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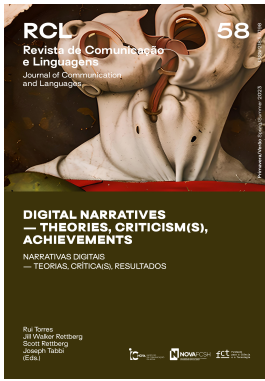
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# An Enactive Approach to the Construction of Meaning in Interactive Digital Narratives

## *Uma Abordagem Enactiva da Construção de Significado nas Narrativas Digitais Interactivas*

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### Abstract

Narratives are essential to our perception of the world. Considered ubiquitous in all activities involving the representation of events in time, they play a crucial role in collaborative sense-making in society. As the potential and uniqueness of computing as a storytelling medium become increasingly visible, narratives become volatile, unstable, dynamic, and unpredictable, allowing systems and readers to collaborate to tell stories together.

Interactive Digital Narratives are essential artifacts to how we relate with the world and causally link structured states and events. They expand with conventional narratives because their interaction dynamics are involved in procedural, performative, and interactive forms that shape the narrative and readers' experiences. Considering that the aesthetic experience of Interactive Digital

Narratives consists mainly of perceiving and enhancing the outcomes of the interaction between agents, we seek to understand how action influences the construction of meaning by the readers.

In this paper, we reassess the emergent properties of Interactive Digital Narratives, framing how the aesthetics of behavior has a significant role in this embodied and action-guided medium. Through the lens of the enactive theory of cognition, we want to understand how Interactive Digital Narratives incorporate information and structure the processes of reception, functioning as complex semiotic meaning productions and embodied sensorimotor making. For that, we establish and describe a strategy that specifies the behaviors a system can have to fulfill some abstraction layers that include their external surface and internal processes. We contribute to the discussion about how action and interaction promote new readership performances and subsequently affect the readers' subjectivity.

interactive digital narratives | emergence | action | construction of meaning | readers

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## Keywords

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## Resumo

As narrativas são essenciais para a nossa percepção do mundo. Consideradas onnipresentes em todas as atividades que envolvem a representação de eventos no tempo, elas desempenham um papel crucial na produção colaborativa de significado na sociedade. Quando o potencial e as possibilidades únicas da computação como meio de contar histórias se tornam cada vez mais visíveis, as narrativas tornam-se voláteis, instáveis, dinâmicas, e imprevisíveis, permitindo aos sistemas e leitores colaborar para contar histórias em conjunto.

As Narrativas Digitais Interactivas são fundamentais na criação de eventos situados, sendo representativas dum novo modo de contar histórias e que caracteriza a nossa relação com os outros e o mundo. Representadas por dinâmicas de interacção, tornam-se processuais e performativas, divergindo em novos modos narrativos, bem como diferentes experiências do leitor. Considerando que a experiência estética das narrativas digitais interactivas consiste principalmente em observar e reflectir os

resultados da interacção entre agentes, procuramos compreender como a prática da acção influencia a construção de significado por parte dos leitores.

Neste artigo, reavaliámos as propriedades emergentes das Narrativas Digitais Interactivas enquadrando a forma como a estética do comportamento tem um papel significativo neste meio personificado e orientado para a acção. Através da lente da teoria interactiva da cognição, queremos compreender como é que as Narrativas Digitais Interactivas incorporam informação e estruturam os processos de recepção, funcionando como produções semióticas complexas de significados. Para isso, estabelecemos e descrevemos uma estratégia que especifica os comportamentos que um sistema deve ter para cumprir algumas camadas de abstracção que incluem a sua superfície externa e processos internos. Contribuímos para a discussão sobre como a acção e interacção promovem novos desempenhos dos leitores e subsequentemente afectam a sua subjectividade.

narrativa digital interactiva | emergência | acção | construção de significado | leitor

## Palavras-chave

### 1. Introduction

Narratives are a fundamental part of how we write our history and are a representative feature of our evolution as individuals and in society. It is through them that we can preserve the past and create models of events that allow us to predict the future by simulating various possible outcomes. They become omnipresent in all activities that represent events in time because they are about the mix of invention and repetition, following rules that we have learned to recognize, being pervasive and accountable for a shared understanding of the world.

