Introduction

The present study brings into an encompassing framework many cultural, media, and science fiction theory ideas which I have developed in recent years. The framework that unites and gives coherence to the work is an investigation into the concepts of hypermodernism, hyperreality, and posthumanism. These are three cultural theory concepts of how digital media technologies affect society and the lives of citizens of late capitalism. The book is a project of contributions to selected sub-fields of academic scholarship within each of these three areas.

The book is composed of three parts which are structured in their contents and sequence according to a sense of logical and fluent progression. The titles of the three parts:

- Hyper-Modernism: Digital Media Technologies and Science Fiction (SF)
- Hyperreality: Reevaluation of Jean Baudrillard's Media Theory and the Simulacrum
- Posthumanism: The History of Cybernetics According to N. Katherine Hayles, the Challenge of Creative Coding, and the Future of Informatics

The writing in each section is built on the foundation of three previously published essays. Each essay is revised significantly and expanded from its original version to become a relevant sub-chapter within its section and, in turn, within the framework developed for the overall text. Many new additional pieces of writing are inserted between essays to add to the coherence of the essays' overarching argumentative structure and support the overall movement of the work. The following explanations are based both on the already published essays and on new writing that extends, and makes transitions between, the essays.

The Three Central Hypotheses

Corresponding to the three parts of the book, I formulate three hypotheses related to the three major cultural theory concepts. The hypotheses build on my previous research in these cultural studies fields, formulate what I intend to accomplish in the book as an

overall statement, and lead to a set of conclusions which is the devising of a program for future work.

(1) In the shift from postmodernism to hyper-modernism (which I describe in relation to the ideas of scholars such as John Armitage, Albert Borgmann, and Gilles Lipovetsky[1]), the role that science fiction plays in society has changed and needs to be reevaluated. There is a crucial relationship between the depiction in science fiction narratives of the effects of digital media technologies on the lives of citizens of late capitalism and the advancements in what is often naively called the "real world" of digital media technologies. These technologies, in my view, are largely to be understood through stories and representations. As other literature and media studies scholars have substantiated, science fiction has become and should be academically approached as a formidable "reality"-shaping force. To enable a deeper understanding of the hyper-modern world, the scope of what the knowledge field of science fiction studies investigates should expand beyond novels, films, and TV series to the advanced digital media technologies such as Artificial Intelligence, Virtual Reality, Brain-Computer Interface, ubiquitous computing, robots, etc., as they are designed and applied in business, consumerism, and everyday life.
(2) The concept of the simulacrum/hyperreality (which has a lineage in philosophy) lends itself as a starting point to explore the dynamics of what is often referred to as digital transformation. Yet the concept needs an update and reinvention that considers the technological and socio-cultural implications of digitalization. This reconsideration and modification will foster a new understanding of how advanced digital media technologies shape the increasingly virtual "real," leading to new ideas for an "escape hatch" way out of hyperreality and post-truth.
(3) To escape the mistake of continuing to build onto the foundations of computer science and computer code as they have been, it is desirable to rethink how one looks at and interacts with software code, informatics, and computer science. If one adopts a transdisciplinary, expressive, posthuman viewpoint towards coding, taking as starting point the existing Creative Coding movement, could this lead to changing the paradigm of media in cultural studies and introducing a paradigmatic concept of transdisciplinary code or informatics?

The Logical Progression of the Three Concepts or Hypotheses

The movement in my research from the first to the second to the third parts (or cultural theory concepts or central hypotheses) follows a logical progression of thinking and exigency. In the first of the three phases, I argue and demonstrate that science fiction theory or studies is more than the scrutiny of novels, films, and TV series. The discipline and methodology of SF studies are also a way of illuminating contemporary developments in digital media technologies. SF thinking deserves a more prominent place in the academic system, and in its research agendas and curricula, not so much as a genre, but as an epistemological mode.

