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INTERACTIVE DIGITAL NARRATIVES: HOW ACTION AND EMBODIMENT CONSTRUCT MEANING ON BEHAVING SYSTEMS

NARRATIVAS DIGITAIS INTERACTIVAS: A IMPORTÂNCIA DA ACÇÃO E DO CORPO NA CONSTRUÇÃO DE SIGNIFICADO EM SISTEMAS COMPORTAMENTAIS

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ABSTRACT

Computational and interactive technologies are ubiquitous and have facilitated the incorporation of a set of semiotic systems that enable the creation of distinct meanings and formats in the understanding of the emergent messages. Experiencing and comprehending the same system through the constantly reminded of distinctive strategies and paths creates some challenges and aesthetic implications represented in the social, political, and cultural context.

Forms of collaboration and communication are described by actions carried out while receiving feedback and evaluating their result, making itself available through physical movement and interaction. We act to sense and construct meaning, so our brains create information and sense-making based on our body's movement, the environment's spatial organization, among other organized activities. In the same way, interactive systems are embodied, dynamic, performative, and they are regularly communicating with their environment, becoming autopoietic.

Interactive digital narratives are artifacts that connect states and structured events finding meaning in them, making sense of the world by assimilating it to narrative. They stand for a wide range of variations and readers interact with a computational system to develop the narrative, assuming the role of active participants. They disrupt conventional aesthetics because their nature has a set of affordances and dimensions, and their dynamics of interaction are involved in a processual, performative, and enactive way, shaping the form of narrative and affecting the reader's experience.

We will discuss some idiosyncratic characteristics that turn these artifacts into behaving systems from the analysis of how the supporting medium's properties shape the narrative and the action as fundamental features of interaction and construction of meaning. Centring on systems that have their own behavior we can discuss a phenomenological perspective on embodied experience and understand how readers perform on interactive digital narratives.

KEYWORDS

Interactive Systems, Interactive Digital Narratives, Embodiment, Aesthetics, Action, Construction of Meaning

RESUMO

As tecnologias computacionais e interactivas são ubíquas e têm facilitado a incorporação de um conjunto de sistemas semióticos que permitem a criação de significados e formatos distintos na compreensão das mensagens emergentes. Experimentar e compreender o mesmo sistema através de caminhos que se alteram representa um grande número de desafios e implicações estéticas no contexto social, político e cultural.

As formas de interacção e comunicação são descritas por acções que acontecem numa troca contínua de feedback e de avaliação dos resultados que daí advém, tornando-se disponíveis através do movimento e da interacção física. Actuamos para sentir e construir significado, pelo que os nossos cérebros criam informação e significado com base no movimento do corpo e na organização espacial do ambiente que nos rodeia. Da mesma forma, os sistemas interactivos, por existirem significativamente num contexto específico, vão transformando fluxos de dados e acabam por constituir modalidades de corporeidade um do outro. São sistemas dinâmicos e performativos, e comunicam regularmente com o seu ambiente, tornando-se autopoiéticos.

As narrativas digitais interactivas (IDN) são artefactos essenciais na forma como lidamos com o mundo e que ligam causalmente estados e eventos estruturados. Permitem uma vasta gama de variações, já

que os leitores interagem com o sistema computacional para desenvolver a narrativa no papel de participantes activos. Rompem ainda com a estética convencional porque as suas dinâmicas de interacção estão envolvidas em formas processuais e performativas, moldando a forma da narrativa e a experiência do leitor.

A partir de uma análise das propriedades do ambiente digital em que estas narrativas acontecem e, baseados na acção como uma característica fundamental da interacção e da construção de significado, discutiremos algumas individualidades que transformam estes artefactos em sistemas comportamentais. A experiência com ambientes digitais baseada na nossa corporeidade permite-nos promover uma visão estética adequada a obras que reagem aos contributos dos leitores.

PALAVRAS-CHAVE

Sistemas interactivos, Narrativas digitais interactivas, Corporeidade, Estética, Acção, Construção de significado

1 Introduction

Although we are continually being bombarded with the most diverse sensory inputs, our subjective experience is punctuated by the perception of events represented with a very identifiable beginning and end (Radvansky & Zacks, 2014). These representations of events are abstract and schematic and allow us to generalize our knowledge through time and space (Franklin et al., 2020). At the same time, every time we move, we produce a sensory event, based on a certain kind of sensorimotor skills, "and like everything else we achieve, we do so only against the background of our skills, knowledge, situation, and environment, including our social environment" (Noë, 2015, p. 8). Thus, our perception depends on the nature of our perceptual capabilities and how we create abstractions that are internalized and re-externalized as thoughts and meaning (Tversky, 2019). Perception is something that we do, which makes itself available through physical movement and interaction (Noë, 2004).

