

Beyond Rules and Mechanics: A Different Approach for Ludology

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Abstract

Due to its affiliation with formalism, ludology, the scientific perspective prioritized in game studies, considers the rule-mechanic binomial to be an essential principle of any scholarly approach to video games. Nevertheless, the limitation of the game system order implies that, as a fundamental part of this epistemological approach, the empirical validity of its methodology is already being rejected. As such, this article attempts to shift the focus away from the rule-mechanic relation, and from a cybersemiotic perspective, to refocus it on a conceptualization of the human-machine relationship. In order to do so, the concept of convolution regarding said relation is defined, including both parts of the video game system in terms of signal processing. Likewise, this model is contrasted with a randomized total sample of 1,200 games ($N=1,200$, $n=300$) in order to arrive at a set of conclusions about the behavior of the distinct video game genres in the indicated terms.

Keywords

video game genres, ludology, cybersemiotics, abduction, cognitive approach, signal processing

The study of the conditions that enable video games to exist in their unique fashion represents the core of modern game studies. In the late 20th century, discussions regarding the ontological nature of video games were centered on the issue of

whether they should be observed from the perspective of narratology (Jenkins, 2004; Murray, 1999; Ryan, 2004) or ludology (Frasca, 1999; Juul, 2001). This guaranteed an appropriate consideration of the subject focusing on methodological and field theories (Navarrete-Cardero, Gómez-Pérez, & Pérez-Rufi, 2015) and lead to its current status.

In this regard, ludology, based on the epistemological precedent of cybernetics, was proposed as the approach most in line with the medium's cybertextual nature (Aarseth, 1997). The perception of video games within ludology as a product of the relations between the concepts of rules and mechanics seemed to take priority over its narratological distinctions (Frasca, 2003). The prevalence of this focus made it seem likely that it would be developed while oriented toward a procedural rhetoric (Frasca, 2003), whose study would be later known as "proceduralism" (Bogost, 2011, p. 12).

Since then, ludology has developed as a discipline that observes the universal systematization of the factors involved in video games, be it in the more general concepts (Elverman & Aarseth, 2007; Eskelinen, 2001; Hunnicke, LeBlanc, & Zubek, 2004; Juul, 2003) or more specifically in genre studies (Jaarvinen, 2008; King & Krzywinska, 2002; Pérez-Latorre, 2011), as well as in the scope of discourse analyses (Consalvo & Dutton, 2006; Malliet, 2007; Pérez-Latorre, 2015; Pérez-Latorre & Oliva, 2017). These highly valuable approaches have, however, ignored a possibly more fundamental perspective, that is, one that focuses on the elementary relations of function in a cognitive sense that make interactions in a game device possible.

This study aims to open up this formal category for empirical studies, explaining its role in the concurrent settings of player and game system in aspects that do not exactly match the traditional aspects of mechanics and rules. By doing so, fundamental factors whose definition remained unresolved are to be theoretically established and thus provide future ludological study with new perspectives regarding the specificity of video games.

Background

Overcoming the Rule-Mechanic Binomial

Since its beginnings, the ludological paradigm finds a generalized consensus in the identification of rules as an element necessary for games to exist, either in its more theoretical (Juul, 2011) or the more design-oriented branch (Adams & Dormans, 2012). This is compatible with the differentiation done by Frasca (1999) between *paidea* and *ludus*, quoting Caillois (1967), in that an indeterminate goal beyond victory or failure can also be supported by an environment based on a system of rules (Newman, 2004, p. 20).

Nevertheless, not everybody has agreed on how to consider the mechanics. In a purely nominal setting, various authors describe them as "strategies" (Juul, 2001),

“play” (Myers, 2009), or “game procedures” (Fullerton, Swain, & Hoffman, 2004), referring to different aspects of the concept. Other authors such as Adams and Dormans (2012, pp. 3, 4) compare mechanics with rules, linking the former with the programmed rules inherent to video games and the latter with the printed instructions of traditional games.