With the development of computational approaches that have the potential to communicate via most of the known semiotic modes (Gee 2013), narratives become experienceable through media, resulting from internal procedures of the narrative system and the readers' interactions with it. They become involved in a set of processes that imitate, simulate, and emulate other processes and that are indeterminate, open, variable, and situated (Carvalhais 2022). Interactive Digital Narratives (IDNs) are grounded on situated processes encompassing new ways of perceiving. They allow the combination of artificial

and creative biological processes (Haraway 1994) developed through interaction and presented in a narrative system constantly fluting and changing in new forms. Examples of these are Colossal Cave Adventure (1976), Afternoon, A Story (1987), Myst (1993), Fort McMoney (2013), Life is Strange (2015), Immortality (2022), among others. However, how do we engage with these computational artifacts? How do we read them, and how much effort do readers need to traverse the narratives? And how does the system need to behave to enable the Interactive Digital Narratives? We center and examine how Interactive Digital Narratives create meaning through the structure of aesthetic and semiotic components that are spanned and released through the interactive system. In a *medium* in which each constituent has a unique dimension implicitly, characterized by an aesthetic that has its focuses on human perception (Hayles 2014), we give our attention to the nature of the object and the relations that derive from here.

Interactive Digital Narratives present a broad range of stories that enable readers to move through spaces that provide resources for the emergence of different kinds of narratives. Narratives that the readers develop convey new experiences through manipulating an immersive environment. We can call them *evoked* narratives since we understand the story world following the narrative across different channels. *Enacting* narratives allows readers to perform or read events representing specific and localized incidents. *Embedded* narratives are made of linear sequences, but they are also constituted by the projections and interpretations produced during the narrative, linking events that are waiting to be discovered by readers. They have the potential to produce fragmentation and open-endedness (Nelles 2020). Their structure is presented through various pieces of information across multiple information channels distributed throughout the surrounding space (Jenkins 2004). An example of these transmedia narratives is the *Star Wars* saga, communicated through books, films, television comics, and games, among others. Each contributes to a relatively autonomous experience, but all underwrite the understanding of the narrative world (ibid).

Emergent narratives involve two types of actions: *operative* and *resultant*. Operative actions are the ones that readers can take, allowing them to define their own goals or stories. Resultant actions commonly involve subtle interactions within the system and emerge logically as the narrative unfolds (Schell 2008). Through these different types of actions, we have the capability to engage through a variety of processes, defined by “highly complex software artifacts” that may include dynamic story world representations and characters provided in a simulated system field (Suttie et al. 2013). These narratives emerge from the behaviors of a system and the readers, represented by a constant feedback loop between them that, at the same time, makes them act as opposing forces (Adams 2014).

A cybernetic relationship is established between the system and the reader. The playable system is defined by the challenges posed and “the actions that the player can take to meet those challenges” (Adams 2014, 37). Besides, there is a set of movements

that emerge as the narrative progresses and determine the effect of the readers' actions upon the narrative world. It is a dialogical relationship that always includes some sensory input, readers output, and internal readers cognition (Salen and Zimmerman 2004), composed of a sequence of narrative elements that can be both textual — the story elements that the system presents to the readers — and extratextual — the readers' attitudes and motivations. For that reason, a compelling narrative needs to offer us a succession of interpretive choices with predictable consequences that, however, should never be so obvious that we know precisely how they will unfold. At the same time, the narrative situations we encounter need to offer us the possibility of satisfaction through coherence, expansion, or closure (Upton 2017). All of this is achievable through the text, paratexts, and background of those who contact the narrative being executed repeatedly and consistently in a system that allows the creation of the feedback loop based on a semiotic sequence that requires special effort to navigate (Aarseth 1997).

This way, readers assume a role in the unfolding of the narrative (Wolf and Perron 2014) and are able to influence the course of events, either by invoking preprocessed sequences or by generating procedural outcomes (Aarseth 1997). Hence, we focus on knowing how to read and analyze these computational artifacts concerned with the behavior that seems to respond to the readers' actions at a level connected to the meaning of the readers' actions.