In this way, and if our knowledge constitution comes from the interaction and active exploration with the world in which we live, how the supporting medium's properties shape the form of the narrative and affect the narrative experience? How do we understand the narrative structures and meanings?

According to Marie-Laure Ryan, there are several distinct properties of digital media that impact narrativity. They are either unique to digital media or taken by them to a new level. Digital media have a reactive and interactive nature, where the reactive one is a response to a change in the environment or nonintentional user actions, and the interactive one is a response to a deliberate user action. They are established with multiple sensory and semiotic channels that constitute the multimedia capabilities. There is a connection between machines and people across space that brings them together in virtual environments. They are composed of volatile signs that can be rewritten and refreshed in several ways. They tend to be modular and composed of many autonomous objects used in many different contexts and combinations (Ryan, 2004, p. 338)[1]. There are more conditions in how the medium's properties can impact how one perceives and creates the narrative.

There are a relation between the narrative theory to the three elements that make up the language's grammar — semantics, syntax and pragmatic. Regarding to semantics there are different representations for the medium and the form and substance of the narrative content. Each medium has its characteristics, and we cannot tell the same story in a 300-page book as in a two-hour movie. In terms of syntax, digital media produce new ways to present stories that readers will need new interpretation forms. Finally, on the pragmatic level, they offer new modes of user involvement represented by a dichotomy: internal vs. external involvement and exploratory vs. ontological involvement. This dichotomy is related to the different types of interactivity, and Ryan (2005) relates them like the layers of an onion. In the outer layers, interactivity tends to be exploratory and concerns the story's presentation and how the users are free to move around. However, the readers situate themselves outside the virtual world and do not impact the narrative's destiny. In the inner layers, interactivity tends to be ontological and concerns the user's personal involvement in the story created dynamically "through the interaction between the user and the system" (Ryan, 2005).

Subsequently, the stories we tell are also limited by various semiotic resources, flooded with different types of information —factual, emotional, or cultural (Alonso, Molina, & Requejo, 2013)— and that results in countless forms of interpretation regarding from the readers. From a cognitive point of view, narratives are a complex network of mental spaces that combine and revert into emerging mental representations and contribute to constructing the global meaning of the narrative (Semino, 2009). They are the production and understanding of different intelligent behavior types since organizing experience into narrative may be essential to human cognition (Schank, 1990).

If readers learn their lived experiences by assimilating them into a narrative, we should seek the design of interactive systems that allow for the use of well-performed narrative skills in those systems' performance.

2 Narratives Intelligence

By telling stories, we order the events, organize them in experience, find meaning, and become an essential part of how we learn to approach the world (Nelson, 1989). Narrative can mean the act of telling a story by a narrator to an audience, representing the links that we build and with which we give meaning to life, or it can be the memory that is built, and that serves to keep present the past experience (Mateas & Sengers, 2003). It is a sign with a signifier —speech— and meaning — the history, mental image, or semantic representation (Ryan, 2002). Able to condition both the human body and the technological system, the narrative becomes a medium through which the two are immersed and communicate (Hayles, 1999). So computers become storytellers (Don, 1990), theater, with a dramatic plot (Laurel, 2013), or vehicles for narrative development (Murray, 1997).
Interactive Digital Narratives (IDNs) are computational, and like other digital environments, they are also participatory, spatial, and encyclopedic (Murray, 2012). Deeply interactive, they are based on feedback processes and their cognitive elaboration, so their fundamental features include real-time information exchange and selection and interpretation processes (Kwastek, 2013). IDNs become a medium based on the realization of narrative inputs (Manovich, 2001), so action becomes a primary component in the human-computer relationship accentuating its performative character, influenced by somatic actions (Joyce, 1996). By combining artificial and creative biological processes (Haraway, 1994), IDNs stimulate a reality that is constructed, allowing space for action whose rules are defined as a result of the reader's expectations, improving their critical thinking and understanding (Frasca, 2007).

Being algorithmic, IDNs are made up of *surfaces*, which represent the sensory components of the object, and computational *subfaces* to which we usually do not have direct access (Nake, 2016).

1 Janet Murray (2012) characterizes digital media according to four affordances: procedural (the computer becomes the primary vehicle of information), participatory, encyclopedic (information storage capacity), and spatial. Lev Manovich (2001) lists numerical representation, modularity, automation, variability, and the multiplicity of channels that he calls transcoding.