This inequality of criteria is mainly due to the differences between both categories not being as clear as they should ideally be. In this regard, the definition proposed by Sicart (2008), focusing on mechanics as “methods invoked by agents, designed for interaction with the game state,” is one of the most widely accepted in the current approaches to the subject (Dubbelman, 2016, 2017). This is the notion this work is mainly centered around. While Jārvinen’s (2008) definition of mechanics as “means to guide the player into particular behavior by constraining the space of possible plans to attain goals” (p. 254) still could not represent mechanics as a concrete and separate entity from rules, Sicart’s is valuable in that it focuses on its decision-making aspect and thus on the game functions that are the player’s responsibility.

However, Sicart’s approach still retains Jārvinen’s idea that mechanics should be formalized as verbs, while rules represent verification conditions that are likewise prescribed by the program and where said verbs can be articulated. In semiotic and inevitably anthropocentric terms, it can be established that, in regard to the subject-avatar, mechanics operate in the actual order of /being-able-to-do/, while rules do so in the virtual order of /having-to-do/. It should, however, be taken into account that Sicart’s own definition implies that establishing a clear-cut difference between mechanics and rules is a rushed job, in at least two regards: (a) If the former are the group of possible actions that are *designed* to make the player advance, they are a /being-able-to-do/ exclusively focused on a /having-to-do/, that is, they are defined by the goal established by the rules as well as the rules themselves and (b) every /being-able-to-do/ has an implicit /being-not-able-to-do/, and thus the very concept of prohibition that characterizes rules in a more or less explicit manner.

This leads to a reconsideration of some of the definitions that Sicart overcomes, such as those proposed by Lundgren and Bjōrk (2003), Cook (2005), and Jārvinen (2008), who understand mechanics as a subcategory of rules, or the one proposed by Fullerton, Swain, and Hoffman (2004), who understand them as the group of methods allowed by the rule system and that are consequently ruled by it. Juul’s (2011) appeal to game theory can be interesting in that it understands a strategy as “an overall plan for how to act in the variety of different states that the game may be in” (p. 59). This plan, although anticipated by the game’s program, is an exercise of the player’s individual skill, limited by two factors: the actual one pertaining to /knowing-to-do/ and the virtual one belonging to /wanting-to-do/. Keeping in mind that an emergency implies an unexpected behavior from the player, the game’s program should allow for this with wider or smaller margin of error.

As such, it could be stated that mechanics, understood as algorithmic devices, are part of rules in that the former involve the latter. However, there is a human instance

that cannot be found in the purely programmatic dimension, although it might be expected to a certain degree in its inherent system. Therefore, Sicart's definition of "methods invoked by agents" is relevant to us: The most operative division does not seem to be between mechanics and rules as cybernetic components of the program's reality, but rather a distinction between the player and the program as components of the video game's reality, especially taking into account that, despite both interacting with each other in the common system of gameplay, they respond to different systemic logics that should be analyzed in their specificity.

The Abductive and Configurative Formulae

Genre is conceived, in this article, as the main interactive unit of video games. This conception is based on the fact that the modern definition of the concept of genre (Miller, 1984), summarized as "a *relationship* between textual structures and the situations that occasion them" (Frow, 2006, p. 13), is somewhat equivalent to the understanding of second-generation human-computer interaction (HCI) as something that "cannot be seen independently of the use situation" and simultaneously "does not solely focus on the needs of the individual user in a specific situation" (Bødker, 1987, p. 22). Due to the cybernetic nature of genre in video games, this parallelism justifies the relevance of resorting to the approaches of the cognitivism-based second wave of HCI studies. This is also the case with the language/action theory of Winograd and Flores (1986), which focused on "the shift from language as description to language as action" (p. 76) and Bannon's (1991) approach, based on cognitive psychology.

The interdisciplinary nature of HCI studies justifies the application of a discipline like semiotics (Souza, 2005), which reunites these epistemological approaches in an understanding of the production of signs via functions and thus via signals. From this, it can be inferred that "basic computer skills exhibited by contemporary users are in fact *semiotic engineering* abilities of the same sort required from professional designers" (Souza, 2013; <https://www.interaction-design.org/literature/book/the-encyclopedia-of-human-computer-interaction-2nd-ed/semiotics>). The focus of semiotics on natural languages, as Tanaka-Ishii (2010) notes, has found its development mainly in humanities, whereas formal language—and, as per Winograd, "language as action"—is the focus of science and engineering (pp. 5, 6). Therefore, this approach conceptualizes the confluence of Jean Piaget's cognitive psychology, Charles S. Peirce's analytic semiotics, and Umberto Eco's interpretative semiotics in a single device and considers it possible to express these theories from the margins of the theoretical tradition of the second wave of HCI studies.

