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SOFTWARE ART AND SENSITIVE CONTINUUM: SPACES OF LATENCY BETWEEN LIVING SYSTEMS

KEYWORDS: DIGITAL ART, VISUALIZATION, THE SENSITIVE, DATA ART, VISUAL ART

PhD Thesis Proposal in Research-Creation.
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ABSTRACT

"If the door to perception were cleansed, then everything would appear to man as it is - infinite." [1]

This thesis evolves from within the field of software art and aims at expanding the possibilities of a sensible perception and consequent sensitive visual manifestation, art development and expression in the production of visual art using algorithmic processes and computer programming.

Art that involves computers, computation, computational logic or its architecture frequently responds to a variety of names: Media Art, Software Art, New Media, Interactive Media, Cybernetic Art, Electronic Art, etc. Digital Art, 'Art Numérique'(French) or 'Arte Digital'(Spanish) make direct reference to the digit, the number, the sign it represents, the place it holds, the digit that transmits and that encapsulates information. Software Art, encloses both, the reference to the digit and the art in the writing of the program. The written code or software, corseted by the boundaries of the machine, becomes the material of art, and it modifies and impacts the creative thought process and the scheme of its production.

The artist Golan Levin, in his essay "Is the computer a Tool?" declares: *"If writing is a medium of thought, then software is an agent of will. When it executes my will, software and I form a single, coextensive unit of thought and purpose. The computer, accordingly, is merely the software's mortal coil."* [2]

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[1][10] William Blake (1793) en Bill Viola, Reasons for Knocking at an Empty House"

[2][5] Golan Levin. Is the Computer a Tool ? Creative Code. John Maeda, editor. Page 140. Thames and Hudson Ltd., 2004

Later he adventures an hypothesis: "*After a quarter of a million years of using language, our brains have actually evolved to accommodate it, and now have several substantial regions that are solely dedicated to processing it. Radical augmentations of human intellect like writing and computation, though much newer than spoken language, stand no less chance of becoming integrated into who we are, if our race survives long enough.*" [3]

Software art that is of interest to this thesis merges 'Fine Arts' and 'Technology' and assumes a dialogue between two different and sometimes opposite methods of research and knowledge production. This cross-discipline permeability, inherent to digital art, is so deeply nourished on the History of Arts, on Critical Aesthetics and on the artist's metier as is on the ideas and engineering of Science and Technology, its history and its evolution.

The project proposes the crafting of drawings, using external numerical data as the source for the formulation of its visual content carefully pursued through a methodical writing and rewriting of software, aiming at reaching a sensible pictorial trace. The process will benefit from a rich visual language of patterns, textures, lines, forms, backgrounds, spaces, tensions and will craft in detail the written code to expand the expressive capacity of the medium. The process involves the recollection of trajectory data and general activity data from communities of social insects: dynamic living systems that articulate multiple and varying physical - chemical - social - and environmental factors. Cross referencing these variables will offer the opportunity for diverse entry points and alternate readings nourishing the options for pictorial expression. This process differs from preceding digital or software art pieces in that it positions its input source separate from the - intuitive or rational- artist's decision, or the generative -random or not- computer capabilities, sustaining a tension between having and not having control over its content. This work stands in line with preceding creative compositions in real time art and artists John CAGE / David TUDOR, Ryoji IKEDA, Miller PUCKETTE, Pierre BOULEZ, David STOUT, Cory METCALF.

Disciplinary theory will strengthen and ground the research. The research will evolve on its aesthetic pursue through the writing of software encased by a perceptual and sensible intention toward the production of visual representations or drawings.

In "The Porcupine and the Car," video artist Bill Viola points at the limitations of our senses. He refers to the philosopher Henri Bergson in such

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[3]Ibid. [5]

a way that he presents the senses as 'limiters' of energy and of the amount of information reaching us at every instance. He points at the camera as embodying a point of view that he names 'point of consciousness', a perceptual place in a space. "One of the most interesting aspects of recording media is how they tell us so much about the way we perceive the world." [4]

Data visualization understood as a 'tool' for artistic research and creative exploration holds the potential for de-naturalizing historic conceptions and fore-thoughts, as it alters the contextual observational space and its meanings, opening up for a renewed experience of seeing, of distinguishing, of evidencing, of re-framing the subject of study. The viewing apparatus and its software behave, then, as an adaptable tool powered by intuition and a sensible after-chase or negative feedback process guiding the execution.

