

Semiotic literacy with internet digital codes

Irene de Araujo Machado

Full Professor in Communication Sciences at the School of Communications and Arts (ECA) of the University of São Paulo (USP). She is currently an associate professor at ECA/USP and in the Graduate Program in Media and Audiovisual Processes.

E-mail: irenear@usp.br

Daniela Osvald Ramos

Journalist, professor of the undergraduate course in Educommunication and in the Graduate Program in Communication Sciences at the School of Communications and Arts of the University of São Paulo.

E-mail: dramos@usp.br

Abstract: In this article, we address the socio-technical changes in contemporary times by a historical approach arising from the introduction of internet in the culture. Subsequently, we investigated the importance of knowledge of digital codes in this context. We formulated the hypothesis that it is necessary to face the complexity of understanding the technical infrastructure of the network so that we can educate citizens, and not users, who consume all sorts of codes from complex and constant coding and recoding dynamics, without the proper semiotic competence for the critical interpretation based on the self-referentiality that language imposes on us in this new historical framework. As a conclusion, we assume that there is a need for a literacy project that includes the understanding of the use of codes in communication.

Keywords: semiotic literacy; digital codes; internet; technoculture; self-referentiality.

Resumo: Neste artigo, abordamos as mudanças sociotécnicas na contemporaneidade a partir de uma abordagem histórica advinda da introdução da internet na cultura. Posteriormente, investigamos a importância do conhecimento dos códigos informático-digitais neste contexto. Desenvolvemos a hipótese de que é necessário enfrentar a complexidade do entendimento da infraestrutura técnica da rede para que possamos formar cidadãos, e não usuários que consomem toda sorte de códigos a partir de dinâmicas complexas e constantes de codificação e recodificação, sem a competência semiótica adequada para a interpretação crítica a partir da autorreferencialidade que a linguagem nos impõe neste novo quadro histórico. Concluímos que é necessário um projeto de alfabetização que contemple o entendimento do uso dos códigos na comunicação.

Palavras-chave: alfabetização semiótica; códigos informáticos; internet; tecnocultura; autorreferencialidade.

1. INTRODUCTION

The technical development of the internet goes back to the Cold War context, between the United States and the Soviet Union, after the Second World War, in the North American Department of Defense, and to the consequent creation of Arpanet, its first prototype. This story involves many engineers who planned both the network structures and their functioning and all the hardware that supports the existence of the internet. Soon after, in the 1960s, Marshall McLuhan already announced the global village, while Stewart Brand put it into practice with the *Whole Earth Catalogue*. This project, which lasted from 1968 to 1972, was a counterculture magazine that, in addition to promoting the sale or exchange of products, preached the DIY (do it yourself) and full access to tools, which became real with the expansion of the internet in the 1990s, precisely because of the ease of circulation and access to all kinds of information and tutorials, or how to do's. The *Whole Earth Catalog* today has a name and web address: Google, a portal for accessing content accessible in a first layer of search on the network¹.

After the building of infrastructure and the popularization of access, internet began to expand worldwide in the last decade of the 20th century. In 1995, they started their commercial activities in Brazil, that is, the sale of access and, of course, the beginning of development of new business models for the network that, later, would end with others previously established, as was the notorious case of the phonographic industry and journalism, to name two widely known examples. Undoubtedly, these changes altered several social dynamics that until then defined economic, political, cultural and educational practices. Its center is the disintermediation from the intermediaries hitherto known – such as companies, politicians, journalists, teachers –, through the unique intermediation through a calculation center operated by humans and which works through a network.

Galloway² details this process, and Eugene Thacker³, prefacing Galloway, analyzes that this control occurs in the contemporary way of operating biopolitics, the control over bodies, a concept elaborated by Michel Foucault⁴. The biopower coming from internet is organized as control in literal protocols, because it is the network management physical infrastructure. Thus, control now comes from a single system and has the characteristic of being a diagram, technology and style of management. In Thacker's words,

it is worthwhile to note that the concept of "protocol" is related to a biopolitical production, a production of the possibility for experience in control societies. It is in this sense that Protocol is doubly materialist—in the sense of networked bodies inscribed by informatics, and in the sense of this bio-informatic network producing the conditions of experience⁵.

Thus, for the control operated by humans to happen over the internet, it is necessary to encode filters of various types that work, in turn, as data distribution protocols, which become a content that can be consumed. These

1. WIENER, Anna. The complicated legacy of Stewart Brand's "Whole Earth Catalog." *The New Yorker*, New York, Nov. 16, 2018. Letter from Silicon Valley. Available from: <https://www.newyorker.com/news/letter-from-silicon-valley/the-complicated-legacy-of-stewart-brands-whole-earth-catalog>. Access on: Nov. 15, 2019.

2. GALLOWAY, Alexander. *Protocol: how control exists after decentralization*. Massachusetts: The MIT Press, 2004.

3. THACKER, Eugene. Foreword: protocol is as protocol does. In: GALLOWAY, op. cit., p. XIXIV.

4. FOUCAULT, Michel. *Nascimento da biopolítica*. Lisboa: Edições 70, 2010.

5. THACKER, op. cit, p. XIX-XX. In the original: "vale a pena notar que o conceito de 'protocolo' está relacionado a uma produção biopolítica, uma produção da possibilidade de experiência em sociedades de controle. É nesse sentido que o Protocolo é duplamente materialista – no sentido de corpos em rede inscritos pela informática, e no sentido desta rede bioinformática que produz as condições de experiência."

protocols are made up of digital codes. We have protocol levels, just as we can have different levels of digital codes. There are protocols that control the physical infrastructure of internet, and others that work through *proxies*. The proxy also acts as a protocol distribution intermediary and can be transparent, highly anonymous, more difficult to track, or just anonymous, with some protection⁶.