In order to perform this analysis, two studies will be referred to. Despite their apparent contradictions, both studies incorporate the same coherent model in the reality of gameplay, as revealed by the experience of this work. These approaches establish two perspectives on the same phenomenon: That of the human-machine mediation in the complex system of video games.

The first approach is that represented by Navarrete-Cardero, Pe´rez-Ruf´i, and G´omez-Pe´rez (2014), who attribute an abductive quality to the thought processes of video games. As per this approach, the abductive basis, structured from the capacity of intelligence for the construction of hypotheses (Eco & Sebeok, 1983), implies a creative process of an intensity that is generally not prominent in media such as cinema and literature. According to this, it is accepted that video games belong to a simulation paradigm (defined by rules and mechanics) and not a narrative one (defined by causes and effects in a frequency and a temporal sequence established to help the action progress). In video games, a controlled reduction of certainty leads to an increase in the device’s joyful play and heuristic potential (Costikyan, 2013).

According to this point of view, the closest examples in literature and cinema to video games regarding the terms of abductive reasoning would be avant-garde works or those who defy classification, attributable to the historical mode of parametric cinema according to Bordwell (1985, p. 274). The abstraction of these narrative formulae, as well as their capability to further the abductive function of the spectator, would be one step closer to the ability of video games to act as a configurative and interactive device. As such, the study concludes that film narratives are generally syntagms that are paradigmatically thought of from the perspective of either the inductive or deductive functions, while videoludic experiences are paradigms syntagmatically thought of from the perspective of the abductive function.

In parallel to this, Vargas-Iglesias (2018) proposes a model based on the square of opposition (Be´ziau & Jacquette, 2012; Sullivan, 1967) and the development of the functions of the subject according to Piaget. This approach, based on the function as the unit of analysis, tries to establish the logical conditions that underlie the production of genres and simultaneously the compatibility regimes that enable them to exist. Four categories are then touched upon, all of which can be linked to the four most elementary genres: intuitive function (Action, A), formal function (Strategy, S), inductive function (Puzzle, P), and deductive function (RPG, R).

Setting these four categories in a square of opposition that reveals their compatibilities and incompatibilities sheds some light, as stated by the author, on the possibility of a future study regarding the combinations of these genres. By doing so, two means of relation between functions can be identified: Be they of subordination, which can be formulated as algebraic functions as it concerns contrary and implicated elements $\{A(S), A(P), S(A), S(R), \dots\}$, or of independence, which can be formulated as disjunction, in the case of contradictory elements $\{S/P, A/R\}$ or those who choose to remain equidistant despite their regime of compatibility $\{A/S, A/P, P/R, \dots\}$. Likewise, the study reveals three theoretically plausible forms in which to structure genres: elementary (composed of a single function), hybrid (composed of a binary relation of functions, either separate or subordinate), and mixed (composed of three functions, one of them subordinate to another one, with a third one added). All the possibilities that can, potentially, be derived from the combination of the functions $\{A, S, P, R\}$ will be denominated in this article as

“configurative functions”; that is, functions that illustrate an inferential condition that can be exclusively attributed to the programming environment.

Although seemingly unbridgeable, the distance between both theoretical positions is merely an epistemological illusion. Said illusion is undone when understanding video games as a state machine that receives input signals and returns output signals (Adams & Dormans, 2012, p. 41). Thus, abduction would correspond with the input signal as it belongs to the environment of the player’s decision-action, while the output signal matches with a modified version of the previous input signal due to the machine’s conditions of function, that is, the elementary configurative functions in their distinct genre combinations. According to the interpretation provided by Souza (2005, p. 42, 2013) regarding Peirce’s (1868) use of semiotics in the field of HCI studies, three aspects of the sign are distinguished as follows: “object” (referent), “representamen” (representation), and “interpretant” (meaning in the beholder’s mind). This can be said to match exactly with the designer–system–user relationship. This relationship is based on the finality provided by the designer, the programmed expression that engages in the implementation of said finality, and the interpretation by the user. When generalizing this distinction and incorporating the cited studies into it, it can be established that the configurative solution matches with the representamen aspect, while the abductive solution matches with the interpretant aspect. It can be concluded therefrom that both solutions belong to different aspects of the sign and are therefore compatible in a homogeneous model.

