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# Do Computers Write on Electric Screens?

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How do we, humans, communicate with computers, or computational machines? What are the activities do humans and machines share, what are the meeting points between the two? Eventually, how can we build concepts of these meeting points that leaves space for the proper mode of existence of both humans and machines, without subduing one to the other?

Computers are machines that operates on a scale different from humans: the calculus done by machines is too fast and untangible for humans. This is why computers' activities has to be textualized, put into a form that can be understand for humans. For instance into a graphical interface, or a command line. More generally, this article tackles the problem of interface between humans and machines, the way the relation between humans and machines has been conceptualized. It is inspired both by philosophy of the modes of existence – since computers are machines with their own mode of existence – and semiotics, since computers' activities have to be converted in some sort of signs that can be read by humans.

First, inspired by Gilbert Simondon, we try to understand the mode of existence of computational machines. By commenting on Turing 1936's seminal article, *On Computable Numbers*, we show that computational machines are at their core writing machines. But a writing based on calculus, different from the human way of writing. Writing can therefore be understood as a meeting point for humans and machines, provided we give a definition of writing that is large enough to include both humans and machines. Secondly, we examine theories that deals with the relationship between the two, mostly english-speaking theorists of interface (Manovich, Galloway) compared to french semiotics of *"les écrits d'écran"* ("written writing screens"). We show that both approaches share an anthropocentric conception of machines and/or writing, making the machine a mere instrument fulfilling human needs. Eventually, we propose some elements towards a non-anthropocentric semiotics, by focusing on the notions of interpretation and the spatiality of writing. This non-anthropocentric semiotics is the first step towards a semiotics that would make room

for the mode of existence of computational machines, enabling us to renew the way we think our relationship to them.

**Keywords:** semiotics, digital media, writing, anthropocentrism

## I. Introduction

How does one communicate with *computational machines*, those technical objects that function by means of binary calculations integrated into a piece of electronic machinery? How do human beings interact with machines that execute instructions inscribed on a surface of less than $100mm^2$ in a few fractions of a microsecond? The problem is that humans do not have a perceptual apparatus capable of handling this spatio-temporal scale: we are unable to deal with the difference between 0 and 5 volts. However, for the machine, this difference is highly significant since it is the basis of the binary code that organises the way it stores and handles data.

For humans and machines to meet, bridges have to be built between their different requirements. "Interfaces", or mediating texts such as source codes and "architexts" – to use a term invented by a whole section of French media theory – do constitute bridges of a sort. However, these notions tend to mask the technical reality of the machines, because they are organized around an anthropocentric understanding of *writing*. Is it not true that "interfaces" give rise to an organisation of signs that are meaningful to humans, i.e. texts? Source codes and other architexts can be effective at the machine level; but in the final analysis, surely their purpose is to produce texts that are readable and meaningful to humans? In other words, how can we conceptualize the bridges between humans and machines without subordinating the one to the other? How can we make each of the two realities exist in itself, which is the pre-condition for exploring the possibility of their interrelationship? How can we find common ground, a common meeting-point, from which to make the differences between these two realities explicit, and what could this meeting-point be?

We suggest that the common ground might be found in *writing.* Computational machines are in fact writing machines. Not only because they are instruments with which human beings can write, but because their own functioning depends on a certain kind of writing, writing that does not correspond to the same requirements as human writing. The point is that binary writing, which obeys the rules of elementary arithmetic and Boolean logic, does not conform to the same constraints as the alphabetic writing of humans. In other words, the writing of these machines is quite different in nature to the writing of humans. We have called the writing of these machines *computational writing* and the writing of humans *textual writing*. It is important to identify the specificity of each of these two kinds of writing in order to understand digital media not only as a regime of human meaning, but as a place where humans and machines meet, and which we must learn to understand as fundamentally hybrid. This is why we are calling for a new kind of non-anthropocentric semiotics, and giving some pointers here towards its development.

First, we will try to explain why computational machines can properly be understood as writing machines. This will involve developing a concept of "writing" that is not anthropocentric, and understanding – like Turing – that these machines function based on a form of writing, and how they do so. Our second aim will then be to show that the theories that have attempted to conceptualize interactions between humans and machines, without the benefit of the notion of computational writing, end up by evacuating the computational machines themselves from the relationship they are attempting to characterize. Thus, theories constructed around the idea of interface, of software, or - in Continental theories - the concepts of "screens-as-writing" *(écrits d'écran*) and "architext" (*architexte*)[1], are all based on anthropocentric presuppositions concerning writing and thus run the risk of neglecting the activity of the actual machine in the implementation of digital media. These theories tend to promote an instrumental conception of these machines in which, because they are considered merely as means to human ends, they are either relegated to the role of perfect executors of programmes written by humans, or else understood as crystallizing human values and extensions of power relationships – both symbolic and economic. Our third goal is to describe the specificities of the computational writing performed by machines, in order to open up the possibility of developing a non-anthropocentric type of semiotics that would help to describe the role of computational machines in the reality of computerized media *in their own terms*: in other words, to accept that the machines themselves contribute to the culture and the new world that we now share with them.

## II. Computational machines as writing machines

The basis for characterizing computational machines as writing machines is an article by Alan Turing, *On Computable Numbers*[2]. This article is crucial, not only because it makes an important contribution to resolving a problem in logic known as the *Entscheidungsproblem* (decision problem), but above all because it is without a doubt one of the most important texts in the history of computer science. In 1936, Turing produced the theoretical model of what is today called a "computer", a model that was taken up by Von Neumann and his colleagues in their *First Draft of a Report on the EDVAC*[3], where they specify the material organisation of such a machine: this is the famous "Von Neumann architecture".

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[1]Yves Jeanneret and Emmanuël Souchier, "Pour une poétique de l'écrit d'écran," *Xoana* 6 (1999).

[2] Alan Turing, "On computable numbers, with an application to the *entscheidungsproblem," Proceedings of the London Mathematical Society* 42/2 (1936).

[3] John Von Neumann, "First draft of a report on the EDVAC," *IEEE Annals of the History of Computing* 15/4 (1993 [1945]).

The ideas advanced in Turing's text are still entirely valid and operational in contemporary computer science, which is why this text is truly foundational and why it is well worth taking a closer look at it.

In 1936, Alan Matheson Turing, then a student at King's College Cambridge, wrote an article on the *Entscheidungsproblem*, a problem in logic that was first posed by Hilbert and Ackermann in 1928. In order to answer the question, Turing imagined a machine made up of a tape divided into squares and a mobile head that would move along a horizontal axis, either to the right or to the left of the tape. The head would scan the squares; it would also print, or delete, symbols on the current square. According to Turing, this machine would be able to solve the axiom of choice problem, since it would calculate anything that is algorithmically calculable.