From that conclusion of Part One, I arrive at the recognition that my work is about the advancement of a science fictional thinking (i.e., SF as an epistemological mode) to understand the collective cultural "we" existence in a more emphatic sense than the academic acknowledgment or practice of science fiction studies has been heretofore. My goal becomes, at this point, to grow my own system of thinking – as a science fictional thinking – that elucidates the effects that digital media technologies have on society and the lives of citizens of late capitalism. Since I cannot do that *ex nihilo*, I ask myself which system of thinking of which cultural theorist is the best starting point? Who is the most advanced "science fiction thinker?" I have chosen the theory of the simulacrum and hyperreality of Jean Baudrillard.

Baudrillard was a philosopher, sociologist, media theorist, and photographer. His transdisciplinary work was also unclassifiable. He wrote incisively about media and political topics which are highly relevant today: post-truth (the erosion of democratic and scientific consensus about true and false), hate, extremism, Reality TV, war mediated by television and the Internet, and terrorism. In the socio-cultural situation of post-modernism becoming hyper-modernism, codes and models precede and determine everyday life existence. Media culture and VR are, for Baudrillard, "more real than real." The disappearance of reality transpires not via some alleged betrayal of "reality" by virtuality, but through an excess of "reality" unfolding in intensive high graphical resolution. The culture that privileges rhetoric (images and discourse) institutes its own "reality," and the old familiar reality tends to disappear.

Baudrillard also wrote extensively about consumerism, shopping mall architecture, and mass advertising becoming personalized advertising. He delved into the commonality between genetic and informatic codes. He theorized the possibilities for resistance to and transformation of hyperreality with his research into the "symbolic exchange" and gift-economics of the so-called "primitive" cultures studied by ethnographic anthropology. Baudrillard's photography is an example of a radical technological practice that is instructive for the project of Creative Coding. His notions of ambivalence in poetic language and "taking the side of objects" are pertinent to paradigm shifts in the writing of software code.

My approach – following the recommendation of Rex Butler in his book *Jean Baudrillard: The Defense of the Real*[2] – is to go deep into understanding Baudrillard's system of thinking and come to resemble him to then differentiate myself from him, to agree with him to then discover my disagreement with him. I have two key differences from Baudrillard:

(1) I assert that conceptualizing the challenge to the simulacrum and hyperreality is more important than the diagnosis of the simulacrum and hyperreality. This is implicit in my "reading" of the writings of Baudrillard.
(2) I assert that we are now living in the cultural circumstance of digitalization and a society saturated by informatics. Baudrillard in the 1980s-1990s was not positioned to reflect upon this hyper-modern situation.

As the consequence of these two key differences which I have discovered that I have from Baudrillard, I take a logical step to formulating my further research which is Part Three.

The simulacrum and hyperreality are valid and fecund concepts. They allow, for example, to shed light on the urgent problem of "post-truth" and the crisis of democracy. Yet – as a first point – in digitalization, hyperreality is now implemented on a much more micro level of detail by algorithms, AI neural networks, and software code. Hyperreality can no longer poignantly be described as instituted only by the rhetoric of images and persuasive discourses. Second point: since my primary goal is the conceptualization of the challenge to the simulacrum/hyperreality rather than the diagnosis of the simulacrum, I am going to research and look for the challenge to hyperreality in theories and practices of software code. This generates my interest in the Creative Coding movement and the potential of a transformation in what informatics is – from an engineering discipline to a transdisciplinary and creative field.

Accordingly, the conclusion of the book drafts an agenda for the promotion of the ideas of Creative Coding. It calls for:

(1) an engagement of cultural theory and media theory with both the conscious and implicit ideas of the movement of Creative Coding
(2) an engagement of the humanities, the arts, and cultural studies with the practice of Creative Coding
(3) research into how the movement of Creative Coding can change computer science itself – in the latter's core concepts, applications, educational curriculum, and in the definition and profile of who is a programmer
(4) the expansion of informatics from a technical engineering discipline to a transdisciplinary field that includes ideas from art, design, sociology, psychology, philosophy, literature studies, media studies, etc.

At the time of the mid-twentieth century invention of computer science, no one knew that informatics would have such a major impact on all culture and everyday life. Now it is clear that we have become an "informatic society," and a trans-disciplinary informatics that is up to the task of engaging with that is needed.