Nevertheless, it must be assumed that video games represent an appreciable difference from other applications. While the latter, by necessity, feature a “one-shot” relationship (Souza, 2005, p. 90), that is, a direct relationship without any ambiguities that could hinder the relationship with the interface, the former is precisely based on the somewhat conflictive relationship with the program’s expression. It is important to notice that this new division shifts the focus away from the controversy regarding the differentiation between mechanics and rules: Now, the issue is not centered on statuses managed by the program, but rather signals and their modifications. The way in which both spheres appear in the game complex will serve as the objective of the present article.

Work Hypothesis

As stated before, the description provided by Navarrete-Cardero et al. (2014) of video games as a paradigm that is thought of in syntagmatic terms finds its counterpart in the fact that the medium cannot be solely described as an input signal, but rather, and in a synchronic manner, as an output signal. The player’s simultaneous operation of a syntagmatization of the paradigms (play development) and a paradigmaticization of the syntagms (game discovery) is solved based on the programmatic base of a strict recursive logic or a quality that defines a process in that it is based on its own definition.

It is understood that it should not be attempted to find the accurate definition of said process in the paradigmatic generality of the rule nor in the syntagmatic

specificity of the game, but instead in a middle ground that will be referred to as the transformational level, as per Chomsky (1957). This level occurs depending on the player's abilities (ludic competence), progressively improving throughout gameplay.

This process of heuristic synthesis that occurs within the player is informed by an algorithmic logic preset by the program. However, it should be emphasized that the process does not refer to rules themselves, but rather the modification done by the player to the device that contains said rules, leading to a contextual update that will cement its perception and learning. Gameplay cannot be strictly defined in the traditional sense, that is, the relation between the player and the rules (an inoperative abstraction in empirical terms), but instead as the relation of the player's competence with the particular way in which rules are given to the player's experience.

Taking all this information into account, this work will have as its starting point the existence of a relation in which the signal of the game's status machine (intuitive, formal, inductive, deductive functions) modifies the player's input (abductive function), thus generating an output signal. This modification does not match with the classical terms of rules and mechanics established by early game studies (although it is influenced by them). It is triggered instead by a transformational level and by a degree of competence specific to the player. The hypothesis of this work is to define the structure of said modification. This is to achieve an empirically operative model in fields such as aesthetics, cultural studies, and sociology.

Method

Convolution and Means of Abduction

In order to understand the semiotic nature of the signal modification logic proposed here, it should first be understood (as stated earlier) that the signals to be described belong to different cybernetic orders. The machine is recursive in nature, as extracted from the study done by Mnih, Kavukcuoglu, and Silver (2015), which found that an artificial intelligence (AI) can play 49 games released for the classic console Atari in a satisfactory manner, even vastly outperforming the average human in terms of skill. The AI used in this study (Deep Q-Network, combining optimized learning and a neuronal network capable of finding object relations based on sensory data) operates by implementing heuristic learning processes in the decision algorithms, focusing on the reception of the pixels in the video game and the score. In other words, due to its purely syntactic character, the work of this AI would be equivalent to the function of a game that is capable of playing itself.

This dimension is analyzed by Björk and Juul (2012) based on their "zero-player game" concept in a timely discussion about what designates a player as such. In said work, these researchers add a further three ways in which a game can be played without a player intervening: setup-only games (those in which the player's influence is limited to the initial configuration from which the game is generated

algorithmically), solved games (those that are solved through mathematical description and are thus determined before the session starts), and hypothetical games or conceptual games that are unplayable in practice and whose reality only serves to infer an idea from the player's behalf. It is meaningful that each of them can be attributed to a function of the ASPR configurative model, representing a good example of the validity of said model due to the player factor being reduced to 0: the intuitive function for games played by AI, the formal function for solved games, the inductive function for hypothetical games, and the deductive function for setup-only games.