In his attempt to resolve the *Entscheidungsproblem* posed by Hilbert and Ackermann, Turing begins by explaining that it is first necessary to define what is meant by a "calculable number": it is a number "whose decimal form can be written down by a machine". In Turing's formulation there is thus a clear proximity between writing and calculation. However, it is important to understand that this is writing of a very specific kind. For the machine to be able to calculate, it must be provided with a tape "analogous to paper", divided into squares "like a child's arithmetic book", and on which it can "write down" symbols. These symbols are either of the first order, i.e. numbers which in the event are made up purely of 0's and 1's; or of the second order, for example a letter "A" which can replace a given sequence of numbers. The machine can be considered as a "calculating machine" when it can manipulate the two orders of symbols, and not just first-order symbols. The machine is thus finite because all its operations (movements of the head, inscription or deletion of symbols) are determined by its internal configurations, which are limited: the behaviour of the machine can thus be programmed. But the machine is also finite in the sense that it is entirely automatic: it has no need, in order to function, for any external intervention (human or other) – provided that the set of all possible configurations has been described correctly, i.e. that it has been correctly programmed.

Nevertheless, although writing and calculating are almost synonymous, it is interesting to note that Turing never says that his machine "reads", nor that it "writes". He explains that the machine *scans*, and that it can only work on the symbol that it is currently scanning: "the scanned symbol is the only one of which the machine is, so to speak, 'directly aware'"[4]. In other words, the machine has no memory. But the machine does "interpret": for each symbol that it scans, there is a precise operation which it must perform. The machine thus acts according to

[4] Turing, "On Computable Numbers," 236.

what it has scanned. To "scan" is to detect by moving the reading head along the tape, i.e. it is a form of "reading" which is one-dimensional – to the left or to the right. Similarly, the machine does not really "write" either; Turing says that it "notes" or "writes down" or "prints" symbols. The mathematician structures his argument around an *analogy* between the machine and a human being: "we may compare a man in the process of computing a real number to a machine which is only capable of a finite number of conditions"; "Computing is normally done by writing certain symbols on paper. We may suppose that this paper is divided into squares like a child's arithmetic book*"*[5]*;* a tape which is "analogous to paper". But he takes care not to cross the boundary that would attribute human behaviour to the machine.

Rather than contributing to the myth of the human machine, Turing contributes instead to a mechanical reduction of the human, but one which is provisional. Turing does indeed need to model and formalize human reasoning so that calculation can then become automatic. The analogy between the operations of humans and those of machines thus tends more towards a limited reduction of the human to the mechanical, rather than elevating the machine to the level of human intelligence. He does not seek to make the entire range of human intellectual operations mechanical, only calculation. It must not be forgotten that when he refers to a "computer", he is not designating the machines that we call "computers" today, but rather the human employees whose work consists of carrying out various sorts of calculations: statistical, accounting, etc. The Turing machine is thus a logical formalization of the task of human calculators. In paragraph 9, where he formalizes human reasoning and then evokes the possibility of mechanizing it, he ends up by establishing an analogy between these very specific intellectual operations performed by humans and mechanical operations. Human calculation, he explains, is based on two essential operations. Firstly, it consists of the writing of a finite set of symbols on paper, often squared[6]. Secondly, the human calculator then acts according to the symbols that s/he sees, but also according to his or her "state of mind" on the spur of the moment. While it is possible for the "states of mind" to vary, the number of different states of mind that are possible cannot be infinite – otherwise, here again, no discrimination would be possible. Secondly, after the system of signs come the "elementary operations" of the human calculator: either the writing of a new sign on the square currently observed, or else observing a new square – each time with or without a change in the state of mind. When human calculation is

[5] Turing, "On Computable Numbers," 231.

[6] The symbols must be limited in number, otherwise it may not be possible to *tell at glance* the difference between two inscriptions, for example between 99999999 and 9999999

formalized in this way, it can then be made automatic: "We may now construct a machine to do the work of this computer"[7]. At this point, Turing gives the details of this automation. It is here that he describes most closely the analogy between the human and the machine: to the "state of mind" of the calculator corresponds a "configuration" of the reading-head of the machine; to the squares that are "observed" by the calculator correspond the squares "scanned" by the machine; to the "changes" done by the calculator correspond the "moves" of the machine. These mechanical "moves" and human "changes" are always strictly determined, respectively by the configuration of the reading-head and by the "state of mind" accompanying the square under observation. If we follow Turing, every calculation can be brought down to operations of writing symbols, of reading (observation or scanning, according to whether the operator is a human or a machine), and modifications of states.

What is at issue in this text is the construction of a relationship between a human being and a machine – a relationship built upon writing. To be able to conceive his automaton, Turing has to proceed to a mechanical reduction of the human. The human-machine relationship is then of the order of an analogy. But what is interesting is that once the machine has been conceived and described, the relationship is no longer analogical: the human and the machine do not do the same things, they are different. The human is not a machine and the machine is not a human. It is true that they have something in common, i.e. a certain form of writing. This is the place where their relationship is made explicit. But this relationship is nevertheless strongly differentiated, in the sense that humans and machines do not use the same sort of writing. The writing of humans is of the order of what we propose to call *textual writing*, whereas that of machines is of the order of *computational writing.*

Before we attempt to characterize these two orders of writing, in what sense can we really say that a machine "writes"? To do so, we have to adopt a technical conception of writing: "writing", in this sense, is *inscribing signs on a substrate*. An "inscription" here is to be understood in the sense of a material alteration, circumscribed to a specific space and not resulting from chance. An "inscription" in this sense does indeed follow a set of rules which prescribe a finite set of possible alterations: the French alphabet, for example, or a binary language. But inscriptions thus defined are not yet signs; in order to become signs, they must: i) designate something other than what they are materially[8]; and

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[7] Turing, "On Computable Numbers," 247.

[8] Following the model of Ferdinand de Saussure (Ferdinand de Saussure, *Cours de Linguistique Générale*. Paris: Payot, 1916), a sign is made of a signifier and a signified. The relationship between the two is arbitrary, meaning there is no direct connection between the letter of a word or a picture and what it represents. This relationship is

ii) they must be "read", i.e. they must be recognized as meaningful alterations and interpreted as "referring to something else". We are indeed dealing with signs when, for example, the letter "A" represents a sound in a human language; or when an "0" is an electromagnetic alteration which expresses the absence of value, or the logical value of "false" when the interpretation is made according to the principles of Boolean logic. In order to become a sign, an inscription thus requires an act of reading and interpretation.

This three-part definition of writing as the *inscription* of *signs* on a *substrate* is not anthropocentric, in the sense that it does not immediately consider writing as the exclusive privilege of humans. It also has the advantage of being sufficiently broad to include a wide variety of practices from different historical and cultural contexts. For example, the Roman soothsayer, who circumscribed a region of the sky in order to observe the trajectories of birds and thereby elucidate the favours of the gods, practiced writing; so does the journalist who composes an editorial for the upcoming edition of the newspaper for which he works; and the same goes for a machine which scans symbols and adjusts its behaviour accordingly.