## 2. Narratives that Play the Readers

*Eliza* (1966), an early natural language processing computer program, was one of the first attempts to transform the nature of our aesthetic relationships with computation as a medium, creating the sense that we can talk with the computer and that the computer can answer us properly. It was an invitation to discover where we stood by exploring the work since we had to become different in order to navigate it. In *Afternoon, A Story* (1995), considered one of the most important early works of electronic literature today (Grigar 2021), the literary text can be understood due to coded and predetermined rules during its execution and the readers' activity and interactions. In *Façade* (2005), an example of the computer as a compelling medium for storytelling, new configurations of perception and agency place readers in an exceptional relation to what they perceive. In *Bandersnatch* (2018), the readers and the system react to each other's actions and influence each other's behaviors, thus shaping the outcome of events.

In these examples, we find a dialectical relationship where the reader and the narrative system oppose each other. There is an operational logic behind the narrative defined by the physical units of interactions performed by the readers represented in resulting actions that are triggered by the representation of events (Reed 2017). On the other side, the readers also challenge the narrative system by testing the capabilities and limitations of the system itself (Adams 2014). It is an arrangement that embodies the existence of modalities, where each one has its own way of communicating information

and has particular affordances that the others do not (Kress 1993), being semiotically distinct and contributing to the play state of IDNs.

Interactive Digital Narratives make available a set of choices for the audience that affects the order or way a series of events unfold. Allows the ability to make new patterns, find the unusual among the ordinary, and spark curiosity (Brown 2009) through a process of transduction where things transfer from one state to another (Kitchin and Dodge 2011), extending playing toward an attitude of being in the world (Sicart 2014). Engaging with specific objects and contexts that are similar to play but respect the purposes and goals of that object or context, IDNs disrupt and break the conventions and nature of how we see the world and how the world could appropriate an artifact that is not created or intended to play.

Through a sequence of two steps where the readers first perform an action, and then the system answers to that action by changing its state, we can observe a collection of data elements that can represent the process of reading an interactive digital narrative. We have a presentation engine that displays a set of movements and link anchors and that allows the identification of a set of actions that readers can perform to change the system's states. It is an interaction engine that registers the readers' actions and allows the transition from a current state to a new state, selecting the next movement and moving the narrative forward (Thue 2020). Based on the system's current state, we can determine what each reader should observe, possibly identifying the object that can be changed by interacting in the process. It refers to both how the readers interact with the system and how the system communicates to the readers based on established rules and constraints that regulate the development of the interactive digital narrative and determine the fundamental interactions that can take place within it.

Furthermore, the system describes the computational artifact as it exists on a digital storage medium (Koenitz 2010). It is a combination of *surfaces* representing the object's sensorial components and computational *subfaces* to which we usually do not have direct access (Nake 2016). There is a material level that defines the changes triggered by its operations in the material world (Kitchin and Dodge 2011), and there is the discursive level, in terms of the different narratives and discourses that generate and inform, enabling the construction of meaning. It is also “the ability to read and write processes, to engage procedural representation and aesthetics, to understand the interplay between the culturally-embedded practices of human meaning-making and technically-mediated processes” (Davidson and Mateas 2005, 101) that generates the potential to communicate content through the system in an interactive digital narrative.

Providing interaction rules that can evolve the environment and the desired outcome of the narrative arc, the system can allow explorability, replayability, reusability, and contextuality. Explorability is about to what degree the interactive digital narrative is dynamic, that is, how much dynamic content a player can explore appropriately in each playthrough. Replayability allows us to focus on how we want to structure



the narrative and what type of content needs more dynamism to avoid seeming static. Reusability is how content can be reused or how often content is shared between play-throughs. Contextuality provides a valuable lens for clarifying the relationship between the narrative and the state space of the system. Additionally, a narrative that reacts to a system state that updates once a second is very different from one which only reacts once per reader's interaction, such as clicking a choice (Garbe 2020). Both actions of the readers as an interactor and the opportunities provided by the system define and shape the different processes that are being created. Moreover, these processes describe the methods, techniques, and logic that drive the operations of systems (Bogost 2008), resulting in different products that come from the same system and represent instantiated narratives (Koenitz 2010). It is connected to how narrative actions are processed and how narrative output that seems connected to those actions is produced.