In the early stage of internet, in the early 1990s, being on the network had a primordial playful character, of discovery, game and anonymity. This was manifested in the habit of always entering the network with an avatar, which means adopting a cybernetic identity, or else, more simply, adopting a nickname. This context, which is perhaps due to the more widespread knowledge at the time of network architecture and the possibilities of total transparency and its regulation through resources to maintain a certain anonymity, has changed radically since the expansion of internet as a new space for commercial transactions. Thus, it became necessary for everyone to identify themselves civilly on the network, so that the navigation data and preferences could undoubtedly be associated with the civil identity and with navigation registration numbers that consolidate the consumption data, either the objective ones, as the purchase of products, or the subjective, as the preferences of taste.

After 25 years of commercial operation in Brazil, it can be said that using the internet is easy. But it has not always been like that, when it was necessary to first master the access codes of Microsoft's DOS operating system, to enter the computer and the internet (Figure 1), which was not yet the World Wide Web (WWW), the graphic interface created later by Tim BernersLee, in the reference year 1989, according to Wikipedia⁷.

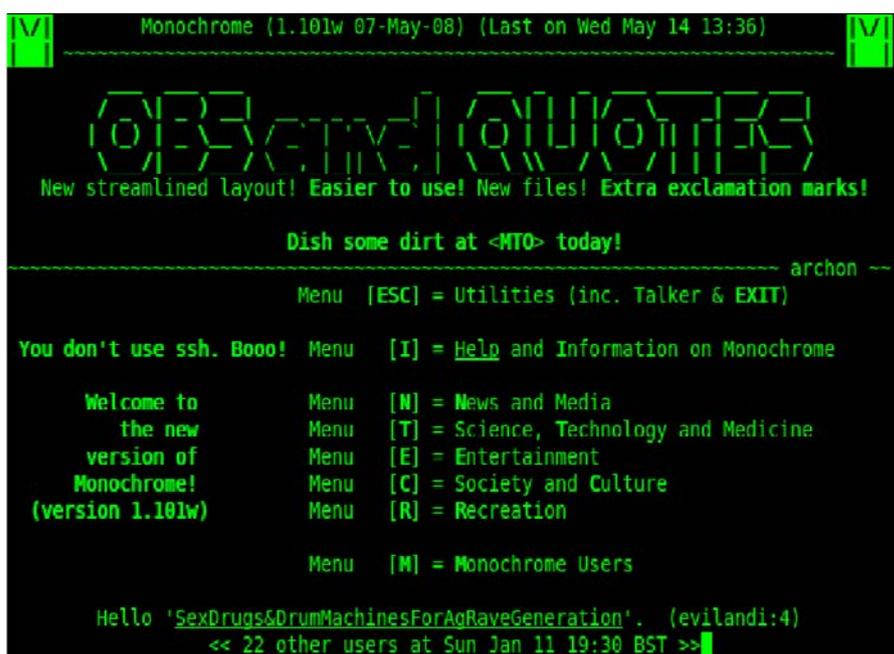


Figure 1: Internet interface before the WWW became popular

6. PÉREZ, Ignacio. El rol de los proxies y protocolos en la investigación de malware. *We live security*, Buenos Aires, May 29, 2015. Available from: <https://www.welivesecurity.com/las/2015/05/29/proxies-y-protocolos-investigacion-malware/>. Access on: Nov. 15, 2019.

7. TIM Berners-Lee. In: WIKIPEDIA: the free encyclopedia. [San Francisco, CA: Wikimedia Foundation, 20-]. Available from: https://pt.wikipedia.org/wiki/Tim_Berners-Lee. Access on: Nov. 20, 2019.

8. Available from: https://pt.wikipedia.org/wiki/Bulletin_board_system#/media/Ficheiro:Monochrome-bbs.png. Access on: Jan. 9, 2020.

At least 40 years after this initial context, at the end of the first decade of the 21st century, it was clear that in addition to the collective oblivion about the path that took us here, such as the eminently technical nature of the network and the ideologies of its technical project, the improvement of the graphical interfaces almost completely covered the layer that was most noticeable in Figure 1: the use of digital codes, which occurs in different levels. In turn, these codes are directed by means of network proxies and protocols which, in turn, are also encoded. Several orders of digital codes model⁹ everything that passes through fiber optic cables and reach computers that give access to internet. These are constant processes of encoding, decoding and transcoding. Manovich suggests the following hierarchy of levels: “interface-content; operating system-application; web page-HTML code; high-level programming language-assembly language¹⁰-machine language¹¹.” What we can see in this case is the constant need for recoding, while decoding is masked to the end user and can only be seen by those who know and understand these different coding and recoding orders.

As evidence of these technical recoding needs, the symbol chosen for the TOR Project’s anonymous browser is an onion (Figure 2), and it was the metaphor chosen by the community of programmers who developed this tool, illustrating the possibility of entering the internet with the understanding that this environment consists of several layers of codes, like an onion. The TOR “peels” each layer of code, leaving no trace. Goes through proxies and protocols scrambling numbers, so as not to be traceable. This is a profound socio-technical change and socially little known, due to its high specificity and complexity. However, we realize its social effects when complex phenomena emerge from this anonymous layer of internet.

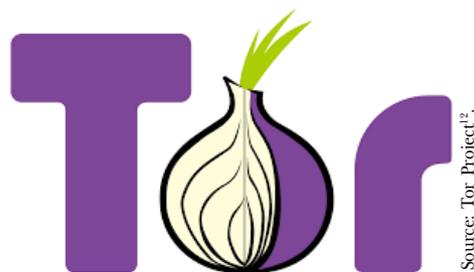


Figure 2: Logo of the TOR Project, which offers a browser that makes anonymous browsing possible over the internet

This anonymity project is also a manifesto:

In the 1990s, the lack of security on the internet and its ability to be used for tracking and surveillance was becoming clear, and in 1995, David Goldschlag, Mike Reed, and Paul Syverson at the U.S. Naval Research Lab (NRL) asked themselves if there was a way to create internet connections that don’t reveal who is talking to whom, even to someone monitoring the network. Their

9. The concept of modeling was proposed by Lotman to understand how codes relate in different languages of a semiotic system to organize the texts of a culture. LOTMAN, Iuri. **A estrutura do texto artístico**. Lisboa: Estampa, 1978, p. 16.