However, this definition has its drawbacks. It is too general and doesn't take the context of writing into account: it considers a practice (writing) without any regard for its social, historical or cultural context. Therefore, it is hard to see what might *not* be considered as a piece of writing. What is certain is that a writing practice does not rely exclusively on know-how, on the mastering of a specific technique. It also relies on mental representations of writing, and the status it has in a given society. The same invention – writing considered as the inscription of symbols on a substrate – has very different implications when it is used as a memorandum for shamanic incantations in Native American tribes[9] or when it becomes the central tool for the domination of a social caste in ancient Mesopotamia[10]. The same can be said about writing applied to computers. As Annette Vee put it, digital literacy is not only a matter of mastering a certain kind

based on a convention. If the relationship is arbitrary, this implies that a signifier (for instance the letters that form the word "computer") signifies something different (a computational machine) to what it is materially: a string of letters.

[9] Pierre Déléage, *Inventer l'écriture. Rituels chamaniques Rituels prophétiques et chamaniques des Indiens d'Amérique du Nord, XVII^e^-XIX^e^ siècles* (Paris: Les Belles Lettres, 2013).

[10] Jean-Jacques Glassner, *Écrire à Sumer. L'invention du cunéiforme* (Paris: Le Seuil, 2000).

of knowledge, i.e. programming. Literacy is an issue in societies that emphasise and value its mastery[11].

But the question of digital literacy, as formulated by Vee, is relevant on another level. Programming is writing *for* the machine, designed to make the machine follow instructions. These instructions have to be readable for the machine but also for humans. In this case, context is of primary importance and programming cannot be reduced to mere instructions to a machine. Recent work shows that computer code is not just a set of instructions for a machine. Also discernible in computer code are the marks of the context in which it was produced[12]. It obeys a visual rhetoric – indents, layout design, comments, etc. – that make it readable for humans[13]. It is also rooted in professional environments and job markets where the economic and symbolic stakes are high[14] and which influence the way developers write software.

Our question, however, is different. Our aim is to understand the writing *of* the machine, in other words to find out whether the activity of the machine can be qualified as "writing" and what the implications of this would be. By arguing, as Turing does, that a computational machine is a writing machine, we are making a strategic move. But it is strategic only because we live in a society where writing, as well as reading, has great symbolic importance[15]. Saying that something like a computer "writes" is therefore a way of promoting it to the status of "those who matter" in the symbolic order of humans. To qualify the activity of computational machines as "writing" is to use the symbolic value of writing to make room for machines in our contemporary "scriptural economy"[16], and therefore to lay the grounds for acknowledging these non-human entities not as tools or instruments for humans, but as entities with their own way of doing what they do.

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[11] Annette Vee, "Understanding Computer Programming as a Literacy," *Literacy in Composition Studies* 1/2 (2013): 45.

[12] Tania Bucher, "Objects of intense feeling: the case of the Twitter API," *Computationnal Culture* 3 (Online publication, 2013). Available online: http://computationalculture.net/article/objects-of-intense-feeling-the-case-of-the-twitter-api

[13] Joanna Pomian and Emmanuël Souchier, "Informatique et pratiques écrivantes," *Traverses* 43 (1988).

[14] Adrian MacKenzie, "The Performativity of code: software and cultures of circulation," *Theory, Culture & Society* 22/1 (2005).

[15] Roger Chartier, *The Order of Books* (Stanford: Stanford University Press, 1994).

[16] Michel De Certeau, L'invention du quotidien. Tome I: Arts de Faire (Paris: Gallimard, 1990).

For machines to be understood as "writing" machines, we have to provide a minimal definition of writing. The above definition fails to address the problem of context, but it is of great interest nevertheless, because it allows machines to enter the cultural and symbolic order of writing. This is a necessary, though insufficient, step towards understanding the polyphony that is consubstantial to texts in general and to digital texts in particular.

To bring our focus back to the machine, it is fully included in this tripartite definition of writing. Firstly, it is certainly dealing with a finite set of symbols: the first-order symbols consisting of 0's and 1's, as well as the second-order symbols which are instructions – whether in hexadecimal form or in an assembly language. These characters are symbols because they call for an interpretation, in that they designate something other than what they are themselves: they are not only the decimal form of a computable number, because they lead the machine to adopt another state, another "configuration". Secondly, the "writing" is certainly a form of inscription. These symbols are indeed inscribed by the machine itself, which has the capacity to note down or to obliterate symbols. Thirdly, these symbols are definitely inscribed on a substrate: a hard disk, or the strip of paper in the Turing machine.

To be able to assert that the Turing machine is a writing-machine, we therefore have to postulate that writing is an inscribing operation that modifies a substrate, and an operation of elementary manipulation of symbols. This definition of "writing" is technical – "logistic" as Yves Jeanneret would say when he opposes the "material dimension of the circulation of texts" to the semiotic or poetic dimension of the interpretation of those texts[17]. It is technical, and not symbolic, which is doubtless the reason why Turing takes care to refrain from using the terms of "writing" or "reading" when referring to the activity of his machine: the machine neither writes nor reads in the same way as a human being.

If we kept the term "writing", which Turing abstained from doing, this is mainly for two reasons. First, keeping the term "writing" to characterize the activity of machines makes it possible to avoid excluding them from the realm of culture in the name of a human monopoly over the act of interpretation – an exclusion which is "the strongest cause of alienation in the contemporary world", according to Simondon. Now such a monopoly is explicitly or implicitly at work in a great many studies on communication between humans mediated by machines, as is the case for theories that centre on the notions of interface, source code, software and architext. These theories are not without interest, but – being anthropocentric – they focus exclusively on interpersonal communication between

[17] Yves Jeanneret, *Critique de la trivialité. Les médiations de la communication, enjeu de pouvoir* (Paris: Non Standard, 2014), 11.

humans via machines, and not on communication between machines or on communication between humans and machines. Why? Because they tend to evacuate computational activity from the materiality of digital media by subordinating it to a scheme which is anthropological and instrumental: sometimes these machines are considered purely as a means to human ends, sometimes as perfect executors of programmes written by humans, and sometimes as crystallizing human values or as extensions of economic and symbolic power relationships. In other words, because these theories lack the concept of computational writing, they subordinate the computational activities of machines to the regime of textual writing – which amounts to denying the existence of computational writing. We will make a closer examination of the evacuation of machines, first by *French media theory*, and then by theories that focus on the notion of interface.