Building upon the concept of interaction and agency, we will follow the discussion by examining how narrative mechanics perform representational functions and encourage critical awareness by considering the aesthetics of behavior that are conveyed through IDNs as objects of meaning-making. The objective is to address the evolution of theories that allow us to analyze the readers' agency concerning computer systems and, more specifically, with Interactive Digital Narratives.

### **3. Interaction and Agency as Instruments of Change**

Interaction is both a property of the system and a characteristic of the readers. Based on the feedback loop that enables the transaction of information between two different systems (Haque 2006), readers interact with the digital narratives through interfaces, creating a relationship with the system based on mechanics, rules, and properties (Sicart 2014). Mechanics are defined as methods invoked by agents and describe the particular components at the level of data representation and algorithms (Hunicke, LeBlanc, and Zubek 2004). Regarding the narrative, the mechanics describe the rules by which the readers can interact with the system and the progression that can be done through choice, task completion, scripted scenarios, discovery, or in-game systems (Carstensdottir, Kleinman, and El-Nasr 2017). It relates to how readers act in the face of the narrative and enables the concept of immersion and agency.

Agency relates to structuring a reader's capacity to act and co-create both the narrative experience as the narrative system design and its contents, transforming new potentials for perception and action. The attribution of agency is a precondition of any social relation. It has been established between humans and non-humans in many fields, including philosophy and anthropology, political activism, and critical cultural theory (Mackenzie 2006).

The vision of agency in Interactive Digital Narratives is mainly related to the readers' capacity to take meaningful actions and observe their results. When these actions are motivated by an anticipation of some story event or revelation, and when

the response rewards that anticipation appropriately, the readers experience dramatic agency. This dramatic agency should be the design goal of any interactive digital narrative (Murray 1997). Marie-Laure Ryan (2002) captures this as a system where the readers can exercise their agency by moving around, picking objects, or viewing the action from different points of view related to an internal ontological interactivity.<sup>1</sup>

Andrew Pickering (2010) defines a “dance of agency” between the concepts of “human agency” and “material agency,” where humans try to apprehend the agency of the material world through the mediation of artifacts, while the material world both yields to and resists human apprehension. We can also mention how actor-network theory (Latour 1996) does not distinguish between “human” and “non-human” and uses the concept of “actant” instead to establish the parallel between the readers’ agency enabled by the machine and the system’s agency that human constantly interprets. This is essential for understanding the role and nature of agency in Interactive Digital Narratives.

Moreover, various perspectives on the concept of becoming and embracing a relation between social structures and human actions must provide our notion of agency. In digital environments, the reader’s ability to take meaningful actions is mediated by the computing system and the socially situated interpretation of actions rendered by the readers. A system’s ability to allow evident actions, enact certain restrictions, and compensate certain behaviors represents significant effects on the readers’ agency, situated materially in the system affordances and interpretively in the context of use (Ahearn 2001). In this way, we call for a play relationship to describe the interaction between humans and systems. The last one is a consequence of human interpretation of the system’s properties and capacity, characterized by the story author and authoring system designer (Harrell and Zhu 2009). Following a sense of agency that allows it to be a definitive resource with significant and aesthetic effects for Interactive Digital Narratives, we define the concept according to the fundamental actions that are possible to the readers, the effects that these same actions can have on the narrative world, and, finally, the system’s ability to modify the narrative context (ibid). It is a “punctuated agency” characterized by more extended periods when human agency is essential and shorter phases where the systems can proceed independently without direct human intervention (Hayles 2017). Because of that, we can also distinguish between actors and agents, where the first term stands for the readers and is related to human agency. The second term stands for the system agency, which can act as cognitive support for the first ones (ibid).

These demonstrate the dynamics and play relationship connected to the state of agency, which is related to three dimensions: relationship, scope, and dynamics (Harrell and Zhu 2009).

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<sup>1</sup> Ryan (2002) defines different types of interactivity according to a relationship based on the layers of an onion. While in the outer layers, the readers’ actions are based on an outside perspective and limited to observation, in the inner layers the readers’ actions can have real effects on the environment, modifying the system’s overall state.

