended his Le Livre to be activated by a team of operators at each "seance" or performance. (Lovatt, 2012)

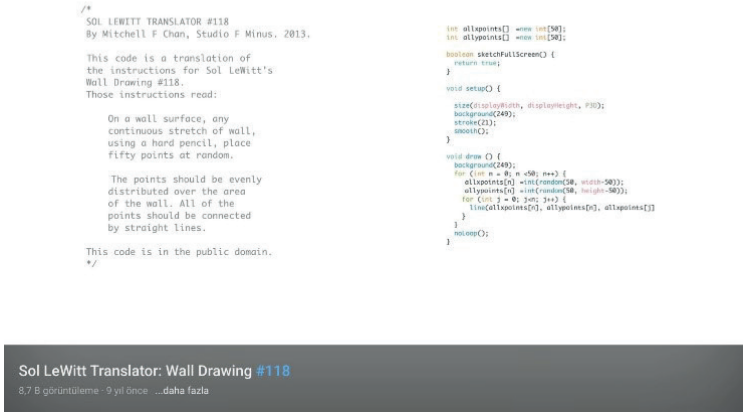

Fig. 10 The codework of Sol LeWitt Translator Project, Wall Drawing 118 (Chan, 2013)

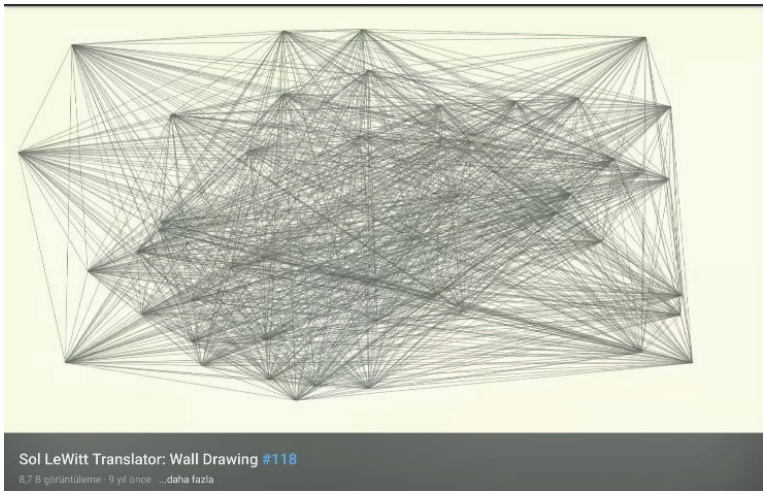

Fig. 11 The output of Sol LeWitt Translator Project, Wall Drawing 118 (Chan, 2013)

The generative approach enables media translations, allowing generativity to transcend traditional art forms and extend into architecture, graphic design, mathematics, and literature because of the systemic approach. Thus, it is not surprising that computers have become integral to the practice of generative art, as they provide artists with the ability to create complex algorithms and generate intricate designs that are difficult to produce manually. (Boden,2021) Neither does the transmedia aspect of the present-day text2image generators. Mitchell Chan's 2012 project, "Sol LeWitt Translator," exemplifies the translation of wall drawings into digital media and the sharing of procedural instructions in code form.

In the 1970s and 1980s, generativity was discussed around computers and thus more widely recognized as an art form by artists such as Harold Cohen. Cohen's program, AARON, was one of the first computer programs to create original artworks, using a combination of algorithms and artificial intelligence to generate abstract drawings and paintings. (McCorduck, 1991)

As a painter, Cohen aimed to transfer the act of painting to a computer program. So as an apparatus with a robotic arm and programmed with a GOHAI (Good Old Fashioned Artificial Intelligence) system, AARON is one of the first examples of Artificial Intelligence art. GOHAI is not like an artificial intelligence system using neural networks as we understand it today but rather a set of expert decision-making rules mimicking a human.