## III. Humans without machines: anthropocentric perspectives on writing in digital media theories

### French media theory

The French media theory known as "*les écrits d'écran*" ("screens-as-writing")[18], although it obviously takes an interest in digital media, is not a theory of the machine; instead, it posits a type of relationship between humans and machines that we shall now question. This theory is indeed centred on writing, but on textual writing, and it has therefore helped to spread anthropocentric representations of the machine that end up ignoring the machine itself. Our aim is not to criticize this anthropocentric view as such, but rather to understand the underlying notion of writing that makes this anthropocentric interpretation possible.

The initial concepts of the screens-as-writing theory were developed by Yves Jeanneret, Emmanuël Souchier and their colleagues. They were interested in the circuits that writing moves through and – in the case of digital media – in what made it possible for a text to be displayed before the eyes of a reader. According

[18] A word-for-word rendering in English of the French term "*écrits d'écran*" could be "writings *made by*, *for* and *on* a screen". Emmanuël Souchier first coined the term in 1996 to emphasise the written nature of digital media. It was also a way of legitimizing semiotics as a valid method to analyze software, web pages etc., since these objects are considered as texts in this theory. Not only are computers based on writing, they also produce written objects. This is why we have chosen to translate "*écrits d'écran*" as screens-as-writing. Digital media obviously include a visual and pictorial component (the screen, where the interface appears), but they are above all a product of writing and allow users themselves to write ("writing").

to them, screens are also texts, and so there is no reason to oppose screens to books: "contemporary writing happens in a new space, which is the screen. It is therefore not appropriate to oppose "writing" to "the screen", as has been done too often; on the contrary, the two terms need to be considered in a coherent fashion, emphasizing that they henceforth belong to a new stage in the historical development of writing: "screens-as-writing"[19]. If we follow the reasoning of these authors, since writing is branching out into a new form of development, what is important is to understand what makes it possible to display a text before the eyes of the reader. However, the writing which interests them is a form of human writing, in the sense that it happens in the socialized space of symbolic human exchanges. The point being that, as they are aware of the fact that the introduction of computers has broken the "intimate and perennial" relationship that unites the sign with its substrate, they consider that it is necessary to employ specific tools and procedures to make writing available on a screen. In other words, there cannot be text on a screen without having recourse to specific textual tools: this is what they call *architexts*. "We use the term *architexts* (from *archè*, origin and command) to designate the tools that make the existence of writing on the screen possible and which not only represent the structure of the text, but also control its execution and production"[20]. At the heart of their approach, there is writing. But it is a human form of writing which, when it is digitized, must undergo techno-semiotic mediation in order to exist and to be perceptible by human readers. The machine, in these theories, has a dual status. First, it is a black box, something that cannot be known without being put into a textual, readable form. Secondly, the machine is submitted to an anthropological and instrumental scheme. All this stems from the anthropocentric character of writing in the theory of screens-as-writing.

Why can we say that the theory of screens-as-writing turns the machine into a "black box"? This stems from the fact that the theory recognizes the split brought about by computers between the substrate and the symbol, between what is calculated and what is perceptible, and the need to build a bridge "between the technology and language". Mediation is necessary to make the transition "between the requirements of the machine and those of social exchange"[21] For instance, between the data that a user enters by means of the keyboard – the letters – and what will appear on the screen, there is a need for several intermediate layers to translate between what is legible for a human being and what can be

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[19] Yves Jeanneret and Emmanuël Souchier, "Pour une poétique de l'écrit d'écran," *Xoana* 6 (1999): 97.

[20] Jeanneret and Souchier, "poétique de l'écrit d'écran," 103.

[21] Emmanuël Souchier and Yves Jeanneret, "Écriture numérique ou médias informatisés?," *Pour la Science - Scientific American* 33 (2002):102.

manipulated by a machine. To bridge the gap between "the technical memory trace which is inaccessible to humans" and "the text displayed on the screen"[22], and *vice-versa*, various textual layers are inserted. There is thus a technical dimension, the space of the machine, which remains inaccessible to humans and thus demands mediation. There is a hidden space, that of calculation, a "black box"[23] that takes on different forms. It can be for instance an algorithm, where "writing which has reached a degree of abstraction such that the senses cannot perceive it without intermediaries", an algorithm "that the eye cannot transcribe in perceptible form"[24]. Each time there is a technical dimension which is absent "from the visible scene"[25], a space made up of texts "coded by and for the machine"[26], illegible as such and beyond human understanding. In other words, the technical space for calculation cannot be perceived by humans because it is organized *for* the machine. It therefore calls for processes to put it into symbols and meanings that can be grasped by the *anthropos* – in short, for a form of mediation. And this is what is of interest for the theory of screens-as-writing.

This theory thus proceeds from and produces a certain ignorance of the machine, and focuses its attention on the mediating textual levels that make the existence of writing on the screen possible: the architexts. It is important to analyze these architexts to the extent that they crystallize values as well as various socio-economic issues. It is important because, as well as making digital texts possible, they control them in the sense that they "format" the writing as a "discipline imposed on the 'writing body", in the sense used by Michel Foucault"[27]. It is therefore important, in the field of screens-as-writing, to develop research that focuses on the critical study of forms of domination – symbolic as well as economic – in the industrial architexts market. The only thing is that, as soon as one enters the field of mediation of technical space, where bridges have been built between technology and language, it is no longer a question of the machine but only of humans – because these bridges correspond to human criteria of understanding and intelligibility, where the issues at stake are human issues. And it is these issues that are of interest to the theory of screens-as-writing, when it seeks for example to demonstrate the power relationships established with and through the architexts that prescribe writing. The screens-as-writing theory is focused first and foremost on humans: humans who write to other humans, thus

[22] Souchier and Jeanneret, "Écriture numérique," 102.

[23] Souchier, "Écrit d'écran"; Souchier and Jeanneret, "Écriture numérique"; Yves Jeanneret, *Y'a t-il (vraiment) des technologies de la communication?* (Villeneuve d'Ascq: Presses Universitaires du Septentrion, 2007).

[24] *Ibidem.*

[25] *Ibidem.*

[26] *Ibidem.*

[27] Jeanneret and Souchier, "Poétique de l'écrit d'écran", 106.

mobilizing – consciously or not – architextual layers. Or else humans, computer programmers for example, write to machines and for them; but *in fine* they do this with a view to interactions between humans. Thus, once it has been framed by the theorists of screens-as-writing as a "black box", which therefore demands mediation, the machine is neutralized – and in two different ways.