Agency relationship is about the readers' actions and the system's actions concerning one another, requiring the desire to communicate with some intention or meaning (Sakamoto and Takeuchi 2016). It is constituted by a set of actions allowed by the system capable of independently carrying out human-like actions and a set of actions performed by the readers, which becomes capable of causing a character to move, acquire artifacts or interact with other readers and circumstances (Harrell and Zhu 2009). Whatever originates from here is described as a set of results of the readers' actions or the system, which can be measured differently. Both actions can have an immediate and localized impact in real-time and space. However, although not immediately visualized, they can also have outcomes that can later have repercussions that determine and alter the narrative structure.

Scope, from a reader's perspective, is related to two levels of effectance. Effectance is about the outcome of a given action on the narrative and its meaning for the story's progression. It relates directly to Self-Determination Theory, where actions are developed according to intrinsic and fundamental needs of autonomy, competence, and social relatedness (Roth and Koenitz 2016). The local effectance is when the readers can view the immediate effects of their actions. In contrast, the global effectance has a more substantial influence and is highly related to the impact that actions can have on the future of the narrative and can lead to new situations (Roth 2016).

The nature of the agency relationship between the system and the readers and the impact of the given action can vary over time. In Interactive Digital Narratives, the dynamics are related to the creation of belief that requires a reactive environment in which the readers experience agency. At the same time, the narrative evolves in a plausible way, and characters react in a credible manner (Roth and Koenitz 2016). The reactive environment is interrelated with the system's usability, which must be considered reflecting the degree of involvement and reciprocity.

Since IDNs have their formal description that includes the definitions and existing relations embedded in a processing system, any reading depends on a detailed and accurate understanding of the exact operations of that specific interactive work. Within Interactive Digital Narratives, agency is primarily considered regarding a reader's autonomy in a narrative, mainly defined as the theoretical agency (Day and Zhu 2017). Originally generated through computational narrative systems that actively generate stories, story worlds, or dynamically alter narrative elements, we consider for this paper that the operating system and the readers' knowledge of how that system works can influence their experience.

#### **4. Emergence as an Agent in the Construction of Meaning**

Interactive Digital Narratives must be understood phenomenologically because their ability to be played enables them with a performative idiom (Hayles 2017). They are "rule-based systems" defined by the interaction between rules and readers' actions

(Juul 2005), where emergence is a primordial system structure. It is the number of rules that can be combined and presented through a large number of narrative variations, which the readers then design strategies for dealing with (Juul 2002). They are a form of ergodic literature, meaning that the “author” of the narrative does not have complete control over the experiences that are generated by the system and where the mechanic is the message (Brathwaite and Schreiber 2009), defining the “rising patterns, structures, or properties” exhibited by a system (Mignonneau and Sommerer 2006, 172).

This relation with the sense of being constantly acting as the result of playing is a property of engagement with the world that allows us to make it meaningful, covering a relationship where meaning, theory, and action rise (Dourish 2004). The construction of meaning in IDNs can be divided into three general categories: the meaning of IDNs, the meaning in IDNs, and the meaning created around IDNs and interactive digital narrative culture. Meaning is connected to their function as cultural objects and media products. The meaning in Interactive Digital Narratives focuses on the development and execution of the narrative itself and how it is expressed through them. Simultaneously, there is also a type of meaning that is raised around the idea of these new forms of the narrative being a demonstration of why their meaning matters (Paul 2014).

The meaning of IDNs is framed by considerable cultural implications being connected to the interpretation of the signs and the logical and lexical semantics inherent to it but also on computational reading and, consequently, on procedural rhetoric (Bogost 2010). Interactive Digital Narratives become meaningful through processes where there is a strong articulation of how actions can and cannot be carried out. Because of their enactive nature, IDNs are perceived by readers and contribute to the construction of meaning through ergodic processes (Carvalhais 2022), reforming our perceptual faculties and emerging new subjectivities and uncertain potentials for perception and action (Denson 2020).

We propose that our understanding of the world around us arises from the interaction we can engage with and how the meaning can be constructed. Hence, Interactive Digital Narratives is about the processes that depend on the new hardware and software of the digital imagery that takes place outside the spatial and temporal dimensions of subjective perception (*ibid*).