CONCEPTUAL AND THEORETICAL FRAMEWORK

Writings by Wolfgang ERNST "The Delayed Present - Media-Induced Tempor(e)a lities and Techno-traumatic Irritations of "the Contemporary" 2020 [5], "Technologos in Being : Radical Media Archaeology and the Computational Machine" 2022[6] Katherine N. HAYLES "Chaos Bound" 1993[7], "My Mother Was a Computer: Digital Subjects Literary Texts" 2005[8] Lev MANOVICH "Avant-Garde as Software" 1999[9] and "The Language of New Media" 2001[10], "New Media from Borges to HTML" [11], Janet MURRAY "Inventing the Medium" [12] , Donna J. HARAWAY "Manifesto Cyborg" 1983, "Staying with the Trouble," 2016, Jussi PARIKKA "Insect Media: An Archaeology of Animals and Technology" 2010, clarify the contemporary scene of creative computation and facilitate an educated access for framing pioneering art pieces.

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[4][10] (Pg. 59)

[5][1] Wolfgang Ernst "The Delayed Present - Media-Induced Tempor(e)a lities and Techno-traumatic Irritations of "the Contemporary" Sternberg Press, NY 2020.

[6][2] Wolfgang Ernst "Technologos in Being: Radical Media Archaeology and the Computational Machine" Bloomsbury Publishing PLC, NY 2022.

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[12][9] Janet MURRAY "Inventing the Medium" The New Media Reader 2003 Noah Wardrip-Fruin and Montfort Nick, editors, MIT Press Ltd, Cambridge, United States.

Texts of Norman KLEIN "From Vatican to Las Vegas: A History of Special Effects" and "The History of Forgetting" 1997 add to a historical reading of time and space and memory. The various texts gathered under chapter one "The Complex, the Changing, and the Indeterminate" of "The New Media Reader" book edited by Noah Wardrip-Fruin and Nick Montfort present key ideas behind the first computer developments with writings by Alan TURING, Douglas ENGELBART, Ivan SUTHERLAND, Vannevar BUSH, Rot ASCOTT, Norbert WEINER, and others.

Artists journals, art production diaries and workbooks, where artists phrase their intentions and processes of research hold a framework for the practical and theoretical aspect of the art production in this thesis. Writings by Vera MOLNAR who saw in the computer a new medium to expand the expressive capabilities of painting, Bill VIOLA's "Reasons for Knocking at an Empty House" 1995 or The VASULKAS "Vasulkas: Machine Visions" 1978, "Steina and Woody Vasulka Vidéastes. 1969 - 1984: 15 Années d'images Électroniques" 1984, "Buffalo Heads. Media Study,Media Practice, Media Pioneers, 1973 – 1990", 2008 artists who point their interest on poetics, time and perception. Artworks and writings of artists of software Casey REAS, Golan LEVIN, George LEGRADY are central to the interest of these thesis because of their permanent attention to the formal aspects of pictorial language and drawing throughout their software art production. Earlier texts on aesthetics and the sensible experience of the body in space by Jaques Ranciére, Maurice Meleau-Ponty stand also as poignant contributions to this research.

CHRONOLOGY: Art and the Computer. Information Theory. Information Aesthetics

"Video is like a pencil. Art is one of the things you can do with it." John Baldessari [10] Pg.70

The computer first makes its debut in the realm of the arts towards the end of the 1950's after twenty years of having transformed through technological developments from an electronic calculator applied primarily to military purposes (Ex.: ENIAC Electronic Numerical Integrator and Computer, UNIVAC) to a medium that pushes forward conceptual and aesthetic morphogenesis which continues to evolve in the arts to these days.

The first artist to apply the computer to art was Max Mathews. Mathews produced the first synthetic sounds from a calculator towards the end of

the fifties while working as an engineer at Bell Laboratories in New Jersey, USA. An amateur violinist, Mathews is considered today, as the founding father of electronic music. A decade later the computer made its way into the creation of visual arts. In the early 1960's George NEES, Frieder NAKE and Michael NOLL, two German students in mathematics and American engineer, all produced digital printouts of plotted drawings resulting from mathematical procedures. From then on, multiple technological developments accelerated the computer's incremental use within the arts. In 1953 the addition of the cathode ray tube to the Whirlwind system computer at the MIT Massachusetts Institute of Technology allowed for visualization and later on inscription enabled it. Later came the peripherals, the scanner, the plotter, the graphic pad, etc. In 1965, Douglas ENGELBART in a keystone presentation known as the "Mother of all Demos" from the Augmentation Research Center at Stanford University, and in front of an audience of thousand people presented a the NLS System: An online system that allowed for geographically apart communication with a collaborative text editor that included hypertext links. In this historic event, Engelbart also introduced the use of the first mouse.

These innovations revolutionized experimental and creative concepts for artists. A few visual artists begun to experiment with visual productions using technologies, analogue video and digital computer technologies, mixing both old and new techniques. The artwork production of renowned artists Woody and Steina VASULKA exemplified this period of immense visual experimentation and exposed the internal architecture and the logic of the machine through their research.