First, it is subservient to the humans who use it. It functions, it executes coded programmes, as if it were an extension of the human will – sometimes humans who have had to learn how to handle it and to speak to it so that it will do what is ordered (i.e. computer programmers), sometimes humans who can purely and simply ignore it (users). This neutralization of any action by the machine itself, which rests on its subservience to an anthropological and instrumental scheme, is in no way surprising to the extent that the "architext" concept was formulated precisely in order to deconstruct the rhetoric of interactivity and its attribution of a "messianic" dimension to technology[28]. With their "architext" concept, these authors criticize the myth of a "human machine" according to which a machine can act in the same way as a human being: "The key question is simple: can a tool act in a way equal to that of a human being? The answer is just as clear: no, it cannot […] It follows that there is not, and in the proper sense of the term there cannot be, any possible interaction between a human being and a machine."[29].

There is no inter-activity between a human and a machine, because the machine does not *act*. If something happens on the screen after the user has clicked on an icon, for example, it is not because the Web page itself is interactive, it is simply because various upstream architexts have transformed the click into a writing gesture that effects the display of a new window or image. The interface (the screen) is taken by the semiotics of screens-as-writing only as a translation of human acts of writing – acts that are possibly multiple, but definitely human. This being so, saying that "the machine 'acts' is pure rhetoric"[30]. No, the machine does not act, because action, in the eyes of Yves Jeanneret and Emmanuël Souchier, is "a deployment of energy endowed with meaning by a subject in a social, historical and cultural context"[31]. This is – of course – something that a machine cannot lay claim to. To adopt their term, the machine "functions", but it does not "act".

To sum up, the first part of the operation whereby the theory of screens-as-writing neutralizes the machine involves reducing the machine to a mere

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[28] Jeanneret and Souchier, "Poétique de l'écrit d'écran."
[29] Jeanneret and Souchier, "Poétique de l'écrit d'écran," 97-98.
[30] Jeanneret and Souchier, "Poétique de l'écrit d'écran," 98.
[31] *Ibidem.*

instrument. And this subordination of the machine to an instrumental scheme occurs as a reaction against the idea of a "human machine". We can recognize here one of the attitudes that Simondon, in his introduction to *On the mode of existence of technical objects*, has taught us to spot[32]. This attitude consists of reducing technical objects to mere useful instruments, in order to resist the tendency to endow robots with human characteristics –for better or for worse. The "better" can, for example, be manifested in the technophile rhetoric of "interactivity". The "worse", on the other hand, tends to take the form of technophobia, which conveys fear of the autonomy of technology. While Simondon speaks of the "submission" of technical objects to an instrumental scheme as an integral part of technophobia, the theory of screens-as-writing, with its "architext" concept, proceeds to make this reduction as a reaction against unconsidered technophilia. The theory of screens-as-writing, because it is based on an anthropocentric conception of writing, leads to the neutralization of the machine. From this perspective, it is indeed necessary to first "textualize" computational operations so that they can be perceived as significant by human beings; the machine is then only considered on the basis of its role in manipulating meaningless symbols so that they can be displayed on a screen for humans. The computational activity is only considered in so far as it makes it possible to display writing on the screen. This is not surprising since most of the theorists who have adopted the idea of screens-as-writing have a background in literary studies, so that their main interest is in the circulation of texts, and thus in human criteria of intelligibility and meaning, in their material conditions of visibility. If they take an interest in computational activity, it is only because it is involved in the material instantiation of contemporary texts. The way that this theory enters into the field of digital media, via the context of textual writing, thus leads it to doubly neutralise the machine: either the machine is what is inaccessible to us humans and something that we can know nothing about; or else the machine is something that intervenes in the production of contemporary texts and makes it possible to display them on screens. This intervention is of course

[32] "Our culture thus entertains *two contradictory attitudes* to technical objects. On the one hand, it treats them as pure and simple *assemblies of material*, that are quite without true meaning and that only provide utility. On the other hand, it assumes that these objects are also robots, and that they harbour *intentions* hostile to man, or that they represent for man a constant threat of aggression or insurrection. Thinking it best to preserve the first character, culture strives to prevent the manifestation of the second, and speaks of putting the machines in the service of man, in the belief that reducing it it to slavery is a sure means [sic] of preventing rebellion of any kind." Georges Simondon, *Du mode d'existence des objets techniques* (Paris: Aubier, 1958), 11. Translation from the French by Ninian Mellamphy [1980] available at https://www.sfu.ca/~andrewf/simondon%281%29.pdf.

anything but neutral, because it crystallizes human values and is an extension of pre-existing power relationships. In other words, the theory of screens-as-writing is interested in textual writing, and that has the consequence of rendering the machine interesting only in so far as it makes it possible to display texts on the screen, thus subordinating the machine to an anthropocentric scheme of usefulness. The concept of architext, which quite rightly deconstructs the marketing rhetoric of interaction, makes it possible i) to draw our attention to the mediating layers that enable the display of text on the screen; and ii) to textualize the technical space of the machine, considered as a black box which is inaccessible to the human perceptual apparatus. However, by doing this, it neutralizes the existence of the machine in two ways: i) by subordinating the functioning of the machine to a purely utilitarian scheme according to which the machine does nothing other than crystallize and execute human wishes and logic; and ii) by reducing the machine to its role in the production of textual writing, thus overlooking the computational writing activity which is specific to computational machines.

The concept of writing, around which the theory of screens-as-writing is built, thus tends to obscure the reality of machines. But this theory is not the only one to have analyzed digital media and thus established a relationship between humans and machines. A second group of theories, centred on the "interface" notion, has also addressed this question. What are the assumptions underlying this notion?

## Interface-based theories

The term "interface" was initially employed in chemistry in the late 19th century, to designate "a surface which separates two physically distinct states of matter". Gradually, the interface idea was extended to the digital domain, and then to management theory[33]. In the digital domain, an interface is something that "links the software and the hardware with each other, with humans and with other sources of data". In this sense, the "interface concept" does serve to conceptualize the articulation between humans and machines, [the machine here being the hardware], and it is the main field of study on Human-Machine Interactions (HMI). How then do scientists in the human and social sciences, in media studies, think of interfaces and what are the effects on the way they consider relationships between humans and machines? In order to examine this question, we have to start by reviewing some of the central themes of the interface idea: i) its scope (can *anything* be an interface?), ii) its pretensions to invisibility ("the best interface is no interface"), and iii) its reinsertion into broader cultural issues. On this basis, it becomes possible to show that the theories constructed around the

[33] Emmanuël Souchier, "Présentation," *Communication & Langages* 142/1 (2004): 7.

notion of “interface” nourish, sometimes in a paradoxical way, the instrumental conception of technology. Finally, we will tackle the question of developing a theory of interfaces that is able to confer an existence to computational machines.