Surface and subface are inseparable, and any aesthetic manifestation must be studied from this peculiar ontology and seen as a semiotic entity (Gudwin, 1999), emphasized by the reader's ability to modify or be modified by system parameters (Lloyd, 2006). These artifacts are open works (Eco, 1989) and are ergodic since they force the reader to develop a non-trivial effort, building environments that imply their receptors and transform them into actors (Aarseth, 1997). IDNs provides scenarios and choices among several possible paths, in which the same starting points can be recreated, giving rise to multiple narrative arcs (Crawford, 2002) and are amplified and transformed repeatedly through space and time, and can be described as action-based means (Galloway, 2006).

IDN creators must develop a system where the content appears in readers' imagination as if they were really in the narrative world. In this way, the narrative can be understood as a mental construction where the readers' action and interaction trigger responses in the system (Koenitz et al., 2016) . Thus, for Janet Murray (2012), any interactive digital narrative's success is its "dramatic agency." Agency is a way of exploring the procedural and participatory properties of the environment, which leads readers to act according to a set of responses appropriate to the digital environment in which they are inserted (p. 9). Murray explains that:

> "To create a dramatic agency, the designer must create transparent interaction conventions (like clicking on the image of a garment to put it on the player's avatar) and map them onto actions which suggest rich story possibilities (like donning a magic cloak and suddenly becoming invisible) within clear story stories with dramatically focused episodes (such as, an opportunity to spy on enemy conspirators in a fantasy role-playing game)" (Murray, 2018).

Andy Pickering (1994) also treated the agency concept and developed him in two different idioms: the representational and the performative. In the representational one, all the knowledge produced is only relative to the agency, specifically human, of whom produces this knowledge. On the other hand, the performative idiom, is related to interactive digital narratives, defines that the world in which we find ourselves is full of agency. Besides the human beings who are agents, there are also other forms of agency, relative to the material world and the digital artifacts with which we relate that are also continually acting. "The performative idiom invites us to think symmetrically about agency: human beings are not the only actors around; the material world acts too. And it invites the further idea that science and technology are amongst our ways of coping with this busy world" (Pickering, 1994).

Since the act of telling a story is an essential part of human life, several systems have begun to emerge with the capacity to transmit these stories. Thus, they cease to exist only in the form of text and begin to organize themselves into cognitive structures forming bases for the field of automated story generation and, subsequently, the construction of intelligence narratives. Recognizing that experiences are continually being created and interpretation is always in flux, we see the experimental and performance characteristics of the digital artifact reinforced, where actions play a fundamental role in building meaning.

3 Actions that matter

Interactive systems offer new ways of understanding artistic and cultural practices that involve the construction of artifacts, organized spaces, and gesture and movement systems from a post-cognitivist perspective. The idea centered on post-cognitivist is represented according to a performative relationship with digital artifacts and a cognition relationship with social and cultural formations, leading to new ways of thinking about the development of interactive art, interface design, and human-computer interaction (Penny, 2017).

In general, human beings understand the world according to a synesthetic and proprioceptive function and are often led to take action. Thus, an aesthetic theory of interaction must include the development of concepts such as perception and action (Penny, 2017), which are provided with motor intentionality and involve direct, unmediated, and embodied contact with the world (Romdenh-Romluc, 2010).

Acting on procedural authorship and writing the rules that shape the way artifacts behave, IDNs become influential in the perception and formation of human subjectivity. The way to experience the digital artifact is a mode of activity that involves practical knowledge about the possible behaviors and the sensorial consequences associated with them (O'Regan & Noë, 2001). The relevance of integrating the notions of sensation and action is essential to understand that human beings act to comprehend mechanisms and meanings and that the body's experience has in motricity its primary reference. "Motricity is not a servant of the consciousness, which transports the body to the point of space that we previously represented (...) motricity is the primary sphere in which in the first place the meaning of all meanings is engendered in the domain of the represented space" (Merleau-Ponty, 1996).

Interactive digital narratives engage us in telling stories that have dynamic elements. These elements are the flow, which is defined by the sequences of actions, the significant events are when one action causes an action to happen, and parallelism reveals sequences of actions happening simultaneously. Focusing on an object of study whose interface is built to activate, control or channel an action, we resort to the distinction made by Kirsh and Maglio (1994) between actions that change the world (pragmatic) and actions that change the nature of our mental tasks (epistemic). While the pragmatic action is carried out so that we physically approach a goal, an epistemic action is defined as something a user does to their environment to facilitate the accomplishing of a specific goal rather than trying to achieve the goal directly. They assert that thinking is enhanced or made possible by manipulating things globally and identifying with artifacts (and associated sensorimotor procedures) as epistemic action (Kirsh & Maglio, 1994). An example given by the authors is the word game Scrabble, whose movement and interaction allows the joining of letters into words.