Part One – Hyper-Modernism: Digital Media Technologies and Science Fiction

In Part One of the book (in "What Is Hyper-Modernism?"), I argue that, in the current historical times of digitalization or the rise of digital media technologies (or the so-called Fourth Industrial Revolution technologies), we are now living in the era of hyper-modernism. Hyper-modernism co-exists with, intensifies, and supersedes postmodernism.

There are two research motivations or starting points for my discussion of the cultural theory concept of hyper-modernism:

First motivation or starting point: Hyper-modernism has as prerequisite an engagement with postmodernism. There is extensive literature in cultural theory and media theory on defining the cultural logic of "late capitalism" or post-World War II Western consumer and media society as postmodernism. Some key academic texts in this area which I will discuss:

- Fredric Jameson, *Postmodernism: The Cultural Logic of Late Capitalism* (1991)
- Jean-François Lyotard, *The Postmodern Condition: A Report on Knowledge* (1979)
- Sonja Yeh, *Anything Goes: Postmoderne Medientheorien im Vergleich* (2013)[3]

Discussions of these canonical texts, with which I am largely in agreement, provide academic contextualization for my take on postmodernism. Postmodern media theory is additionally identified with thinkers such as Jean Baudrillard, Paul Virilio, Michel Foucault, and Donna Haraway. I will summarize the essential features of the cultural situation of postmodernism according to these thinkers. Lyotard, in an exemplary way, considers postmodernism to be the crisis of the "grand narratives" or "meta-narratives" which were predominant in the previous cultural-historical era of modernity – such as Marxism, industrialism, or the Enlightenment idea of linear progress in history.

The aspect of postmodernism that interests me the most is the turn towards the recognition of the crucial role of narratives and fictions in the exercise of power and control in the media-technological society. In the essay "What is Hyper-Modernism?" I enumerate the defining features of hyper-modernism. I also explain that the most important feature for me is that, in hyper-modernism, the power and control exercised via narratives and fictions in the media-technological society now get implemented on a much more intense level of detail via algorithmic-informatic codes and digital, virtual, and cybernetic technologies.

I seek to understand these codes neither from a strictly engineering/technologist perspective nor from a strictly Marxist/critical theory perspective, but rather as discursive articulations which can then be actively and paradigmatically re-coded in culturally transformative Creative Coding projects. Some key academic texts about hyper-modernism which I will discuss are:

- John Armitage, *Machinic Modulations: New Cultural Theory and Technopolitics* (1999)
- Albert Borgmann, *Crossing the Postmodern Divide* (1992)
- Gilles Lipovetsky, *Hypermodern Times* (2004)

Discussions of these canonical texts, with which I am largely in agreement, provide essential academic contextualization for my own perspective on hyper-modernism. These are the chief recognized references in the field.

Second motivation or starting point: Within the scholarly areas of postmodernism and hyper-modernism, I focus on a more specific research question: In the shift from postmodernism to hyper-modernism, what changes occurs in the role that science fiction plays in relation to technology and society? My answers to this question are:

(1) Science fiction is an increasingly important driving force or independent variable that shapes technology and society.
(2) SF narratives (such as *Black Mirror*) offer insightful commentaries on the effects of Fourth Industrial Revolution technologies on society and lives of citizens of late capitalism.[4] As expressions of hyper-modernism, they claim to show the intensely detailed ways that power and control are now exercised via advanced digital and virtual technologies. Yet these "colonizing of life" technologies should not be fixed in

what they are (as these popular SF narratives tend to do) – they can be reframed, re-designed, and re-coded. My emphasis on narrative and Creative Coding facilitates this opening to change.

(3) SF has become a significant mode of academic knowledge, perhaps a candidate for increasingly comparable status with other academic disciplines. Far from being fantastical, SF is a genre of high-definition realism that cultivates knowledge of a set of objects of inquiry which are neither entirely literal nor figurative.[5]

These answers to the research question are articulated in the essays "Mobility and Science Fiction" and "Science Fiction Heterotopia: The Economy of the Future."

Scientists, engineers, programmers, and entrepreneurs in the technology industries constantly recount that they are inspired in their work by their love of SF films, novels, and TV series. In addition, developments in digital media technologies, and in current events in politics and the world, are frequently explained by commentators with reference to SF films. The first lady of Ukraine, in a major speech before the U.S. Congress in Washington, D.C., explained Russia's war in the Ukraine referring to the SF film series *The Hunger Games*.