10. “Assembly language or assembling language is a human-readable notation for the machine code that a specific computer architecture uses.” LINGUAGEM assembly. In: WIKIPEDIA: the free encyclopedia. [San Francisco, CA: Wikimedia Foundation, 2016]. Available from: <http://pt.wikipedia.org/wiki/Assembly>. Access on: Oct. 25, 2010.

11. MANOVICH, Lev. Database as symbolic form. **Convergence**, Thousand Oaks, v. 5, n. 2, p. 81-99, 1999, p. 97, our translation. We emphasize that the high-level language is capable of performing more refined and abstract operations, such as the ones predicted in the softwares, and that the Assembly language is related to the machine language (also called low level).

12 Available from: <https://www.torproject.org/>. Access on: Dec. 27, 2019.

answer was to create and deploy the first research designs and prototypes of onion routing.

The goal of onion routing was to have a way to use the internet with as much privacy as possible, and the idea was to route traffic through multiple servers and encrypt it each step of the way. This is still a simple explanation for how Tor works today¹³.

We can say, then, that it is fundamental to understand the technical mediation that occurs in the consumption of information over the internet. This mediation develops in a constant improvement of the codes at these different levels, being them machine codes, which allow the hardware to process increasingly fast, or the software, with the improvement of algorithms and their functions. Those who master the codes dominate the circulation process. This domination, in the strict sense of the word, or this control, is also fragmented. Some dominate the codes at the machine level, others at the software level, others, at the same time, the codes for the circulation of content in certain formats, such as search formats, whose main representative is Google, which dominates its own codes, since they are a private property. Thus, those who master the codes start to control access to content and even more than the access, the way it occurs.

Who fully controls the codes? We may never know for sure, but we know that this control is potentially over who has the necessary knowledge both to develop new codes and to break proprietary codes. These individuals can act in companies or independently, such as hackers or crackers, those who break codes because they either want to understand how they work or have some shady objective. When breaking codes is impossible, it is necessary to understand their dynamics and then manipulate them indirectly. This happened, for example, in the case of the North American elections, when Cambridge Analytica bought the data and metadata from users and was able to develop an algorithmic code for the processing of this data aiming at certain cognitive effects based on psychometric analyses calculated to achieve certain effects, read: to influence the vote in a given candidate.

In this way, codes of different orders create a new business model that is also the dynamics of contemporary content consumption, as shown in Chart 1.

At these levels, there is a continuous improvement of code mediation, which is increasingly efficient from the point of view of its processing by the machine. The problem of code domination now reaches a geopolitical dimension. A recent Chinese video consumption application, TikTok, achieved great success in the United States in 2019¹⁴. Each person can easily record and post a video to the app and categorize it according to a *hashtag*. This term is used to designate one or more keywords preceded by the symbol

13. HISTORY. In: TOR Project. Seattle: The Tor Project, 2011. Available from: <https://www.torproject.org/about/history/>. Access on: Dec. 27, 2019. In the original: "Na década de 1990, a falta de segurança na internet e sua capacidade de ser usada para rastreamento e vigilância estavam se tornando claras e, em 1995, David Goldschlag, Mike Reed e Paul Syverson, do Laboratório de Pesquisa Naval dos EUA (NRL), se perguntaram se havia uma maneira de criar conexões com a internet que não revelassem quem está falando com quem, nem mesmo para quem monitorasse a rede. Sua resposta foi criar e implementar os primeiros projetos de pesquisa e o protótipo de roteamento de cebola. O objetivo do roteamento de cebola era ter uma maneira de usar a internet com o máximo de privacidade possível, e a idéia era rotear o tráfego através de vários servidores e criptografá-lo a cada passo do caminho. Essa ainda é uma explicação simples de como o Tor funciona hoje."

14. HERN, Alex. Revealed: how TikTok censors videos that do not please Beijing. **The Guardian**, London, Sept. 25, 2019. Available from: <https://www.theguardian.com/technology/2019/sep/25/revealed-how-tiktok-censors-videos-that-do-not-please-beijing>. Access on: Oct. 14, 2019.

#, which serve to organize content on different platforms, such as Twitter, one of the first to use it collectively.

So, if I hold an event, for example, and I want to disseminate it on internet in a decentralized way, I designate a *hashtag* for it, such as “#2019event.” Using this *hashtag* in all photos, texts, videos, I can retrieve the content of other people on the same topic. Shirky¹⁵ used the expression “organizing without organizations” to describe this phenomenon. It is with this dynamics that TikTok works. However, it is noted that themes sensitive to the Chinese government do not circulate in the app, such as the use of the keywords *Tiananmen Square* or *Tibetan Independence*, and there is no video about the protests in Honk Kong either, which occurred intensively since June 2019. The application has 500 million users worldwide and the West is concerned, since it may be shaping the perception of the world of these people based on what the Chinese understand about “what the world is,” censoring content or, we could say, a deliberate human action on codes¹⁶, exerting control through a management style¹⁷.

Chart 1: Possible coding levels in the dynamics of data extraction and processing

1. Data extraction	To train society for the extraction of its data through different orders, either individual and/or in collective association, and the naturalization of this process.
2. Transform data into metadata	From the data collected, generate possible metadata.
3. Processing with algorithms	To map objective and subjective consumption patterns; cross these patterns with the “average” of Big Data.
4. Orient towards objective/subjective consumption	Consumption based on the business model, but also mediation of social processes as a whole (triage, policing, education, public security, etc.).
5. Reinforce patterns; generate new patterns	Patterns of individual consumption preferences start to be reinforced. Patterns of social inclusion and/or exclusion can also be reinforced.

Source: prepared by the authors.