Key events make evident the official inclusion of computer art into the status quo:

-In 1962 an exhibition opened at the Olivetti Showroom in Milan, Italy, called 'Arte Programmata: Arte Cinetica, Opere Moltiplicate, Opera Aperta.' with a catalog compiled by Humberto ECO who then defined software art as the *'tension between chance and code, between disorder and order.'*

-In 1968 at the Museum of Modern Art in New York, computer art was presented for the first time in "The Machine as Seen at the End of the Mechanical Age" exhibition.

-In London opens Cybernetic Serendipity: The Computer and the Arts exhibition curated by Jasia REICHARDT and sponsored by aesthetic critic Max BENSE.

-In 1970, the exhibition Software organized by Jack BURNHAM in New York invites participants to interact with computers and presents artists Nicholas NEGROFONTE (Architecture Machine Group), John BALDESASARI, Vito ACCONCI and Les LEVINE among others. The exhibition catalog ti-

tled 'Labyrinth' was an interactive text with hyperlinks: The first public exposure of the hyperlink system.

Finally, with the inclusion of computer art at the Venice Biennial that same year the fertile ground for computer arts development's future was forever set.

Artists collaborate with engineers in the generation of altered visuals and sound. The Paik-Abe Video Synthesizer is a good example of this type of collaboration. This collaboration between artist Nam June Paik and engineer Shuya Abe, still holds influence and inspiration for media artists to this day. Repetition, progression, the generation of random or controlled ranges and results, feedback, looping and generative processes are strengths brought by programming and working with computer code. The possibility of connecting external data to audio-visual processes in real time is only made real through the digital medium acting as connector, processor, glue, an infinitely free forming clay or tangible/intangible material.

The process: The algorithm

Performing sequential tasks from an exact list of instructions as a creative procedure linked to mathematical concepts, calculations, geometry or logic can be done with or without a computer. An artist that exemplifies this kind of process is M. C. Escher (Holland, 1898-1972) who produced etchings, woodcuts and lithographs following a mathematical thought process. Many years later artist Sol LEWITT followed a similar process in his work.

"*Artist have known for a long time that the most interesting connections in things involve areas of low, or ambiguous, information, so-called gaps in recognition.*" (Bill Viola pg 67)

Visual artist Vera MOLNAR, who worked alongside of her husband Francois Molnar, an academic researcher in experimental psychology, at the CNRS Centre National de la Recherche Scientifique in France (years 1968-) had access to computing machines. Later on at Université de Paris, in Orsay, she applied a sequential procedure -with out a computer- to her creative production in a process that she liked to call *"machine imaginaire"* a step by step approach that mimics the logic of the computer. Her handmade sketches trans coded via a written program and then digitally printed followed an explicit desire of closely resemble the expressive affect favored by the sensible perception.

Information Theory:

The Shannon–Weaver model of systemic transmission or communication rendered around electronic engineering, was initially published in 1948 under

the title 'A Mathematical Theory of Communication' (*footnote) and explained communication in terms of five basic components: a source, a transmitter, a channel, a receiver, and a destination. Warren WEABER described three types of problems of communication: technical, semantic and effective. In addition, in the text "Cybernetics: Or Control and Communication in the Animal and the Machine" Norbert WIENER declared"*Information is information, not matter or energy.*" Both mathematicians, Shannon and Wiener defined information in terms of entropy, a term borrowed from physics which describes the disorganization or unpredictability of a system (Cite:Guillermet2020) *While they differed in their interpretation of the term, both agreed to define information as a probability function wholly independent from material conditions.*(Cite:Guillermet2020)

'*For information to exist, it must always be instantiated in a medium. ... Conceiving of information as a thing separate from the medium instantiating it is a prior imaginary act that constructs a holistic phenomenon as an information/matter duality.* (*Footnote:N. Katherine HAYLES, How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics. Chicago, 1999)

The breakthrough here is that the message appears cleared of *all* meaning and removed from *any* physical material. This mathematical theory is so fundamentally generic that it does not require the specificity of symbols or characters. The data could as well be text, characters, notes, numbers, images.

Shannon explains in 'A Mathematical Theory of Communication' (C.E. Shannon pg. 54): "*Communication theory is properly concerned, as has been emphasized by Wiener, not with operations on particular functions, but with operations on ensembles of functions. A communication system is designed not for a particular speech function and still less for a sine wave, but for the ensemble of speech functions.*"(footnote Shannon, A Mathematical Theory of Communication) The theory reveals an internal structure that can be applied to all forms of communication regardless of the type or data being transmitted.