All of this indicates that a valuable research question for cultural theory is to interrogate the relation between SF narratives and advancements in the so-called "real world" of systems, applications, interfaces, and user experiences of technologies. Informatic society innovations are to be understood not principally as "real," but as figured by representations.

In Part One of the book, I have two essays which bring together the study of science fiction and research on the cultural impact of digital media technologies. This is done in the context of specific sub-areas of technology. Here are the essay titles and brief descriptions (see information about the original publications at the end of this Introduction):

(1) "Mobility and Science Fiction" – The portrayal of the future of mobility and self-driving cars in SF films and developments in the technologies of autonomous driving.

(2) "Science Fiction Heterotopia: The Economy of the Future" – Future post-scarcity, post-capitalist economic systems in science fiction films and the decentralizing potential of the technologies of 3D printers and additive manufacturing; blockchain and distributed ledger technologies; virtual companions; moral algorithms.

I engage with the academic literature of Science Fiction Studies (SFS). Some key texts which I will discuss are:

- Darko Suvin, *Metamorphoses of Science Fiction: On the Poetics and History of a Literary Genre* (1979)
- Istvan Ciscsery-Ronay, Jr., *The Seven Beauties of Science Fiction* (2008)
- Carl Freedman, *Critical Theory and Science Fiction* (2000)
- Angela M. Cirucci and Barry Vacker, eds., *"Black Mirror" and Critical Media Theory* (2018)[6]

These are the principal recognized references in the field. Elaboration of my agreements and disagreements with these canonical texts provides orientation and clarifies the positioning of my own perspective on the field of SFS. I argue for a new direction of thinking in science fiction studies. I argue that SF has matured to become an autonomous worldview and should not be understood only as the expression of the successive stages of "cognitive estrangement" under capitalism, as much of this academic literature does.[7] I make this argument in "Mobility and Science Fiction" and "Science Fiction Heterotopia: The Economy of the Future."

I engage with academic literature on post-capitalism. Some key texts in this area that I will discuss are:

- Murray Bookchin, *Post-Scarcity Anarchism* (1971)
- Yanis Varoufakis, *Another Now: Dispatches from an Alternative Present* (2020)
- André Gorz, *Reclaiming Work: Beyond the Wage-Based Society* (1999)
- Paul Mason, *Post-Capitalism: A Guide to Our Future* (2015)[8]

My discussion of post-capitalism is strengthened by engagement with these canonical texts. These are writings by the most highly regarded authors in the field. They write about the potential of technologies being designed intelligently to enact a post-scarcity, post-capitalist economy. I argue that the potential exists for the digital media technologies of today to be part of this vision, provided they are carefully designed in alternative ways. I argue this in "Science Fiction Heterotopia: The Economy of the Future."

Part One to Part Two: From Hyper-Modernism to Hyperreality

The aspect of postmodernism that I focus on is the role that narratives and fictions play in the exercise of power and control in society. Related to this symbolic turn is the idea that images and words tend to become detached from "the real" which they are intended to represent. The idea of rhetoric as images and discourse is traced back to Plato. In hyper-modernism, the power of rhetoric to shape culture, politics, daily life, and technological existence accelerates with the deployment of advanced digital technologies.

A thinker associated with postmodernism who engaged deeply with these "rhetoric studies" questions about images, discourse, and the crisis of reality was Jean Baudrillard. Baudrillard is most well-known for his media-cultural theory theses about simulation, simulacra, virtuality, and hyperreality. My goal is to think with and after Baudrillard, to bring his ideas into confrontation with the actual situation of digitalization. The concepts of hyper-modernism and hyperreality (the focus of Parts One and Two) can mutually enrich each other.

Part Two – Hyperreality: Reevaluation of Jean Baudrillard's Media Theory and the Simulacrum

In Part Two of the present study (in my essay "Baudrillard's Importance for the Future"), I argue that the system of thinking developed by the philosopher and media theorist Jean Baudrillard can illuminate the current cultural and technological situation of hypermodernism. I unpack Baudrillard's key concepts of the simulacrum and hyperreality.