15. SHIRKY, Clay. **Lá vem todo mundo**: o poder de organizar sem organizações. Rio de Janeiro: Zahar, 2011.

16. HERN, op. cit.

17. THACKER, op. cit.

2. FRIGHTS OF SELF-REFERENTIALITY IN CRITICAL NOTES

The relationship between domination and control of digital codes seems to have created a strategy of use of a deterministic, certain and unshakable character, either when referring to the impossibility of tracking or when mapped by geopolitically configured control spheres. Becoming users, citizens who lack not only purchasing power, but also the intelligence to have real access to the privileges of digital systems, seem to lose the capacity for critical thinking.

If there is a fundamental characteristic of the studies of communication theory, it is the development of a critical understanding of the media, their codes and languages, within the scope of their historicity, in order to reach their socio-cultural dimensions that exceed technical materiality. Therefore, the time has come to face the dimension of media criticism, leveraging what has been stated so far about the role and power of the digital media codes. For this, it is necessary to emphasize the approach of social uses, shifting the focus from efficiency and predictability to the unpredictability of meaning production in the vast field of “semiotic ecology”¹⁸ and of the moral paradigm that iconic signs established in ethical terms¹⁹.

Without losing sight of the fact that protocol determinism supports the mobility and efficiency of computer systems in data processing, it is interesting to debate the notion that such procedures mark a profound socio-technical change that is little known socially, as previously stated, due to the high specificity and complexity. Considering that the study of highly complex systems, of the emergence and even of code breaking are contemporaneous with postwar scientific achievements, there is evidence that advances in the understanding of entropic systems in the context of the second law of thermodynamics introduce notions of indeterminism, uncertainty and unpredictability²⁰, opening possibilities for critical investigations within the new socio-technical realities. A particular phenomenon of socio-technical processes deserves attention: the phenomenon that the cognitive scientist Douglas Richard Hofstadter²¹ called “self-referentiality.”

Self-referentiality designates all recursion processes, wherever they happen. In computing, it designates the operability of programs that mobilize their own constituents to perform calculations, such as the numerical random process. In language, the metalinguistic function²² turns on itself to produce meanings. In biology, self-reference is understood as the cellular development in which the cell itself regenerates in an autopoiesis process²³. In literature and the arts, self-reflexivity questions procedures in favor of creativity and criticism of the means and processes of sense production. In all these fields, the presence of one of the ancestral symbols of self-reference resonates: the Ouroboros, the serpent/dragon that eats its own tail²⁴.

18. VOLLI, Ugo. Factoides y mneemos: por una ecología semiótica. In: TALENS, Jenaro (dir.). **Videoculturas de fin de siglo**. Madrid: Cátedra, 1990, p. 129-135.

19. COLOMBO, Fausto. El ícono ético: la imagen de síntesis y un nuevo paradigma moral. In: TALENS, Jenaro (dir.). **Videoculturas de fin de siglo**. Madrid: Cátedra, 1990, p. 145-156.

20. LOTMAN, Juri. **The unpredictable workings of culture**. Tallinn: Tallinn University Press, 2013; PRIGOGINE, Ilya; STENGERS, Isabelle. **A nova aliança**. Brasília, DF: Editora UnB, 1997.

21. HOFSTADTER, Douglas. **Godel, Escher, Bach: an eternal golden braid**. New York: Basic Books, 1979.

22. JAKOBSON, Roman. Linguística e poética. In: JAKOBSON, Roman. **Linguística e comunicação**. São Paulo: Cultrix, 1971. p. 118-162.

23. MATURANA, Humberto. **Emociones y lenguaje en educación y política**. Santiago: Dolmen, 1997; MATURANA, Humberto; VARELA, Francisco. **A árvore do conhecimento: as bases biológicas do entendimento humano**. Campinas: Psy, 1995.

24. French poet Paul Valéry dedicated to the Ouroboros myth one of his most daring poems: *Ebauche d'Un Serpent* (Outline of a serpent), translated into Portuguese by the Brazilian poet Augusto de Campos. CAMPOS, Augusto de. **Paul Valéry: a serpente e o pensar**. São Paulo: Brasiliense, 1984.



Figure 3: Ouroboros

In the light of self-referentiality, it can be inferred that there can be no understanding without studies on its own means of production, which supports the demand to examine the socio-cultural relations according to a bias in the criticism of the media in its history and historicity, which is equivalent to focus on digital codes in the lineage of the historical development of other cultural codes. At the outset, there are assumptions to be observed: (1) technical rationality is not a privilege in the development of digital codes, but in the development of technique, as Walter Benjamin reminds us²⁶; (2) codes are socially created conventions in different fields of knowledge; (3) code control does not come with the internet; and (4) computer technoculture is part of the culture cyberneticization process established in the midst of many scientific discoveries. If we think about the counterfield of self-referentiality phenomena in which human, social systems turn out to be extremely complex systems, beyond the reach of any match, the problem of domination and accurate control does not arise as an insurmountable epistemological obstacle, as the field of forces and technical disputes make us believe. Current events in circulation open the way to think about the limits in which certainties escape the standards so rigidly programmed.

Educational campaigns broadcast over the radio – still the most efficient way to reach the most distant poles and difficult to access in the country – are enunciated as a warning signal to the dubious messages that circulate through the social networks of mobile media over the last few years (2018- 2019). The alert declares: “this is a false message [or news].” It does not take much theory to realize that the sentence uttered consists of a paradox: the sentence is correct, however, the relationship with its reference is

25 Available from: https://en.wikipedia.org/wiki/Ouroboros#/media/File:Serpiente_alquimica.jpg. Access on: Jan. 9, 2020.

26. BENJAMIN, Walter. A obra de arte na era de sua reprodutibilidade técnica. A obra de arte na era de sua reprodutibilidade técnica. In: BENJAMIN, Walter. **Sobre arte, técnica e política**. Lisboa: Relógio D'Água, 1992. p. 71113.

not: a message (news) can only be true; if it is false, it is not a message. We are facing the problems of a disturbing, self-referential statement. Self-referential meaning has been the object of a privileged study of linguistic disciplines and should be the subject of all sciences that gravitate towards language, putting at risk and challenging the sign's referentiality²⁷.