Norbert Wiener first accrued the term feedback: a system mechanism in which a certain amount of information is re-entered into the system with the objective of readjusting its aim towards its goal. Feedback is a capacity of complex systems. Wiener is credited as being one of the first to theorize that all intelligent behavior was the result of *feedback mechanisms*, that could possibly be simulated by machines. This was an important early step towards the development of modern artificial intelligence.

The theory of communication rapidly spread across different research disciplines. Begun as a study of communication 'between machines' and ex-

panded to be a study of communication applied to animal and human communication. Arturo ROSENBLUETH, physician and researcher co-wrote together with Wiener "Behavior, Purpose and Teleology' that set the basis for the new science of cybernetics and proposed that 'behavior controlled by negative feedback applied to the animal, to the human or the machine is a deterministic directive factor in nature or in human creations.' This concept impacted in studies of Psychology, Cognitive Science, Epistemology, Linguistics (Ex.: Roman JACOBSON), to name a few.

Information Aesthetics:

"Information needs to undergo a certain amount of analogizing before humans can experience it, a task that today is routinely, and more or less invisibly, performed by interfaces. Information, therefore, not only needs to be "instantiated" in a medium in the general sense, as Hayles contends, but also relies on specific material conditions in order to be perceptually experienced and cognitively processed. This holds important consequences for the visual arts. (Cuote: Guillermet2020)

A new discipline of Information Aesthetics developed independently by French physicist and philosopher Abraham A. MOLES and the German philosopher Max BENSE propose the concept of Aesthetic State. A sort of formal equilibrium between order and disorder in art, a relation between order and complexity: *'In general, the 'aesthetic state' will be considered as a state of order (O) applying to a repertory of material elements of a certain complexity (C).'*(Guillermet2020; Max Bense, "Aesthetics and Programming," in A Little-Known Story about a Move- ment, a Magazine, and the Computer's Arrival in Art: New Tendencies and Bit Inter- national, 1961–1973, ed. Margit Rosen in collaboration with Peter Weibel et al. (Cambridge, MA, 2011), 296. First published as "Aesthetik und Programmier- ung—Aesthetics and Programming," IBM Nachrichten 180 (1966).)

For Moles these structures materialize in the mind, and only exist insofar as they are perceived.('Theorie de l'information et perception esthétique',1958) Moles focus on perception opens new space to think of computer art in terms of information and materiality. Artist Vera MOLNAR blends in her work the immaterial condition of algorithms with the material condition of the hand made mark or trace. In this way she couples the sensible human trace and poetics to the computer generated mark. This is evident in her work Lettres de ma mére 1988, where we perceive the line digitally plotted over the paper to be pictorially rich. In these blue and black ink series over white paper, the graph gets perceived or read as a handwritten paragraph. Molnar plays with the use of certain random parameters in the program vary-

ing the range of 'disorder' within the lines that evidently increase towards the ends of the 'sentences'. As the series progresses, the trace is perceived more fragile, weak, hesitating and trembling, with an end result that accounts for an increased sensible and aesthetic value. This mirrors in a certain sense, the passage of time over the human body, the aging process of vision and motor capabilities, and runs paired with a loss of sense and meaning.

At the birth of the millennium, resulting from an increased access to personal computers and the emergence of new paradigms and conceptions of artistic authorship, numerous artists begun to work with computer languages and programming as their principal creative medium. A lot of artists work collaboratively. Many new computer platforms supporting real time audio visual artistic production become available within large communities of contributors, designers and artists. All of these nourished an expansion in the use of programming and the computer as art material and tool. The open source modular system in C++ language, PureData, MaxMSP first authored by Miller PUCKETTE, engineer and musician, who to this day still develops it together with a large community of contributors, is a first example, a breaking point. Sets a before and after in terms of art impacted by the relationship with the computer. Followed by VVVV, openFrameworks, Processing Development Environment. Just to name some platforms more broadly used by media artists worldwide. All of them count with wide contributing communities that are active in their development, documentation and maintenance.

Data Art and Visualization

Computer programming occupies a central place as a creative tool and artistic language forthcoming new aesthetic, scientific and conceptual mechanisms. The art works constructed from external data collected prior to the creation of the art piece point our attention towards the sensible pictorial expressiveness of some data visualization in the hands of visual artists. Examples of these are On the Origin of Species: The Preservation of Favored Traces (2009), or, Deprocess (2008) by engineer and artist Ben FRY, or Flight Patterns (2005-2008) by visual artist Aaron KOBLIN.

Ai:Artificial Intelligence

Today, pioneer media artists are using artificial intelligence platforms as 'Generative Ai' tools to forward their artistic vision within their practice. A wide toolbox of digital resources get intertwined in the creative process in addition to generative tools including immersive technologies. This evolving

practice engenders new hybrids in matters of authorship, control, collaboration, language, matter, space, reality and truth.

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