The debates arising around Cohen's creations were mainly about authorship. But as he stated in 1972 to an audience, he declares that the machine "is identified at any given moment by the program it is executing, and since I write the programs for generating drawings, I give the machine its identity. It is doing what I have in mind." (McCorduck, 1991) As he also states clearly with the name of his 2011 exhibition "Collaboration with My Other Self", AARON is the lifelong Project of Cohen, where he transferred what he systematizes from his gaze to a system that does not have eyes but uses an advanced memory to store and generate through Cohen's algorithm. (Cohen, 2011) As Cohen stated, art as an activity was made by the artist to determine what art was to be; in this sense making art with a computer was not different from the usage of another device. Aaron was a computer he programmed to make choices instead of him. This is so like what LeWitt does. Thus, we can capture another aspect of the generativity in art: the artist stands as a catalyst that gives commands in the first place but does not interfere with the process afterward.

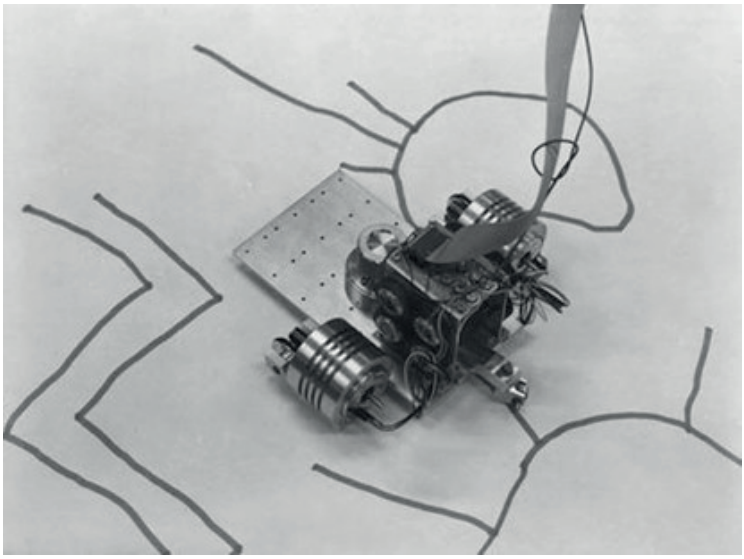

Fig. 12 The 1979 exhibition, Drawings, at SFMOMA, featured this "turtle" robot creating drawings in the gallery. Collection of the Computer History Museum, 102627449. (Cohen, 1979)

1.2 A Model for Generative Art

Generative art in the present day is a term definitive of vast practices of new media. Generative art practices cover everything produced in the context of artwork by an autonomous computer system with the popularization of digital systems such as NFTs in daily language. "Generative models are using an unsupervised learning approach which means that the model is not trained with pre-matched items, but rather the network is fed with an input and then released to find interesting patterns" (Orkunt et al, 2023). I will examine two different taxonomies of generative art to create a model to reveal the artists' relation to the artwork. Philip Galanter and Margaret Boden made these taxonomies, taking the material as a distinguishing character.

German philosopher Max Bense defines generative aesthetics as "Generative aesthetics, therefore, implies a combination of all operations, rules, and theorems which can be used deliberately to produce aesthetic states when applied to a set of materials. Hence generative aesthetics is analogous to generative grammar in so far as it helps to formulate the principles of a grammatical schema." (1971:51) He holds forth in his article that when mathematical aesthetics are considered, the material carrier of the work of art and the aesthetic state achieved by the carrier are distinguished. These

carrier elements are pre-established, and their appearance, distribution, and formation are described in mathematical terms. The elements involve sounds, color, and tones but also meanings that can be deduced from objects, figures, and words. He therefore calls these carriers an aesthetical semanteme. (Bense, 1971)

Following this proposition, Galanter and Boden put forward generative aesthetics not only consisting of computers. However it is an approach to operationalize a defined system in a different set of materials. (Boden & Edmonds, 2019; Galanter, 2022)