Baudrillard tells a cultural history of the "five orders of simulacra." I focus on the research question "What is the relevance of the simulacrum and hyperreality to digitalization today?" My answers to this question are expressed as I make descriptions of significant trends in contemporary culture:

(1) There is a definite tendency for everything experienced to become more and more virtual, including direct person-to-person contact. During the COVID-19 pandemic and lockdown, people drastically increased their involvement online.
(2) Experience is moving towards a "Metaverse" where existence will take place inside a Virtual Reality network. VR and AR (Augmented Reality) simulations are on the rise.
(3) There is a crisis of democracy or post-truth engendered by partisan discourse shaped by emotions, ideology, and social media, undermining consensus agreement about facts, truth, and science. Hyperreality provides a deep explanation of post-truth.

All these cultural trends have something to do with an original thing getting substituted and surpassed by its image, semblance, copy, statistical model, or code. They are all reasonably clarified through consideration of the key concept of the simulacrum.

Then I focus on the research question "How can the simulacrum be challenged or transformed?" What is the "escape hatch" way out of hyperreality? My answers:

(1) By engaging in the thought experiment that "everything is simulation," one gains access to strategies for challenging the social-cultural order that are otherwise not visible – strategies of irony, paradox, performance, rewriting the "code" of simulation.
(2) The position that simulation is only a tendency is questionable. The commentator on post-truth invokes "the truth," self-deceptively believing to have thus established an "outside" position to simulation, a mythical exempted location from which to observe it.
(3) Given the increasing importance in hyper-modernism of the informatic codes that implement simulacra and hyperreality on intensified levels of detail, a major arena for challenging the simulacrum becomes the transfiguration of software code and the "hacking" of codes. This situation is shown metaphorically in the SF film *The Matrix*.[9]

These answers to the two above-formulated research questions are articulated in the essays "Baudrillard's Importance for the Future," "Baudrillard and the Situationists," and "Jean Baudrillard and the Donald: Is Trump a Fascist or is He the Parody of Fascism?"

These three essays explore Baudrillard's concepts of the simulacrum and hyperreality. I also revise and reinvent the simulacrum and hyperreality in the context of digitalization or the digital media technologies of today. Here are the essay titles and brief descriptions:

(1) "Baudrillard's Importance for the Future" – I explain my position in the controversy surrounding Baudrillard. I unpack his works *The System of Objects* and *The Consumer Society*. I clarify his concept of symbolic exchange. I enumerate the historical sequence of the five orders of simulacra. I consider Baudrillard's importance for the future.
(2) "Baudrillard and the Situationists" – I compare his concept of simulacra/hyperreality to Guy Debord's "society of the spectacle."[10] I investigate how Baudrillard updated his concepts for the digital era, and Debord's revision of the "integrated spectacle." I look at Situationist post-art activist practices for resisting hyperreality.
(3) "Baudrillard and the Donald: Is Trump a Fascist or is He the Parody of Fascism?" – Hyperreality offers a deep explanation of post-truth and the crisis of democracy.

I engage with several of Baudrillard's major texts:

- *The System of Objects* (1968)
- *The Consumer Society: Myths and Structures* (1970)
- *Symbolic Exchange and Death* (1976)
- *Simulacra and Simulation* (1981)
- *The Ecstasy of Communication* (1987)
- *The Evil Demon of Images* (1987)
- *Carnival and Cannibal* (2008)[11]

I engage with the academic literature of Baudrillard Studies. Some key texts are:

- Rex Butler, *Jean Baudrillard: The Defense of the Real* (1999)
- François L'Yvonnet, ed., *Jean Baudrillard: Cahiers de l'Herne* (French) (2004)
- Brian Gogan, *Jean Baudrillard: The Rhetoric of Symbolic Exchange* (2017)
- Serge Latouche, *Remember Baudrillard* (French) (2019)[12]

I largely agree with the insights of this scholarly literature, although I also articulate some disagreements, which serves to sharpen the profile of my position. My contributions:

(1) Baudrillard was right to say that "everything is simulation" – not because it is empirically true, but because it enables one to conceive of social change in new ways.
(2) One should think with and after Baudrillard, rather than just summarize him.
(3) It is desirable to upgrade Baudrillard's concepts for the situation of advanced digitalization.