If we attempt to circumscribe the field in which the “interface” notion can apply, the question arises of where the interface actually stops. Is it limited to the graphical interface, i.e. the set of icons and menus that allow us to act with digital media? Limiting the interface to the graphical interface[34], although tempting, is doubly problematical. First, it does not take the technical diversity of interfaces into account: some interfaces link material components to software components, others link programmes with each other (API, or Application Programming Interface), etc. Secondly, limiting the interface to the graphical human-machine interface amounts to generalizing from the particular. Historically, an interface has not always been today's general system of semiotic metaphors that makes it possible to manipulate the machine. For example, before GUIs (*Graphical User Interfaces*) came into widespread use, the main means for relating to machines was the command line[35]. But if the interface cannot be reduced to the graphical human-machine interface, should it be extended – as suggested by Alexander Galloway – to any form of mediation, even to any kind of "go-between" (not only a computer screen, but a sheet of paper, a door, etc.)? Is there not a risk of falling into the opposite problem of excessive generalization to the point that it becomes difficult to define exactly what objects one is dealing with? Galloway's definition of the "interface" as a “borderline state”, or “a moment when one meaningful item is understood as being distinct from another”[36] is actually valid for any threshold or indeed for any straight line or material boundary. If the emphasis is on the interface as a *process* (whereby two things are brought into a relationship with each other, especially on an interpretative or semiotic level as two “meaningful entities”), it can easily be confused with the more general category of mediation.

After the question of circumscribing it, a second difficulty with the "interface" notion stems from the question of its visibility. By “visibility” is meant: does the user realize that mediation is necessary to allow the use of a computer or a smartphone? Is there any friction, or “resistance” between the user’s intentions and the machine? When formulated in this way, the question of visibility is very close to that of the “transparency” of interfaces and their intuitive nature. Now these are actually tricky questions when one addresses issues of ergonomics or interface design. The dominant trend in contemporary design studies holds that a good interface is one that the user is not aware of, whose

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[34] Matthew Fuller et al., *Software Studies: A Lexicon* (Boston: MIT Press, 2008), 149.

[35] Neal Stephenson, *In the Beginning was the command line* (online publication, 1999). Available online at http://www.cryptonomicon.com/beginning.html.

[36] Alexander Galloway, *The Interface Effect* (New-York: Politis Press, 2012), 33.

mediating and framing action is not obtrusive[37]: "the best interface is no interface". This comes back to the dynamics of "immediacy" investigated by Jay Bolter and Richard Grusin[38], according to which the aim of any kind of mediation is to remain in the background in order to keep the focus on what is to be mediated, in this case the tasks that humans want the machines to do.

The problem is that this invisibility, this apparent "seamlessness", can make it difficult to achieve a critical understanding of interfaces, since the fact of considering that they are invisible amounts to blinding oneself to their power of configuration[39]. The role of the semiotician, and more generally of any human scientist who properly fulfils their critical function, thus demands that they do not accept the "intuitive" or "transparent" nature of the interfaces in question at face value, but seek on the contrary to understand the operations through which these interfaces are *rendered* "intuitive". In this sense, there is always a certain "density" to interfaces: they are the fruit of work and study (interface design), they are a composition of signs (the "trash-bin", the "file", the "page") that call upon the memory of certain social practices or specific professional contexts. These signs propose a certain model of the relationship with the machine. Now, once an interface is massively adopted and industrially reproduced, this specific model becomes dominant *ipso facto*. Describing an interface as "neutral" or "invisible" prevents a proper appreciation of its influence and its cultural effects, since its political and potentially problematic significance is evacuated under cover of purely ergonomic considerations.

Some work has already been done with a view to taking this cultural dimension of interfaces seriously. This is in fact central to two important theories in the field of media studies: in the USA, the theories of Lev Manovich on the new media; in France, the semiotics of screens-as-writing with Emmanuël Souchier and Yves Jeanneret. Lev Manovich, in *The Language of New Media*[40], devotes a whole chapter to the interface notion. According to him, an interface is a sort of converter, a "code that conveys cultural messages in a variety of media"[41]. This encoding is not a simple transposition, but a translation, indeed a trans-formation: there is no "transparency of the code". Manovich places himself in the realm opened up by the work of McLuhan, where media not only relay messages, but also transform them. An interface thus has real density. It

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[37] Timo Arnall, *Making Visible* (Oslo: Oslo School of Architecture and Design, 2014), 53.

[38] Jay David Bolter and Richard Grusin, *Remediation: Understanding New Media* (Cambridge: MIT Press, 1996).

[39] Arnall, *Making Visible*, 53; Souchier, "Présentation," 7.

[40] Lev Manovich, *The Language of New Media* (Cambridge: MIT Press, 2001).

[41] Manovich, *Language*, 76.

effectively modifies the perceptions of the user: "the interface shapes how the computer user conceives the computer itself. It also determines how users think of any media object accessed via a computer"[42]. The point is that the computer of the new millennium is no longer merely a tool for calculating but a "universal media machine"[43]; the "interface" is then no longer a simple means of entering into a relationship with a machine, but a new way of envisaging media forms. This new technology reconfigures existing cultural practices: reading, listening to music, etc. Manovich explains: "we are no longer interfacing with a computer but with culture encoded in digital form"[44]. For this reason, Manovich referred to "cultural interfaces" rather than just "interfaces": the way in which we think of media, and cultural practices more generally (reading, writing, viewing, etc) is shaped in part by the digital media themselves. The "interface", for Manovich, thus designates a much broader phenomenon than computers as such: by virtue of its deployment in digital media, the interface has become our main way of understanding the world. By highlighting certain characteristics of these new media, of their "language", Manovich hopes to identify certain aspects of this "interfaced" relationship with the world.

The French theory of screens-as-writing does in a way fit in with this analysis of the interface as embedded in the dense dimension of culture. However, since this theory is rooted in semiotics, it gives particular attention to the signs that make up the screens; this leads to analyses that are more restricted and local than those of Manovich, which are broader in scope. According to Souchier and Jeanneret, the interface (of an item of software, a Web site for example) plays a cultural role since, as an "architext", it "crystallizes"[45] values and representations that will affect the activities it makes possible. In the architexts can be read a "fixation of typical uses", in particular by way of the signs that compose the graphical interface. This being so, a semiotic analysis of the historical and cultural circulation of these signs (for example, the icon of the disk that indicates the "save" function) makes it possible to demonstrate the cultural density of an interface. However, although the theory of screens-as-writing – like Manovich's theory – does make it possible to conceptualize the mediating and communicative function of interfaces, it is still true that a machine is never thought of as having the capacity to act on its own. If screens crystallize the logic of the humans who

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[42] *Ibidem.*

[43] Manovich, *Language*, 80.

[44] *Ibidem.*

[45] Emmanuël Souchier, "Lorsque les écrits de réseaux cristallisent la mémoire des outils, des des médias et des pratiques," in *Les défis de la publication sur le Web: hyperlectures, cybertextes et méta-éditions*, ed. Jean-Michel Salaün et Christian Vandendorpe (Lyon: Presses de l'ENSSIB, 2004).

were involved in their construction (designers, engineers, etc.), if architexts frame the act of writing according to models chosen by the developers and the software editors, the graphical interface is portrayed as a sedimentation of professional practices and human values. We thus find ourselves in a situation where there are no longer any machines, only humans who enter into relationships with other humans. The interface becomes a means whereby certain humans propose or impose certain conceptions of writing on other humans.