Galanter puts forward that the general usage of the term as designating any kind of computer art leads to the exclusion of ethics and the theory of generative art (Galanter, 2022). He emphasizes in his article (2008) that generative art is not a subset of computer art and defines a 'Generative Art Theory' in order to prevent this. Generativity does not describe why art is made or its content; it describes how it is made, just as a method. "Generative art refers to any art practice where the artist uses a system, such as a set of natural language rules, a computer program, a machine, or other procedural invention, which is set into motion with some degree of autonomy contributing to or resulting in a completed work of art" (Galanter, 2022; Paul, 2016). Thus he examines the generative art practices in two branches: material generative art and computer-generated art. Boden's attempt at generative art is very similar to Galanter's. To make a taxonomy, she takes the generative art in a wider sense and suggests that "G-artworks are generated, at least in part, by a process not under the artist's direct control" (Boden, 2019:32). Moreover, "CG-art is produced by leaving a computer program to run by itself, with minimal or zero interference from a human being. The stricter definition of CG-art (art produced by a program left to run by itself, with zero interference from the human artist) was deliberately rejected" (Boden, 2019:32).

In light of these definitions, taking computer-generated art as a subset of generative art, I propose to illustrate the components of generative art in three parts: an aesthetical semanteme that can be studied, an autonomous system, and a creator.

1.1.1 Aesthetical Semanteme

Aesthetical Semanteme plays a significant role in generative art, and it often has a reproductive relationship with the autonomous system used for the operation. As Max Bense (1971) states, when mathematical aesthetics are considered, the material carrier of the work of art and the aesthetic state

achieved by the carrier are distinguished. This distinction is through the system that these material carriers are operationalized through.

This relationship is initiated by the generative command given by the artist, which starts a reproductive cycle where the autonomous system and the aesthetical semanteme constantly react and change each other, creating numerous variations. This cycle can take place differently in real-world possibilities and computer possibilities. In this manner, the aesthetical semanteme may be changed from sound frequencies to corporeal material to vector graphics or primitives. Max Bense calls these units aesthetical semantemes. (Bense, 1971) Compared with traditional art, there stands an empirical operation between the material and the artist, which is the external autonomous device that operates the algorithm created by the artist.

1.1.2 Autonomous System

Philip Galanter (2022) states that an autonomous system is a necessary component of generative art. This autonomous device is not obliged to require free will but instead refers to an automated system that does not require immediate control, such as a robotic system (Paul, 2016). A rule-based art system cannot be considered generative without an autonomous system. This system might range from humans to computers, as we encounter today. For example, in Sol LeWitt's Drawing Instructions, we encounter humans as the practitioners of the algorithm created by the rational reasoning of Sol LeWitt, while in Harold Cohen's AARON, it is the symbolic reasoning that operates the AARON's system and the mechanical arm that helps to create physical results. Thus, autonomous devices may be material and create a human-human interaction through the set of rules designed by the Creator, or these sets of rules also may be operated by computers.

1.1.3 Creator

In her taxonomy of Computer Arts, Margaret Boden states that (Boden & Edmonds, 2019) generative artworks are released by minimal or zero interference from a human being. After setting an algorithm, the Creator leaves the system to run by itself.

Thus, the Creator stands as a catalyst, giving the initial command but not interfering with subsequent choices.

Table 1 Components of a generative system

	Aesthetical Semanteme	Autonomous System	Creator
Sol LeWitt's Drawing Instructions	**Artificial materials of artist's choice**	**Human Facilitator**	**Rational Reasoning**
Harol Cohen's AARON	**Artificial materials of artist's choice**	**Software (AARON)**	**Symbolic reasoning (GOHAI)**

As listed in the table above, Sol LeWitt uses rational reasoning in his Drawing Instructions by setting up commands that are further operationalized by a group of people. "LeWitt's 'operational diagram' functions on the one hand as a statement of authorial intent, and on the other to obviate the need for his presence — having designed a conceptual apparatus, he leaves its implementation to a team of technicians" (Lovatt, 2012). In this manner, he uses artificial materials pre-stated in his command texts that are to be manipulated by human agents liable to conduct the set of rules he created. The relationship between his instructions and the human responsible for operating creates a rhetorical device. (Lovatt, 2012)

On the other hand, in Harold's Cohen AARON, we may see that while the aesthetical semanteme resembles similar, the autonomous system differs. He uses symbolic reasoning to operate the mechanical arm of the AARON.