I research recent relevant academic literature in Baudrillard Studies, especially works which confront the simulacrum and hyperreality with digitalization, parallel to my work.

I engage with texts of other thinkers who wrote about the simulacrum/hyperreality. In philosophy, I consider Plato and Descartes. This is an essential intellectual-cultural background for my argument. I discuss Guy Debord's Situationist concept of the "society of the spectacle" which deeply influenced Baudrillard's formulation. I comment on other theorists of hyperreality contemporary with Baudrillard, like Daniel J. Boorstin and Umberto Eco, to provide a broader view. Some key texts which I will discuss are:

- Plato, *The Sophist*
- René Descartes, *Meditations on First Philosophy*
- Guy Debord, *Society of the Spectacle* (1967)
- Daniel J. Boorstin, *The Image: A Guide to Pseudo-Events in America* (1962)
- Umberto Eco, *Travels in Hyperreality* (1995)[13]

Part Two to Part Three: From Hyperreality to Post-Humanism and Creative Coding

The challenge to the simulacrum leads to the examination of another contemporary media theorist: N. Katherine Hayles. I recognize in Hayles' work an allied perspective. The project of challenging or transforming the simulacrum switches to ideas about paradigm shifts today in computing or software that go beyond the classic original formulation of computer science. The challenge to hyperreality occurs in the re-coding of simulacra. I bring together ideas from cultural and media theory with the practical movement of Creative Coding.

Hayles is a leading scholar in the current of ideas called posthumanism. In *How We Became Posthuman* (1999), she writes a genealogy of twentieth-century informatics, laying out the framework of the three successive orders of cybernetics.[14] Hayles argues that mid-twentieth-century information theory developed an idea of information that is disembodied. Code is conceived as a formal abstraction of computable or representing numbers which have the pragmatic advantage of being easy to transfer across a telecommunications network or store on any physical storage media. This idea of information or code, Hayles asserts, could be re-thought or changed. An upgraded concept of code could be cultivated – built "on top" of the existing concept – that is re-embodied. This is the starting point to my investigation of Creative Coding and the future of informatics, exploring new concepts and practices of code.

Hayles explicitly calls for projects to transform software code. In Part Three, I study ideas and projects of artists, designers, creative people, and software theorists who practice Creative Coding and contribute to a transformative future of informatics.

My exegesis and extensions of the ideas in *How We Became Posthuman* are short, revised excerpts from Chapter 7 ("Cyborg Spock"), Chapter 8 ("Android Data"), and Chapter 9 ("Becoming Borg – Seven of Nine") of my book *Star Trek: Technologies of Disappearance*. The chapters are about the three orders of cybernetics and their SF representations in *Star Trek*.

Part Three – Posthumanism: N. Katherine Hayles' History of Cybernetics, Creative Coding, and the Future of Informatics

In Part Three (in "Software Code as Expanded Narration" and in brief excerpts from my previously published short book *The Software of the Future*), I proceed through four steps:

(1) I lay out the history and principles of the digital media practitioners' movement of Creative Coding. I pose and answer the question: How can the writing of software code become an expressive media? I explore how Creative Coding is an essential practice within a positive overall post-humanist or post-anthropocentric vision.
(2) What is the relationship of software code as inscription or system of notation to the history and future of writing? Can code regain the qualities of human language such as ambivalence, music-like resonance, embodiment, and poetic modulation?
(3) How do the main theses in the literature of software studies or digital culture studies differ from my hypotheses and conclusions? According to some scholars in that field, there is a "real" of human bodies, affects, and behaviors that get colonized or manipulated by data mining, algorithms, surveillance, and profit-making capitalism. What are my agreements/disagreements with that academic position? One divergence is my differing idea of how resistance to this social-technological system can occur.
(4) What is the difference between code as understood by existing computer science and code as understood by posthuman Creative Coding? Are cultural studies undergoing a knowledge shift from the paradigm of media to a concept of transdisciplinary code or informatics? Can Creative Coding influence the future of computer science as a whole?