The contemporary debate that affects and haunts different fields of theoretical reflection revolves around a problem of self-referentiality: the fake news that, in the not too distant past, were understood as “factoids”²⁸ or even as “rumors,” in documentation of Morin²⁹ on post-World War II, about rumors that Hitler was still alive. Even though it is the production of communication on the mobile phone and internet network, as well as fake news, the factoid³⁰ appears as a neologism in the context of the American English language geopolitics when there is an expansion of the press and media power in the era of mass communication; therefore, it is not a product of the internet.

Despite the crisis installed and, increasingly, threatening to the universe of meanings in the communicational productions, self-referentiality and the entire conceptual field of noise, entropy, simulations, autopoiesis, control and the second law of thermodynamics continue to be objects of interest to physicists, to engineers and theorists of information, informatics, cybernetics, but not to theorists of communication and language. We have here a real epistemological obstacle preventing knowledge achievements.

The frights that affect us make us suspicious of such precepts, after all, there is no way to doubt the synthetic noises that confront us in these dark times, putting at risk what defines our cultural-anthropological condition: human interaction and the autonomy of speech production. The digital media in their telematic and digital information³¹ networks have changed the ecology of communication systems, highlighting the agents of technical rationality and the field of forces that irreversibly spread through socio-technical relations.

Without disdain of threats, our weapon remains the thought translated into signs of the communication languages. Therefore, there is no reason not to face the challenges using the theories that, whether we like or not, examine concepts relevant to the world of communication, as stated in the first part of this article. This is the main objective of our contribution to the contemporary debate on the agenda, which can undoubtedly open explanatory paths through its synthetic sounds of factoids, fake news, memes and all these entropic movements of the non-deterministic world.

In the pursuit of building a synthetic world, based on numerical calculations and combinations of infinite possibilities, self-referential processes result directly from the work of computer language codes. The hard core of the computer system depends, therefore, on algorithms, not on analogical referents. It is “an authentic product of simulation³².”

27. COLOMBO, op. cit.

28. VOLLI, op. cit.

29. MORIN, Edgar. **O ano zero da Alemanha**. Porto Alegre: Sulina, 2009.

30. The suffix “oide” in Portuguese adds a derogatory meaning to the word (as in “debilóide,” “intelectualóide,” “humanoide” etc.). VOLLI, op. cit.

31. Information and informatics designate two different entities. As Gianfranco Bettetini explains, “information refers to the determination of what is determinable: determinable, in the Aristotelian tradition, is represented by matter and, in the logical perspective of quantifying data technology, is reduced to a binary alternative relationship that supposes a decision to choose between two possibilities.” Therefore, information means quantities, informatics, math calculation operations. BETTETINI, Gianfranco. *Las ambigüedades del sujeto informador*. BETTETINI, Gianfranco. **La conversación audiovisual**. Madrid: Cátedra, 1996, p. 63.

32. YOUNGBLOOD apud COLOMBO, op. cit. p. 156.

We know that without codes, no language and no culture is supported. Western civilization had its development marked by the discovery of the alphabet and the consequent invention of writing, which became the multiplier force of codes. How should we understand the audiovisual world in which we live without understanding the dynamics of the photographic codes of light that produce images that dominate cultural environments? The same can be said about the digital codes. However, codes are cultural conventions resulting from intellectual achievements.

From the historical point of view, the emergence of writing has challenged not only the learning of a code, but also the development of cognitive skills for its reading. For cultural historians, the great invention of writing does not focus on the acquisition of the alphabetical code, but on the emergence of the reading man. The reading man is the agent of reading, and this is the great force that triggered the exponential civilizing event in the magnitude of its expansion in constant becoming. As a result of such an undertaking, we can only regret that the so proclaimed digital culture so far does not seem in the disposition to enhance any human capacity, since the reader has been relegated to the mere condition of a user. We are just consumers of a consumer market, ignorant illiterates of digital media. We can say that, from this point of view, the business model implemented by the internet was successful, since chances of critical reading decrease dramatically if we do not face the difference between the formation of citizens and users.

Thus, the great paradox of self-referential codes in the digital virtual environment is placed in front of us: the radical distance between the hand – our digits – and our brain. It was not the connection between hand and cerebral cortex that conditioned the distinction between man and ape, enabling our ancestors to stand, freeing their hands to perform tasks³³. We would be condemned to the ignorance of those who only surf the waves of the superficiality of digital networks if it were not for the possibility of understanding the functioning of digital codes, their generative capacity to simulate virtual worlds and the development of artificial languages that move information and communication. Let us focus on understanding the codes and the environments they develop.

We have learned with M. McLuhan³⁴ that the media generate environments, since they combine different ways of processing the available information and of making it accessible to human perception, cognition and interaction. This is how he understood meaning production: one that acts through environmental mediations. For McLuhan, such a environment moved a cyberneticization process of communication and culture, since the information processing available in the environments combined actions from different sources, namely, environmental, human and machinery, which demands an exercise of control in fight against entropy. Consequently, in order to understand the nature and action of the media, information must be placed at the center of the communicative universe. Such an understanding was not taken seriously, unfortunately for future generations that are born, grow and live in the 21st century in network connections in virtual environments – of simulation in self-referential networks subject to all kinds of entropy.

33. ENGELS, Friedrich. Humanização do macaco pelo trabalho. In: ENGELS, Friedrich. **A dialética da natureza**. Rio de Janeiro: Paz e Terra, 1979. p. 215-217.

34. MCLUHAN, Marshall; FIORE, Quentin. **O meio são as mensagens: um inventário de efeitos**. Rio de Janeiro: Record, 1969.