Conclusion

As a result of this research, we have seen that generative art was used before Bense's theory of information aesthetics. Nevertheless, if we proceed from Bense's proposal for the objectification of the art process, we see that the objectification in question is through the autonomous system between the artist and the work. At this point, without forgetting the function of the autonomous system, when we approach Sol LeWitt's Drawing Instructions, we see that the human body is included as a participant in the work by positioning it as a rules enforcer. This participation is very different from the approach of interactive art that attracts the viewer to be involved in the art process. As a matter of fact, if the generative work is shaped by an objective process between the work and the artist, as Bense suggests, it is necessary to develop a new definition of participant for the people involved in the autonomous system. I think that this model, which observes the relationships cast through generative art in the past, can help the new authorship debate that has been opened through the generative AI models used today.

REFERENCES

Bense, M. (1971). The Projects of Generative Aesthetics. In J. Reichardt (Ed.), Greenwich, Conn., New York Graphic Society (pp. 57–61). https://archive.org/details/cyberneticsartid0000reic/page/n5/mode/2up

Boden, M., & Edmonds, E. (2019). From Fingers to Digits: an artificial aesthetics. Leonardo book series, The MIT Press.

Chan, M. (2013). Sol LeWitt Translator: Wall Drawing #118 - YouTube. Studio F Minus. https://www.youtube.com/watch?v=RDrHHsez3nU

Circle Limit IV (Heaven and Hell) | Museum Escher in The Palace. (n.d.). Retrieved May 30, 2023, from https://www.escherinhetpaleis.nl/escher-today/circle-limit-iv-heaven-and-hell/?lang=en

Cohen, H. (1979). Drawings, SF Moma. SF MoMA. https://computerhistory.org/blog/harold-cohen-and-aaron-a-40-year-collaboration/?key=harold-cohen-and-aaron-a-40-year-collaboration

Cohen, H. (2011, October 28). Gallery @ Calit2 COLLABORATIONS WITH MY OTHER SELF Panel Discussion. The Qualcomm Institute. https://www.youtube.com/watch?v=mACOrxh3YwA

Dorin, A., McCabe, J., McCormack, J., Monro, G., & Whitelaw, M. (2012). A framework for understanding generative art. Digital Creativity, 23(3–4), pp. 239–259. https://doi.org/10.1080/14626268.2012.709940

Dunham, D. (n.d.). SubTile 2013, Marseille An Algorithm to Create Hyperbolic Escher Tilings. (2013). Retrieved May 11, 2023, from https://www.d.umn.edu/~ddunham/subtile13.pdf

Galanter, P. (2008). What is Complexism? Generative Art and the Cultures of Science and the Humanities.

Galanter, P. (2008). What is Complexism? Generative Art and the Cultures of Science and the Humanities.

Galanter, P. (2022). Material Generative Art. V Generative Art Conference GA2022. https://generativeart.com

Kurt, Merve. (2014). Corporeal Experience in Virtual Reality. *Mobility and Fantasy in Visual Culture*, L. Johnson (ed.), pp. 162-166. Routledge.

LeWitt, S. (n.d.). Wall Drawing #118 — Are.na. Retrieved May 16, 2023, from https://www.are.na/block/2790246//

Lovatt, A. (2012). The mechanics of writing: Sol LeWitt, Stéphane Mallarmé and Roland Barthes. Word and Image, 28(4), 374–383. https://doi.org/10.1080/02666286.2012.740187

Mallarme, S. (2019). Le Livre. Princeton University. https://graphicarts.princeton.edu/wp-content/uploads/sites/158/2019/02/mallarme16.jpg

McCorduck, P. (1991). Aaron's code: meta-art, artificial intelligence, and the work of Harold Cohen. W.H. Freeman.

Paul, C. (2016). A Companion to Digital Art.

Turgay, O., Kaptan, M., Öktem Erkartal, P., Demir, T., Doğukanlı, A. Ç. (2023). Interdisciplinary Trajectories: Regenerating Barcelona Pavilion With Midjourney, Interior Architectural Issues Design Theory Philosophy, Livre de Lyon, s. 299-320, ISBN:9782382365557.

Wieting. (2010). Capturing Infinity. *Reed, March*.

https://www.reed.edu/math/wieting/essays/CapturingInfinity.pdf