In this way, and taking into account that interactive digital narratives consist of observing and reflecting the results and combinations that come from the interaction with the artifact, we can speak of epistemic action par excellence. These are complex sensory actions through which we build our sense of place in the world, and this involves not only a pragmatic and instrumental action, but also an epistemic action that generates meaning (Penny, 2017, p. 374). Moreover, it generates meaning because it includes all other actions —speculative action, generative action, and creative action— in the way that "experience is not in the information (or the actual art piece itself), but it is in the interaction (the way the piece of art is understood in the real environment)" (Vyas & Van Der Veer, 2006).

Action leads to meaning, and meaning is related to the phenomenon of *transportation*. Transportation is represented by the feeling of leaving behind our current circumstances and vividly experiencing the events of a book or film. The more we feel transported, the more we feel the narrative's influence on our beliefs and attitudes (Zacks, 2015, p. 108). The simple act of leafing through a book or listening to a story conveys the feeling that the real world can disappear,

with a perception in which characters seem to be real, and situations in the narrative are happening. These experiences have a cognitive and emotional dimension that leads to a change of attitude, belief, or behavior through various processes, including the evocation of vivid mental images. The transport is facilitated by the actions that are headed and that relate to various types of interactivity. Explicit interactivity has to do with participation and choosing procedures related to "interaction, in the true sense of the word". In essence, it is related to the system's ability to include the reader in the subject represented by simulating his actions in a parallel world. At the same time, interaction can also occur at the cognitive level —cognitive interactivity— "which identifies psychological, emotional, hermeneutic or semiotic interactions," allowing to dive into a set of representations and sensations, creating a direct relationship with the concept of immersion (Zimmerman, 2004).

Interactivity must also be coherent and engaging. Coherence means that the experience makes sense and that the data collected about the reader adequately represents his/her behavior, and the system responds reliably. According to a dynamic of entertainment, the environment must be understood, contributing substantially to the interest of those who contact with the artifact. It is linked to the body —embodied interaction— and related to multiple agents' scenario, in virtual or real space, bringing interaction as inherently extended in both time and space (Penny, 2017, p. 358). As the mind extends beyond the brain into the body and the environment, and if so, "we may be able to see ourselves more truly as creatures of the world" (Clark & Chalmers, 1998), also bodily behavior and interaction "involves motor and cognitive extensions and the development of skills and cultures around them" (Penny, 2017, p. 198). Interaction is an embodied phenomenon because it happens in the world, and this world, either physical or social, transmits a form, substance, and meaning to interaction. So, interaction with an interactive digital narrative, for example, is an adaptation to our embodied experience in the world because "we are embodied beings whose sensorimotor acuities have formed around interactions with humans, other living and nonliving entities, materiality, and natural phenomena" (p. 364).

We experience digital environments based on predictions that are based on our body involvement with the world, so the reader's experience and space where the interaction occurs is turned into a relational process that addresses the entire system (p. 361), being a field appropriate to foster an aesthetics vision adequate to the computational world.

4 Aesthetics of behavior

We have been developing a relationship with computational technologies that are defined by the patterns of the immediate interactions that they lead and the web of relationships, experiences, and actions in which this interaction is made. Embodiment is the property of being manifest in and of the everyday world and does not merely imply a physical embodiment, but it also extends to other aspects of our everyday world. Conversation, for example, is an activity incorporated by the simple fact that it happens in the world through the participation between two people and is carried out according to an equally incorporated set of relationships, experiences, and actions. According to Alva Noë (2015), conversation is also an organized activity that obeys many factors. It is a primitive and biological activity responsible for our cognitive development process. It is fundamental in building relationships that happen in a time and place. It is also a source of pleasure since it can be involving and fascinating in the most diverse forms (p. 16). Action is also an organized activity "is a temporally extended, dynamic exchange with the world around us, one that is guided by principles of timing, thoughtfulness, movement, spontaneity, function, and pleasure" (p. 23). Action consists of operations on mental representations which are used in the construction of mechanical processes of the body (Penny, 2017, p. 103). It can be supported by intentionality, that describes a referential relationship between two entities. However, sometimes it is "possible for an agent to intentionally perform an action even when he or she did not specifically intend to perform that action" (Bratman, 1984). We need to distinguish between two different ways of experiencing the action – the action as an object and the action as a subject (Legrand, 2007). Action as an object is perceived and recognized as being of the reader while acting as a subject is the structure of experience through which the world is lived.