Umberto Eco was more fortunate: he became a respected semiotician whose boldness led him to advance many of the proposals announced by the Canadian guru. In a provocative article, Eco³⁵ develops McLuhan's idea that the media take control of the information production process and, therefore, of power – which we hope to have dealt with satisfactorily in the first part of the article. Eco's shrewdness forces us to follow his thinking more slowly.

When redefining the code from its functions, Eco states: “a code is a system of pre-fixed possibilities and only based on the code are we able to determine whether the elements of the messages are intentional (desired by the source) or a consequence of noise³⁶.” With this, it gives the different uses of the code the prerogative to incorporate certain content and to expand the interpretive field of its possibilities, thus confirming the idea that “the universe of mass communications is full of these conflicting interpretations; I would say that the variability of interpretations is the constant law of mass communications³⁷.” With this, Eco reaffirms not only that “the message depends on the code,” but also that the use of codes is uncontrollable and completely unpredictable: “they are not controllable neither by private will nor by the community³⁸.” Ultimately, it is a matter of considering that the use of codes implies resizing not the starting coding nor the decoding within the corresponding record, but rather the recoding, when the recipient triggers messages with the codes of his living universe, his intellectual repertoire and critical skill.

The internet is far from developing the intellectual ability presented by Eco, although there are initiatives that deserve to be examined, for example, that proposed by the semiotic operation in vogue on the internet called *dog whistle*, which in Wikipedia entry appears as *Dog-whistle politics*³⁹. The operation consists of sending a political message that seems to mean something to the population in general, but that has a different or more specific meaning for another subgroup, already predetermined in this communication strategy. As is well known, dog whistles emit frequencies that humans cannot hear. The recoded code would then act as the whistle that resonates at a frequency that humans cannot hear, but that dogs can. The same happens with what is audible only by the groups equipped with the code to decipher the emitted code.

Faced with this ambivalence of codes, which undermines the consecrated idea that the media transmit ideology of industrial society in a unilateral way, Eco proposes the need for a semiological guerrilla conduct that can be understood by the following reasoning.

If you want a less paradoxical formulation, I will say: the battle for the survival of man as a responsible being in the age of communication is not won there where communication starts, but where it reaches. If I spoke about guerrillas, it is because a paradoxical and difficult fate awaits us – I say to us, communication scientists and communication technicians: precisely while the communication systems provide for a single industrialized source and a single message that will reach a public dispersed throughout the world, we will have to be able to imagine complementary communication systems that allow us to reach each isolated human group, each

40. ECO, op. cit., p. 173.

41. HALL, Stuart. Encoding/decoding. In: HALL, Stuart; SOVIK, Liv (org.). **Da diáspora: identidades e mediações culturais**. Belo Horizonte: Editora UFMG, 2006. p. 365-381. See also FAUSTO NETO, Antônio. Enunciação, auto-referencialidade e incompletude. **Revista FAMECOS**, Porto Alegre, v. 14, n. 34, p. 78-85, 2007.

42. HALL, op. cit., p. 366.

43. Ibidem, p. 369.

isolated member of the universal public, to discuss the message that arrives in the light of the arrival codes, confronting them with the departure ones⁴⁰.

Formulations like these marked the great theoretical quarrels of communication studies throughout the second half of the 20th century and have remained so. Little or almost no attention was paid to them by media scholars since the code, in the communicational episteme of the mass media, was considered a closed information system, restricted to its uniqueness. The understanding of the unique code of the language as a naturalized process, for example, marked only the beginning of a great disagreement. Going down this path is an inglorious task, so changing the approach without escaping the problem can represent a gain in knowledge. This seems to have been the option of Stuart Hall when forwarding studies on cultural mediations – also, like Eco, based on television studies – focused on the encoding and decoding circuit, thus advancing Eco’s proposal to study the “codes of arrival” as a strategy to fight for survival in the age of communication.

The dialogue with Hall starts from a notion that is very dear to us: the importance of reading cultural codes in the contexts of interactions within the semiotic ecology of communication and the practices that political relations transform into discourses. It is through reading that the plot of such interactions entails its challenges. Whoever talks about reading, therefore, talks about discursive production of language, spheres of signical refractions and complexities.

For Hall, discursive production delimits a type of singular and distinctive production among the productions of our society, since the discourse is codified sign production. Considering that discursive decoding is only effective when social circulation occurs, what has been encoded enters the dynamics of interaction and becomes the movement of its enunciation⁴¹. Thus, “the moment a historical event is put under the sign of discourse, it is subject to all the complexity of the formal ‘rules’ by which language means⁴².” In addition to the asymmetry between encoding and decoding moments, the distinction between source codes and reception codes highlights the actions that both transmit and distort what has been encoded, denouncing the potential noises of the circulation and decoding process or, as stated by Hall⁴³, “What are called ‘distortions’ or ‘misunderstandings’ arise precisely because of the lack of equivalence between the two sides in communicative exchange.” Here is an educational lesson in reading the media bequeathed by television studies, which deserve to be repositioned in relation to the digital media that operate a diversity of codes, particularly because they are organized based on what Hall⁴⁴ defines as a “semiotic paradigm” configured by iconic signs⁴⁵.

The complexity that affronts us comes from the dominant discourse produced by iconic signs, those that translate the three-dimensional world into two-dimensional signs (such as audiovisual forms) or numerical signs (such as digital forms). Refractions that do not escape even codes that seem naturalized, such is the similarity produced between the perceptual conditions of those who come into contact with them. However, as Hall understood, “these conditions

35. ECO, Umberto. *Guerrilha semiológica*. In: ECO, Umberto. **Via-gem na irrealdade cotidiana**. Rio de Janeiro: Nova Fronteira, 1984. p. 165-175.

36. *Ibidem*, p. 168.

37. *Ibidem*, p. 171.

38. *Ibidem*, p. 172.

39. DOG-whistle politics. In: WIKIPEDIA: the free encyclopedia. [San Francisco, CA: Wikimedia Foundation, 20--]. Available from: https://en.wikipedia.org/wiki/Dog-whistle_politics. Access on: Nov. 20, 2019.

of perception are the result of a set of highly coded operations, albeit virtually unconscious – they are decodings⁴⁶.”