We recap the apparatus theory because it raises crucial questions about the causal relations between technologies and the subjective experiences they mediate, providing its subjects with an aesthetic experience that is physically and socially embodied (Tan et al. 2020). The term *apparatus* can be described as the combination of two French terms: *l'appareil*, which is the primary technological machinery for recording and reproducing sound and images; and *le dispositif*, which represents the psychological, social, and ideological matter that is behind the readers' relationship with the artifact. In Interactive Digital Narratives, the system is composed of an aesthetic machinery that provides the readers with an aesthetic experience “distributed here across technological substrate and experiential form alike, thus opening the door to a reversal of the encapsulation of

experience, and its cordoning off from the underlying apparatus” (Denson 2020, 68). They are aesthetic objects divided among the levels of the substrate and experiential form. The body becomes an affective interface capable of establishing a transudative relation between objects and subjects (Schonig 2021). The experiential form relates to and within the perception of movement constantly emerging between the technological and ontological realms, where the subjective experience can be sliced between the technical substrates and the aesthetic forms that are transmitted to and by INDs (Denson 2020).

From a computational perspective, ontology studies the formal description that includes the definitions and existing relations of a determinate object. For this purpose, it is about the ability of a computational system capable of exercising a set of relations that allow the readers to experience and interact with the told narrative. It is about asking what the functional characteristics and components of Interactive Digital Narratives, as well as the relations that exist between them, are. We can point out an internal code where an author chooses from a set of options and selects only the ones that are presented, being the part of the system that allows us to interact with the interactive digital narrative. Matching, there is a semiotic layer where a reader makes choices, and it is possible to infer and conjecture the intentions behind these choices. Corresponds to the part of the system that informs the readers about the system world and system state through visual, auditory, textual, and sometimes haptic feedback (Aarseth 2014), becoming operates in specific ways, and being designed to communicate certain things (Wardrip-Fruin 2020). We can always find an intentional connotation where the readers act through the system to achieve some purpose, making us question “and seek for an understanding of intentionality behind — or meaning embedded in — any object, action or proposal” (Penha and Carvalhais 2018, 25).

Interactive Digital Narratives are processes based on event structure perception that are tied to the actions that can be realized through them (Zacks and Tversky 2001). At the same time, they are temporally extended to object perception because we can recognize and talk about them based on their component objects and the familiarity with the world of social and physical interactions conveyed by these objects.

## **5. An enactive approach to Interactive Digital Narratives**

Narrating a story constitutes a unique and distinct trait of humanity, making it possible to organize experiences in temporal logic and be seen as mental operations. An interactive digital narrative allows for significant changes in the production and visualization of news stories, allowing them to be experienced as more pleasant, thus becoming more likely to be experienced and generating meaning and understanding (Jenkins 2014). From a semiotic perspective, the construction of meaning is an unavoidable outcome of agency play. The agency of the system matters in the way readers can experience Interactive Digital Narratives, leading to various interpretations that may converge on the same meaning.

The interaction between the system and the readers can be seen in terms of a structural coupling. Perception and action are coordinated with the space around and other agents in that space through emergent and continuous interaction. The system can trigger changes in the readers, while the readers can specify the nature of the change. There is a feedback loop as a model of organization looking to stabilize the relation to the world. In this relationship, humans “perceive actively, in engaged iterative feedback loops, with the environment” (Penny 2017, 176). This way, we can define cognition by its continuous interaction with the perceptual sensorimotor activities of the inhabitant of an environment, becoming aware that the knowledge cannot be separated from the movement, gestures, and practices of the body. Perception is a way of acting on the world determined by the exercise of sensorimotor knowledge (Noe 2015, 8).