When action is involved, we usually take the perspective of the other than our own. So, interaction is concerned with how the actions organize us and how we managed to reorganize ourselves. It is a reorganizational practice, and their "value derives directly from the fundamental importance of organization in shaping human, and indeed all, life" (Noë, 2015, p. 33). It is a sense-making practice that embraces emotion and cognition and that occurs in a continuous temporal relationship with artifacts, tools, languages, human relations, and social systems. It is the development of connecting sensation and action immersed in a world, called "structural coupling". In that sense, "a cognitive system is a system whose organization defines a domain of interactions in which it can act with relevance to the maintenance of itself, and the process of cognition is the actual (inductive) acting or behaving in this domain" (Maturana & Varela, 1980, p. 13). A cognition system is also determined by its autonomy, which signifies that "it is composed of processes that generate and sustain the system as a unity and thereby also define an environment for the system" (Thompson & Stapleton, 2009, p. 24). In this way, "the capacity of a system to manage the flow of matter and energy through it so that it can, at the same time, regulate, modify, and control: (i) internal self-constructive processes and (ii) processes of exchange with the environment'' (Ruiz-Mirazo & Moreno, 2004, p. 240).

The system of an interactive digital narrative, unlike traditional systems, needs to incorporate several functionalities. Firstly, there needs to be a represented history that includes a set of possibilities. Then, to generate a narrative interactively, the system also needs to integrate the user's feedback with its actions and interpret its inputs. "Additionally, it should monitor the user's state independently from active input" (Schröder et al., 2017, p. 381). Thirdly, the inputs should not be limited to classical devices such as the mouse and keyboard "since the storyteller is designed to be perceived as a social counterpart" (p. 381). He must be programmed to understand nonverbal communication elements. Therefore, to allow a natural form of interaction with the narrative and allow close contact with the expression of ideas, memories, and thoughts through different forms of representation and various media, methods are needed to process the user's multimodal inputs.

Furthermore, the behavior of the computational system should matters. It contributes to the aesthetic, visual, and procedural experience and implies the development of an "aesthetics of behavior". Simon Penny (2017) introduces this concept when he talks about two kinds of behaving artifacts practices that the author called "real-time computational art (RTCA) or computationally articulated cultural artifacts (CACA)" (p. 319). These practices are characterized by the active, involved relation in ongoing feedback loops created between the artifact and the reader. So, "behavior is a central part of the artwork in its presented form and in which the designing of behavior is a central part of the practice" (p. 319). The main characteristics that mark this type of practice are building artifacts that imply behavior and embodied and action-guided perception. So, interactive digital narratives become subjects that respond to changes in their environment. That situates the readers as embodied individuals in a world populated by embodied subjects (Ryan, 2004, p. 2).

5 Conclusions

Interaction incites some aesthetic challenges defined by the modes of representation of the artifacts and the emotional responses evoked in the readers when they contact the object. Thus, new social meanings emerge that reflect procedures at the level of composition and interaction of interactive digital narratives and the relationship between the actors involved in the system. Therefore, we look at the narrative as an instrument of thought and a vehicle of meaning, elucidating the complex dependence and the dichotomous relationships between nature and technology.

Multimodality adds complexity to the production of these narratives since the information provided through three different channels —verbal, visual, and auditory— affects the processing of the narrative and the system in which it is inserted. This way, the IDN gains a performative side that brings a paradigm shift in observing receptivity modes, knowledge production, and social expressions. In this way, opportunities arise not only for representations of the real world but also for creating new and augmented realities (Kwastek, 2013).

Analyzing the body as a visible object to which meaning can be attributed allows us to observe it as a communicative resource, which develops through mixing with other bodies, be they organic or mechanical. In an interdisciplinary approach, we focus on the ability to plan and sequence aesthetic and semiotic elements into a coherent whole with the potential to bring about new interactive systems. We privilege aesthetic relationships, which focus on human perception, and study them from a *poietic* perspective, in which each element is a component of the ecosystem that has its own experience in the world (Hayles, 2014).

To understand how readers acquire knowledge about the internal structure of events that are release on interactive digital narratives, "we should look to phenomenological perspectives on embodied experience and ongoing sensorimotor flow and revisit the feedback loops of cybernetics" (Penny, 2017, p. 360). We can discuss the construction of meaning based on the environment that "trigger changes determined by the system's own structural properties" (Hayles, 1999). A new aesthetics arises that is proper to behaving systems, and it is "an invitation to find out where you are by exploring the work. The pieces are worlds, and worlds afford opportunities for exploration, investigation, and learning" (Noë, 2015).

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