In examining the iconic construction of three-dimensionality by audio-visual images, Hall produced his warning:

Since visual discourse translates a three-dimensional world into two-dimensional planes, it cannot, of course, be the referent or concept that it means. The dog, in the movie, can bark, but it can't bite! Reality exists outside of language, but it is constantly mediated by language or through it: and what we can know and say must be produced in and through discourse. Discursive “knowledge” is the product not of the transparent representation of the “real” in language, but of the articulation of language in real conditions and relationships. Thus, there is no intelligible speech without the operation of a code. Iconic signs are therefore also encoded signs – even if the codes here work differently than other signs. There is no zero grade in language⁴⁷.

The serious distortion promoted by the ignorance of the dialectic that the iconic signs represent is in charge of simplifying the decoding, ignoring the conventionality of the codes that appear, thus, naturalized as if they were transparent instances of referential universes of reality. Hall's warning deserves to be learned:

The operation of naturalized codes reveals not the transparency and “naturalness” of the language, but the depth, the habitual character and the quasi-universality of the codes in use. They produce apparently “natural” recognition. This produces the (ideological) effect of covering up the present coding practices. But we must not let appearances deceive us. In fact, what the naturalized codes demonstrate is the degree of familiarity that occurs when there is a fundamental alignment and reciprocity – the achievement of equivalence – between the coding and decoding sides of an exchange of meanings⁴⁸.

To conclude his argument, Hall summons Eco, for whom the iconic signs “look like real-world objects because they reproduce the perceptual conditions (that is, the codes) of those who see them⁴⁹.”

If it is in the instance of the sign that the distortions happen, we can reformulate some questions posed initially. The first concerns the power of codes and the control that, in its name, is exercised by hegemonic forces. If the ability to read is, in fact, a transformative intervention force, the same device of human intelligence that builds codes can break it. Wasn't this Alan Turing's mission in favor of allied troops at the end of the second world war? Despite the historical distances, the map of geopolitical hegemonies in the contemporary context demands similar interventions (not equivalent). However, investments are lacking so that people can stop being just users and become citizens aware of the challenges to be overcome. For the maintenance of an economic model based on consumption in digital environments, this challenge literally does not make sense. Therefore, this can only be undertaken based on education for communication. The mastery of codes is only the beginning of a long process whose path is reworked with each new set of data of cultural unpredictability. If ancestors bet on the education of the reading man, why are we going to give up?

44. Ibidem, p. 370.

45. Under the name of icon, the semiotic study understands the sign construction guided by the similarity processes between instances that naturally have no connection or correspondence, since they result from the mediation of conventionalized codes to represent what is stated. Let us remember here the renowned study by Michel Foucault on René Magritte's canvas, *La trahison des images* (The betrayal of images), in which the phrase affixed to the canvas – “Ceci n'est pas une pipe” (This is not a pipe) – is examined as a paradox and self-referentiality. The icon states that it is a drawing of a pipe, not equivalent to the pipe of the empirical world, while the viewer's perception tells him otherwise, even though he knows that the drawing is not suitable for the taste of those who smoke. FOUCAULT, Michel. **Isto não é um cachimbo**. Rio de Janeiro: Paz e Terra, 1988.

46. HALL, op. cit., p. 6.

47. Ibidem, p. 371.

48. Ibidem, p. 370.

49. ECO apud HALL, op. cit., p. 371.

3. FINAL CONSIDERATIONS

The overcoming of ignorance in relation to the techno-culture digital media cannot do without a literacy project whose initiation does not differ from the learning acquired with the other codes. Learning alphabetic writing endowed us with perceptual and cognitive skills to develop other codes and other skills. Now, we are in another stage of literacy that, like the onion metaphor, implies the adoption of an education that contemplates the different layers that compose the digital media and their dynamics, as shown in Chart 1.

Technical media are not just the result of technical rationality. The cultural value of each of them is linked to the patrimony bequeathed by the semiotic ecology formed by the diversity of cultural codes. We exercise calligraphy for the development of verbal writing; we learned how the camera works to learn how to write with light from photographic and cinematographic codes; and so it is also necessary to develop and implement literacy projects with computer-digital codes, a task that involves the communication languages (verbal, visual, sound, audiovisual) and programming in the hard core of their activities. Evidently, the fruit of this set of writings translates into the domain of iconic signs in their generation by digital codes.

Mastery of iconic languages implies gains in knowledge and expansion of repertoire that dignify human society with its own achievements, inventions, creations. Such is the domain of self-referentiality that it is up to us to know, practice, share and multiply, in order to extinguish the root ignorance, which insists on transforming us into users of material goods that in no way contribute to dignify human existence on the planet. It is not a question of denying the use we make of technique and technology, but of education for its use based on semiotic competences that involve learning the codes at stake, as we discussed previously, and also education for the human qualities of reflection, which demands time for the development of thought. Otherwise, our thinking will only become calculus, as the communication philosopher Byung-Chul Han⁵⁰ warns in his recent works on the adoption of the logic that we expose as logics of life for humanity.

BIBLIOGRAPHICAL REFERENCES

- BENJAMIN, Walter. A obra de arte na era de sua reprodutibilidade técnica. *In*: BENJAMIN, Walter. **Sobre arte, técnica e política**. Lisboa: Relógio D'Água, 1992. p. 71-113.
- CAMPOS, Augusto de. **Paul Valéry: a serpente e o pensar**. São Paulo: Brasiliense, 1984.
- BETTETINI, Gianfranco. Las ambigüedades del sujeto informador. BETTETINI, Gianfranco. **La conversación audiovisual**. Madrid: Cátedra, 1996. p. 63-70.