In other words, in these theories the machine is reduced to a purely instrumental scheme. This tendency was noted, and criticized, by Wendy Chun[46] in her work on source code. Her argument is as follows: source-code is too often considered as "automatically self-executable", as allowing the display of a graphical interface or the execution of software by virtue of its syntax alone. It is presented as the "self-evident ground or source of our interfaces"[47], which is the result of human writing: that of the software developer giving instructions to a machine that does nothing other than execute them perfectly. Whenever the interface is considered as the result of a source-code, i.e. the set of instructions given to a machine by a human being, then any analysis of interfaces eventually results in an analysis of strictly human aims. Thus the theory of screens-as-writing, in seeking to emphasize the importance of technical mediation via the idea of crystallization, ends up promoting an anthropological and instrumental view of the machine according to which the interface is nothing but the result of human intentions. Now, although it is true that these intentions are realized by a machine via a source code, what appears on the screen is not a simple transposition of what the developers ordered the machine to do: there is a real discrepancy between the code and the interface, and this is because the machine itself *acts.* What is at stake, then, is laying the foundations for a theory that would give its proper place to the activity of the machine itself, and thus allow this activity to exist and to be characterized.

In order to do this, we need to consider the interface not as the product of human will alone, but rather as a hybrid (via a code) of human instructions on the one hand, and execution by the machine which is not controlled entirely by prior coding. The outlines of an approach of this sort can be found in the pioneering studies of Brenda Laurel who, back in the 1980s, described digital interfaces as "theatres"[48]. According to Laurel, an interface is a stage. It provides a "shared

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[46] Wendy Chun, "On 'Sourcery', or Code as Fetish," *Configurations* 16/3 (2008).

[47] Chun, "Sourcery", 309.

[48] Brenda Laurel, "Interface as Mimesis," in *User Centered System Design: New Perspectives on Human-Computer Interaction*, ed. Donald A. Norman. and Stephen W. Draper (New-Jersey: Lawrence Elbaum Associates, 1986); Brenda Laurel, *Computers as theatre* (Boston: Addison-Wesley, 1991).

context for action in which humans and machines are agents"[49]. The source code is to be understood as a script, or the text of a play, as "a set of instructions that defines the potential actions to be performed by people and computers working together"[50]. Considering the interface in terms of a stage makes it possible to understand it not simply as the result of a programme written by humans, but as a space where humans and machines can meet. According to Laurel, the machine can be considered as an active agent; however the details of these actions are not fleshed out. We are left only with the metaphor of the theatre: an entity "acts" to the extent that it participates in the unfolding of an action. Nevertheless, the work of Laurel can inspire a non-anthropocentric approach to digital media, making it possible to consider that computational machines do act. "Interfaces" thus become spaces where humans and non-humans can enter into a relationship: they are the results of a complex interweaving of writings and objects (operating system, size and resolution of the screen, version of the search engine, quality of the material employed, etc.); they depend on both computational operations and human instructions, with none of the participating entities being subservient to the actions of the others. A semiotic analysis giving close attention to the activity of both humans and machines can thus be deployed to bring out the cohabitation of these two entities – rather than seeing only the human intentions "behind" the interfaces.

The concepts of architext and interface both deal with the way humans interact with machines. But the effect of their respective anthropocentric presuppositions is that, only too often, they are actually questioning how human beings interact with other human beings, the mediation by the machine being reduced to a purely instrumental role. Whether in the ideal of a "transparent" interface, which fades into the background to make way for the *desiderata* of the user, or in the conception of an architext which is supposed to be the technical crystallization of power relationships between humans, technical mediation in both cases takes second place. It counts either as a necessary evil which is best forgotten (the invisible interface), or as the substrate underlying the conduct of human affairs (architext).

This conception of technology has consequences for the status of the signs that appear on the screen. If, for any writing on a screen, it is valid to distinguish the semiotic layer (the symbols to be read by humans) from the technical layer (the operations of the machine which make it possible to display the semiotic layer), anthropocentric perspectives on technology most often reduce the latter to the former. Thus, if the machine is considered as a pure instrument, it is understood as producing "text" in the human sense of the term. In other words, it

[49] Laurel, *Computers*, 4.
[50] Laurel, *Computers*, 45.

is an instrument capable of participating in "graphic reasoning"[51], which is based on the bi-dimensional nature of writing, on the spatial co-presence of meaningful items, and whose structural concepts are the list, the table and the formula. However, if the machine is indeed itself engaged in a process of writing – as it is possible to maintain according to Turing – it is a form of writing which is not a matter of texts but rather of calculation. And it is precisely this form of computational writing that is obliterated by the notions of interface or architext, because the latter focus exclusively on textual writing. What is at issue is therefore to develop concepts that would allow us to analyze writing on a screen while also considering the computational writing of the machine itself.

## IV. How do machines write on electric screens? The need for non-anthropocentric semiotics

The first possibility would be to understand the interface not as solely the result of a source-code, and therefore entirely subordinate to human will, but rather as a "Place of the Third Kind", i.e. a space for shared action by the machine and the human, and which does not belong exclusively to either of them. In this sense, the interface is no longer understood as determined upstream by digital code written by humans, but rather as the constantly dynamic result of interactions between humans and machines. If, for example, a user re-dimensions a window, or clicks on an icon to open a second window, s/he will see on the screen the result of the combination of his or her actions with the way in which the machine adapts to the situation and participates in it. If some of these adaptations can certainly be written in advance, for instance when the site or the application adapts the size of the type to the size of the window (on the *responsive design* principle), they also depend on the machine which executes the code: the result will not be the same if the computational activity is performed by a computer or by a smartphone. This idea of the interface as a place "of the third kind" turns it into a space that results from a combination of writing by humans and writing by machines. It is therefore not only a process, but a hybrid process in which the machine participates fully, and in which it is not a mere instrument but has a certain power of agency: it writes.