In the essays "Software Code as Expanded Narration" and in the revised excerpts from *The Software of the Future*, I enumerate the defining features of Creative Coding. Creative Coding began as a movement of artists and creative people who had the intention of making art and design projects which involve computer technology. I explore the implications of the movement for cultural theory and media theory. Creative Coding demonstrates that informatics changes over time in conjunction with paradigm shifts in culture, and that digital media and culture reciprocally influence each other. Creative Coding initiates the new artistic genres of "generative art" and generative Deep Learning. The co-creation of art and music together with machines points towards a decentering of the human subjects known as "the artist" and "the author" in a way that a postmodern literary theorist like Roland Barthes had earlier envisioned.[15]

Some academic texts in the discussion about Creative Coding that I will consider are:

- D. Fox Harrell, *Phantasmal Media: An Approach to Imagination, Computation, and Expression* (2013)
- Florian Cramer, "Program Code Poetry" (2001) and "Exe.cut[up]?able Statements: The Insistence of Code" (2003)
- Casey Reas and Ben Fry, *Make: Getting Started with Processing* (2015)
- Oliver Bown, *Beyond the Creative Species: Making Machines That Make Art and Music* (2021)[16]

Discussions of these canonical texts on Creative Coding provide contextualization and ideational support for my perspective and argument. In the amended excerpts from my book *The Software of the Future*, based on my International Flusser Lecture, I pursue the idea suggested by the luminary media theorist Vilém Flusser of an intellectual project of connecting the future of software code with the history of human writing. In the present and future there is/will be a hybrid of code and writing.

Every aspiring programmer learns the "discrete logic" of identities and differences in their first computer science course. This discrete logic that enabled the invention of the digital-binary computer by Alan Turing in 1936 in "On Computable Numbers" was based on the idea of a "formal language" that began with Gottlob Frege's *Begriffsschrift* in 1879.[17] Formal languages follow a defined set of rules and effectively suppress many of the properties of human writing and speech. They emphasize the syntactic elements of language and neglect its semantic and semiotic dimensions. What was lost in the mid-twentieth-century invention of computing were the poetic, musical, ambivalent, and resonant qualities of human languages.

Some aspects of discrete logic: all operations of the "software state machine" change voltage in the hardware, manipulate bits, and are stepwise; all variable names and values are different from each other; and each instruction or line of code has an unambiguous meaning.

As the history of programming languages continues in the present and future, and in the spirit of Creative Coding, the province and features of human languages increasingly reappear within code. Human language characteristics extend and redefine what code is.

In the "codework" software poetry of Alan Sondheim, and in generative art live "code performances," code and language interpenetrate. The poetic code becomes executable. Some key texts about software code and the history and future of writing which I will discuss are:

- Camille Paloque-Bergès, *Poétique des codes sur le réseau informatique: une investigation critique* (2006)
- N. Katherine Hayles, *My Mother Was a Computer: Digital Subjects and Literary Texts* (2005)
- Vilém Flusser, *Does Writing Have a Future?* (1987)
- Jean Baudrillard, "The Poetic as the Extermination of Value," in *Symbolic Exchange and Death* (1976)
- Alan Sondheim, "Introduction: Codework" (2001)[18]

Discussions of these canonical texts about software code in relation to the history and future of writing provide contextualization and support for my own perspective and argument.

A major tendency in the academic fields of software studies and digital culture studies is a Marxist-oriented or "critical theory" approach to describing "platform capitalism" and the supremacy of Big Data, neural network Deep Learning Artificial Intelligence, and algorithms. For these authors, the sovereignty of human subjects, identities, bodies, emotions, and actions gets violated, manipulated, and colonized by maleficent ubiquitous processes of automation, control, and commercialization. I agree that harmful pro-

cesses of power, control, and capitalist profit-making are taking place with the algorithmic-informatic codes. Yet from my perspective, what this academic tendency leaves out is that the processes of power and control are at the same time processes of virtualization. Once existence takes place the realm of the online, the virtual, post-truth, and the Metaverse, there is no going back to some posited previously existing "real."