The enactive approach emphasizes the role that emergent and dynamic social coordination has in the intersubjective nature of human understanding, being a facilitator of perception and action (Popova 2014). Providing a framework that unifies elements of situated action, social cognition, or information processing, we based on that to build a perspective representing participatory sense-making in the domain of IDNs. Vernon (2014) describes sense-making as the process by which “emergent knowledge is generated by the system itself [as] it captures some regularity and lawfulness in the interactions of the system, i.e., its experience.” From this assessment, readers start to construct a relationship between perception and action that help them to guide through the IDN. Readers rebuild a new reality by physically and abstractly assembling the space around them in meaningful ways (Sawyer et al. 2003). Through some rules, actions emerge across embodying and performing successful interactions with a particular semantic distance, enacting a deepened narrative provided by emerging build meaning. Based on that, we assume that Interactive Digital Narratives emerge because of the same process of the cognitive body-brain system that manages embodied and situational navigation within time and space. As the metaphor that Ryan (2004) uses to distinguish (1) the physical space of the fictional world represented by the text, (2) the architecture of the text, (3) the material space occupied by the signs of the text, and (4) the space that serves as context and container for the text, we can assume that responses to the IDN take place at multiple levels of operation, some of them happen in mind, and other ones being not conscious.

IDNs become interactive and narrating machines with and against which readers engage and produce meaning-effects (Ferri 2007). It is a relation between playful practices, machine-side procedures, and semiotic strategies that ranges between ludological formations and intertextual narrative readings.

## 6. Conclusions

Since multiple perspectives have categorized play, in this context, it needs to be appropriately understood in terms of the processes and actions that readers can execute to create a meaningful story together. Play in IDNs can be explained by analogy with the ontology of artworks that are created within a specific cultural and historical context that embodies the responses, thoughts, and emotions of that time and place (Gadamer 2006). Works of art exist as physical objects. However, they also require our participation to exist as art. In correlation, Interactive Digital Narratives behave similarly to works of art. They exist independently of readers, but readers need to interact with them for them to be realized as IDNs (Arjoranta 2022). This way, Interactive Digital Narratives that allow the readers to decide the direction of the narrative enable and transform our senses of subjectively perceived and embodied ways of being in the world, providing a multisensorial interface communication between the human body and the interactive digital narrative system. This alters the readers' subjectivity, extending our senses and the capacity to see and make sense of ourselves (Sobchack 2016). The sense addresses the way in which the body perceives the eternal stimulus provided by the IDN and implies the readers' perception conveying different ways of affection and eliciting higher physiological arousal.

At the same time, the decision-making opportunities presented in IDNs being both a component of the story and the way in which the readers engage with the narrative indicates the presence of different layers of information that, together with feedback loops, turn the IDN a unified artifact, reinforcing each other and providing further information. These layers of information are helped by the presence of / deictic assets referring to linguistic or gestural elements that rely on contextual signs to convey meaning and that can provide a more seamless and intuitive reader experience (Knoller, 2019). Moreover, the presence of deictic elements contributes to establishing a relationship between readers and the system, and has the objective of 1) teaching readers which elements are essential, 2) contextualizing the insertion of bits of information in specific places of the story world, 3) creating some interaction-reaction patterns that could be used to anticipate the outcomes of an action, and 4) maintaining it's sensorimotor system nature, requiring some actual physical interaction (Knoller 2019). For instance, we see Interactive Digital Narratives as part of an advanced cultural form that exists to transcend the limits of narrative sense-making, which processes perceivable input and then output activity (Walsh and Stepney 2018), being this activity both a looping back into perception and attention and a response from the system and the readers. Readers play with the IDN through procedural participation in an authoring and complex system, with some defined constraints, that abilities a specific mode of reception named *readers performance*. In contact with an interactive digital narrative, the readers' performance moves between several levels of meaning, which is not just a performance of the code, but also a performance of the self, shifting between a self-reflective attitude,

allowing them to have an aesthetic engagement with phenomena that are not usually appreciable to human perception. Attempting to understand why and how it is acting by this readers' performance, we call to this paper the aesthetics of behavior.

The aesthetics of behavior in IDNs can be understood following a narrative flow based on an interplay relation between cognitive narrative components, readers' engagement with the artifact, and the system's outcomes as the ability to adjust to the inputs received. It contributes directly to the discussion of how aesthetics and narrative is a powerful means to transference knowledge, improving intrinsic motivation and perceived learning of readers (Alexiou et al. 2022). So, Interactive Digital Narratives are converted into vehicles of effectiveness, becoming an influential tool where their embodied and relational nature enhances the interaction with them that goes beyond perceptual projections.



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