However, if writing is an activity which is common to humans and machines, and if the two can meet in interfaces, it is important to recognize not only that the machine writes, reads and interprets, but that it does not do so in the same way as humans. If, to follow Turing, it is possible to show in what sense computational machines are writing machines, it should also be noted that Turing identified two areas in which machines and humans differ: the tabular nature of

[51] Jack Goody, *The Domestication of the Savage Mind* (Cambridge: Cambridge University Press, 1977).

writing, and interpretation. The "tabularity" of writing[52] corresponds to the spatial dimension, which is usually two-dimensional, of any text. A human writes from top to bottom, from bottom upwards, from left to right, in boustrophedon (alternately left-to-right and right-to-left), etc.; whatever the substrate, human writing is a practice which is deployed in two dimensions. In contrast, the Turing machine writes in only a single dimension. It follows the paper tape, moving only from left to right, from one square to the next. As Turing himself wrote, "in elementary arithmetic, the two-dimensional character of the paper is sometimes used. But such a use is always avoidable, and I think that it will be agreed that the two-dimensional character of paper is not essential to computation"[53]. Thus, even if Turing defines calculation as a form of writing, bi-dimensionality is purely incidental.

Then there is the question of interpretation: machines do not just execute, they also interpret, but they interpret in a quite different way to humans. Machines interpret because they read symbols (0's and 1's, or second-order symbols such as alphabetic characters), and this activity triggers a movement on their part and a modification of their internal state with no need for human intervention (unless there is an abnormal breakdown), since these machines are automatic. However, this machine-like interpretation can only occur on condition that the symbols are not ambiguous, and that they have been explicitly foreseen in the list of all possible states of the machine. The symbols must be rigorously monosemous, one might say, whereas in classical semiotic theory, interpretation is linked to polysemy, an openness to multiple possible meanings of a text according to the reader. And it is precisely this openness that guarantees the value of reading as the actualization of one of the potential meanings of the text. It is clearly not under these conditions that a machine "reads" or "interprets".

By showing that computational machines are writing machines, but that their writing is computational and not textual, the idea is to open up the possibility of developing a non-anthropocentric kind of semiotics that seeks, in these places "of the third kind" that are interfaces, to avoid making computational writing systematically subservient to textual writing – or invisible.

When distinguishing computational writing from textual writing, while considering the former as subservient to the latter, the point is not to create an opposition between the two. Both types of writing are in constant interaction in interfaces, given the fact that interfaces are texts and that every text is

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[52] Christian Vandendorpe, *Du Papyrus à l'Hypertexte. Essai sur les mutations du livre et de la lecture* (Paris: La Découverte, 1999), 39-68.

[53] Turing, "Computable Numbers", 245.

polyphonic[54]. A text organizes, through graphical means, a situation of communication, and therefore the cohabitation between the entities involved in the situation. For instance, in every text there is a way of representing the author, the reader and the tool that was used in the writing, and all of these are visible through editorial utterance[55] ("*énonciation éditoriale*"). In this sense, a text is not a requisition of pre-made entities, of "building blocks" such as Author, Reader and Tool. Rather, it is a pattern of relationships that can best be described in ecological terms[56]. As such, an interface is ecological, because it organizes a particular relationship between computational and textual writing.

But thinking in ecological terms does not prevent us from distinguishing different entities and different activities in a way that allows each participant in the situation to express itself according to its own mode of expression. Neither does it prevent us from analyzing the ideology that tends to threaten the ecological diversity of a text by promoting the idea that the text is the product of a single author. This is the hypothesis, formulated by Michel de Certeau, of the "scriptural economy"[57], where writing has been one of the main ideologies since modern times. To de Certeau, writing in our society is a "myth": it is an activity that promotes, through the figure of the "author" for instance, a human individual as his or her own master, capable of organizing the world according to their own will on the blank space of the page. Writing, to de Certeau, is an ideological operation that tends to deny the polyphony of each text. Our argument is therefore on this ideological (or "mythical") level. Of course, most artists, developers or academics acknowledge the computational part of digital texts. But these are practices that make sense as "artistic" or "innovative" precisely because they differ from a norm, they challenge the ideology of writing as a myth and of the computer as a mere instrument.

The computational writing theory we propose is a conceptual tool that allows this ideology to be challenged as well. It aims to bring semiotics, as a discipline that analyzes texts, into the toolbox to shed a new light on the non-human dimension of every digital text and thus to contribute to new thinking on the polyphony of these texts.

But what might be the concrete objects of non-anthropocentric semiotics? What precisely is there to be observed? Are not the signs indicating the

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[54] Mikhaïl Bakhtine, *Le Principe Dialogique*. Edited by Tzvetan Todorov (Paris: Le Seuil, 1981).

[55] Emmanuël Souchier, "L'image du texte. Pour une théorie de l'énonciation éditoriale," *Cahiers de Médiologie* 6 (1998): 137-145.

[56] Jenny Edbauer, "Unframing models of public distribution: From rhetorical situation to rhetorical ecologies," *Rhetoric Society Quaterly*, 35/4 (2005): 5-24.

[57] De Certeau, *Invention du Quotidien*, 195-224

computational activity of the machine always retranslated into human language? For example, the indication displayed on every page of Google results - "X results in Y seconds" - is certainly a way of putting the activity of the machine into meaningful symbols, but it is centred on the human side to the point where the activity of the machine is subordinate to an anthropological scheme[58]. In other words, the cultural and ideological weight of understanding the interface as text is so powerful that it may be well nigh impossible to find any signs of computational writing that are not already textual writing. Except, perhaps, by taking an interest in outlying activities: not only artistic practices – which care less about the intelligibility of the text produced for humans than about the potential for the expression of the machine – but also all the occasions when the interface goes haywire. Taking an interest in those moments when, in the midst of textual writing, forms of computational writing suddenly invade the screen. This happens, for instance, when there is a "bug" in the display, when a video cannot be read because a plug-in is out of date, or when the CSS[59] of a site does not properly upload so that the text looks disorganized and anarchic on the page. But it is also the case with glitches on Google Earth[60], for example. These glitches clearly demonstrate the mechanical composition of every interface, a composition that is often denied by the dominant anthropocentrism that will tend to disqualify these events as "bugs". But they are only "bugs" if we consider technical objects from the anthropological and instrumental perspective : in the examples we have mentioned, the machine is not making any mistakes, it is doing its job. It is calculating and giving a graphical account of its calculations in accordance with the information it has at its disposal. A "bug" is only a "failure" by virtue of the ideology of the computer as a tool serving humans. The concrete objects of the non-anthropocentric semiotics that we call for are perhaps somewhat limited, but the fact remains that this kind of semiotics would make it possible to investigate the omissions of current semiotics in analyzing our relationships with computational machines, in the hope of making things happen and seeing new fields of research appear.

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[58] Cléo Collomb and Samuel Goyet, "*Meeting the machine halfway*: towards a semio-political approach of computational action" (paper presented at the *Reconfiguring Human and Non-Humans*: *text, images and beyond* symposium, University of Jyväskyllä, Finland, 29-30 October 2015).

[59] Cascading Style Sheet. A CSS is a language that describes the style of a document, most often a web page. The content of the document is usually described in a HTML document, although some of the graphical aspect of the text can be written in HTML.

[60] Collomb and Goyet, "Meeting the machine halfway", 2015.

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