I have nothing against the liberal news media, left-political journalists, scientists, and critical theory academics continuing with their strategies of bringing attention to "the real," the truth, the facts, and the alleged "non-alienated" or "natural" self. On the contrary, those are valuable efforts. Yet I seek to develop new strategies of resistance to the hegemonic systems of social and technological control. In the twentieth-century science of the Copenhagen interpretation of quantum physics, Werner Heisenberg and Niels Bohr each brought attention to the "observer effect" of the disturbance by the act of observation of what can scientifically be known about the "reality" of a system.[19] The observer is part of the system. There is no scientific "outside position" from which to observe a system without distorting its information. The liberal news media and the "critical theorists" are part of the simulacrum. Resistance to digital assemblages should be sought more from re-coding and performances inside the system. This is a point of departure towards discovering new forms of critically interrogating digitalization.

Some texts of software and digital culture studies taking the "critical theory" position which I will discuss are:

- Shoshana Zuboff, *The Age of Surveillance Capitalism* (2019)
- Adam Greenfeld, *Radical Technologies: The Design of Everyday Life* (2017)[20]

Some academic texts in the field which are somewhat closer to my own position which I will discuss are:

- Geoff Cox and Alex McLean, *Speaking Code: Coding as Aesthetic and Political Expression* (2012)
- Armin Nassehi, *Muster: Theorie der Digitalen Gesellschaft* (2019)[21]

By explicating my agreements and disagreements with these landmark authors, I add nuances to my own position and elaborate additional theses for my cultural theory research.

Low-level programming languages such as machine language, assembler, and procedural-functional languages are "close to the machine." They operate in combinatorial ways on voltages and bits. The software layer is the translation between human and machine language. This circumstance of translation renders code sovereign from hardware-level bit-manipulation. Object-oriented (OO) programming languages such as C++, C#, and Java consciously imitate human language. They are languages of modeling, simulation, and virtualization that replicate so-called real-world processes and environments (from banking applications to games and "virtual worlds") in software. The object-oriented design, which identifies the nouns or "classes" or "objects" in the given problem domain, and the verbs or process-relations between the objects, is already, in a sense,

the code. Software design – an instance of human language – plays an increasingly important role in software coding.

OO programming languages assume the existence of so-called "real world" processes. Software development sets itself the task of modeling these processes in virtual spaces. The alleged "real world" is the realm of simulacra and simulation. Modeling what one believes to be real-world processes which are simulations is practicing the simulation of a simulation.

Hayles suggests that we are moving beyond the binary logic of identity and difference to a complex and embodied tension between those two terms. The binary code of intelligent machines is evolving towards resembling the resonant language of intelligent humans.

Aside from Kate Hayles, there is no existing academic literature on how the innovations of Creative Coding will influence the futures of media/cultural theory and computer science.

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- German version: "Mobilität und Science-Fiction," in Sabine Foraita and Andreas Schulz, eds., *Design und Mobilität: Wie werden wir bewegt sein?* (Hildesheim Hochschule für Angewandte Wissenschaft und Kunst and Fruehwerk Verlag, 2019); pp.92-117.
- "Science Fiction Heterotopia: The Economy of the Future," in Marion Digel, Sebastian Goldschmidtböing, and Sibylle Peters, eds, *Searching for Heterotopia: Andere Räume Gestalten* (Folkwang Universität der Künste and adocs Verlag, 2019); pp.142-153.
- "What is Hyper-Modernism?" in *Transdisziplinäre Gestaltung: Essays der Folkwang Universität der Künste* (Vienna: Passagen Verlag, 2017); pp.253-263.
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- "Software Code as Expanded Narration," in Bernd Kracke and Marc Ries, eds., *Expanded Narration. Das Neue Erzählen* (Hochschule für Gestaltung Offenbach, Frankfurt Biennale des Bewegten Bildes and transcript Verlag, 2013); pp.369-384.
- *Die Software der Zukunft, oder: Das Modell geht der Realität voraus* (trans. Marcel Marburger) (Universität der Künste Berlin and Walther König Verlag, 2014). International Flusser Lectures, 64 pages.