50. HAN, Byung-Chul. **Sociedade da transparência**. Petrópolis: Vozes, 2017a; Idem. **Sociedade do cansaço**. Petrópolis: Vozes, 2017b; Idem. **Topologia da violência**. Petrópolis: Vozes, 2017c.

- COLOMBO, Fausto. El ícono ético: la imagen de síntesis y un nuevo paradigma moral. *In*: TALENS, Jenaro (dir.). **Videoculturas de fin de siglo**. Madrid: Cátedra, 1990. p. 145-156.
- DOG-whistle politics. *In*: WIKIPEDIA: the free encyclopedia. [San Francisco, CA: Wikimedia Foundation, 20-]. Available from: https://en.wikipedia.org/wiki/Dog-whistle_politics. Access on: Nov. 20, 2019.
- ECO, Umberto. Guerrilha semiológica. *In*: ECO, Umberto. **Viagem na irrealidade cotidiana**. Rio de Janeiro: Nova Fronteira, 1984. p. 65-75.
- ENGELS, Friedrich. Humanização do macaco pelo trabalho. *In*: ENGELS, Friedrich. **A dialética da natureza**. Rio de Janeiro: Paz e Terra, 1979.
- FAUSTO NETO, Antônio. Enunciação, auto-referencialidade e incompletude. **Revista FAMECOS**, Porto Alegre, v. 14, n. 34, p. 78-85, 2007.
- FOUCAULT, Michel. **Isto não é um cachimbo**. Rio de Janeiro: Paz e Terra, 1988.
- FOUCAULT, Michel. **Nascimento da biopolítica**. Lisboa: Edições 70, 2010.
- GALLOWAY, Alexander. **Protocol**: how control exists after decentralization. Massachusetts: The MIT Press, 2004.
- HALL, Stuart. Encoding/decoding. *In*: HALL, Stuart; SOVIK, Liv (org.). **Da diáspora**: identidades e mediações culturais. Belo Horizonte: Editora UFMG, 2006. p. 365-381.
- HAN, Byung-Chul. **Sociedade da transparência**. Petrópolis: Vozes, 2017a.
- HAN, Byung-Chul. **Sociedade do cansaço**. Petrópolis: Vozes, 2017b.
- HAN, Byung-Chul. **Topologia da violência**. Petrópolis: Vozes, 2017c.
- HERN, Alex. Revealed: how TikTok censors videos that do not please Beijing. **The Guardian**, London, Sept. 25, 2019. Available from: <https://www.theguardian.com/technology/2019/sep/25/revealed-how-tiktok-censors-videos-that-do-not-please-beijing>. Access on: Oct. 14, 2019.
- HISTORY. *In*: TOR Project. Seattle: The Tor Project, 2011. Available from: <https://www.torproject.org/about/history/>. Access on: Dec. 27, 2019.
- HOFSTADTER, Douglas. **Godel, Escher, Bach**: an eternal golden braid. New York: Basic Books, 1979.
- JAKOBSON, Roman. Linguística e poética. *In*: JAKOBSON, Roman. **Linguística e comunicação**. São Paulo: Cultrix, 1971. p. 118-162.
- LINGUAGEMassembly. *In*: WIKIPEDIA: the free encyclopedia. [San Francisco, CA: Wikimedia Foundation, 2016]. Available from: <http://pt.wikipedia.org/wiki/Assembly>. Access on: Oct. 25, 2010.
- LOTMAN, Iuri. **A estrutura do texto artístico**. Lisboa: Estampa, 1978.

LOTMAN, Juri. **The unpredictable workings of culture**. Tallinn: Tallinn University Press, 2013.

MANOVICH, Lev. Database as symbolic form. **Convergence**, Thousand Oaks, v. 5, n. 2, p. 81-99, 1999. Available from: <http://con.sagepub.com/content/5/2/80>. Access on: May 5, 2019.

MATURANA, Humberto. **Emociones y lenguaje en educación y política**. Santiago: Dolmen, 1997.

MATURANA, Humberto; VARELA, Francisco. **A árvore do conhecimento: as bases biológicas do entendimento humano**. Campinas: Psy, 1995.

MCLUHAN, Marshall; FIORE, Quentin. **O meio são as mensagens: um inventário de efeitos**. Rio de Janeiro: Record, 1969.

MORIN, Edgar. **O ano zero da Alemanha**. Porto Alegre: Sulina, 2009.

PÉREZ, Ignacio. El rol de los proxies y protocolos en la investigación de malware. **We live security**, Buenos Aires, May 29, 2015. Available from: <https://www.welivesecurity.com/la-es/2015/05/29/proxies-y-protocolos-investigacion-malware/>. Access on: Nov. 15, 2019.

PRIGOGINE, Ilya; STENGERS, Isabelle. **A nova aliança**. 3. ed. Brasília, DF: Editora UnB, 1997.

SHIRKY, Clay. **Lá vem todo mundo: o poder de organizar sem organizações**. Rio de Janeiro: Zahar, 2011.

THACKER, Eugene. Foreword: protocol is as protocol does. *In*: GALLOWAY, Alexander. **Protocol: how control exists after decentralization**. Massachusetts: The MIT Press, 2004. p. XI XXIV.

TIM Berners-Lee. *In*: WIKIPEDIA: the free encyclopedia. [San Francisco, CA: Wikimedia Foundation, 20–]. Available from: https://pt.wikipedia.org/wiki/Tim_Berners-Lee. Access on: Nov. 20, 2019.

VOLLI, Ugo. Factoides y mnemos: por una ecología semiótica. *In*: TALENS, Jenaro (dir.). **Videoculturas de fin de siglo**. Madrid: Cátedra, 1990. p. 129-135.

WIENER, Anna. The complicated legacy of Stewart Brand's "Whole Earth Catalog". **The New Yorker**, New York, Nov. 16, 2018. Letter from Silicon Valley. Available from: <https://www.newyorker.com/news/letter-from-silicon-valley/the-complicated-legacy-of-stewart-brands-whole-earth-catalog>. Access on: Nov. 15, 2019.