As games can "play themselves" without the intervention of a human player, their behavior unveils hints of their configurative aspect: The intuitive function, associated with Action, is primarily concerned with the physical reaction skills of the player depending directly on the system; the formal function, associated with Strategy, is named as the management of one's own choices according to a speculative calculation of those to the contrary; in the inductive function, related to the resolution of Puzzle enigmas, the user has to use conjunctural intellectual structures to reach the solution to the problems displayed; finally, in the deductive function, linked to RPG, the user needs to structure their particular actions in order to the appeal to general rules specifically established by the genre itself. As such, video games that comprise each of these functions can be played by AIs configured for said functions.

However, on its own, this condition does not explain the nature of video games as human activity. In this regard, Eco (Eco & Sebeok, 1983) suggests that any human inference is done through abduction, since "even in cases in which the rule is evident, and the inference concerns only the case, a hypothesis is never a matter of certitude" (p. 204). This position holds that uncertainty is a cornerstone of human cognition, which would radically distinguish it from machine learning processes, which are based on a mechanic-syntactic application of trial-and-error and memorization protocols.

According to Eco (Eco & Sebeok, 1983, pp. 206, 207), abduction should be understood in different modulations, according to the complexity implicated in the inferential process. Eco differentiates between three possibilities: (a) hypothesis or overcoded abduction, which occurs automatically or semiautomatically as the assumption of a result according to firmly established rules and cases that seem to fit them; (b) undercoded abduction, which implies the selection of a rule from a group of available and equiprobable rules according to the current knowledge of the world; and (c) creative abduction, which develops a rule from scratch that explains everything that is happening. This last type of abduction would be related to the so-called meta-abduction or the need to decide whether the syllogism's possible universe matches with that of our experience.

The abductive signal would therefore adopt distinct forms according to the game's functional category and inferential needs. This relation between the abductive (player) and configurative (game) foundations can be understood in terms of

convolution. This concept, used in the scope of systems engineering, is defined as a basic operation of digital processing that determines the system's answer to an input. In other words, it describes the transformation that a specific signal operates through an input signal, the by-product of said relation.

In more specific terms, this concept refers to a mathematical operation that, in the linear time-invariant systems (systems that are invariant in time, for example, the distinct levels of a video game), transform two functions f and g within a third one ($f \times g$) that represents the magnitude in which f is superimposed with a reflected and offset version of g . It is defined as the integral of the product of both functions after sliding either of them a distance t . In terms that involve the video game more directly, this operation would specify the way in which the abductive function responds (i.e., how it resists, how it behaves) to the given configurative functions $\{A, S, P, R\}$, thus creating an output signal that completes the heuristic cycle and makes advancing the game possible.

In order to understand the implications of this model, a scenario is to be used, wherein a person who has never played a video game before is subject to the commands of the first level of *Super Mario Bros* (Nintendo EAD, 1985). The player's abductive function, completely undefined in this moment, probably will start making all sorts of conjectures: What is my purpose? Do I have to collect the floating blocks to create some sort of structure? Do the mountains and the clouds have any purpose? Why do some mushrooms have angry faces and others do not? Should I talk to the angry ones to know their story? Are these question marks over the head of my avatar useful for answering my questions? That is the reason why the designer places firstly a gratification and then an enemy in the path of the avatar: By doing so, the design establishes the two possibilities that will decide the game mechanics for the whole game file. The configurative function thus limits the abductive function to an overcoded field of intuitive function, a feature of the Action genre. The failed

E.T. The Extra-Terrestrial (Atari, Inc., 1982) displays a clear example of the opposite: The lack of definition of its configurative function, due to clear design problems, leads to the player's abductive function to roam aimlessly, taking actions without knowing their purpose well and trying to combine them unsuccessfully.

This operation implies changing the focus of the ludological approach to the rule/mechanic relationship in that the configurative/abductive relationship does not match with the former: Rules and mechanics depict a relationship that can be exclusively attributed to the program and thus cannot be linked through the concept of convolution, while configuration and abduction depict processes related to program and user, respectively. The dynamic that arises from convolution between the latter two elements is thus specific to a human-computer relationship paradigm that is coherent with a player heuristic (with the subtleties that this would imply regarding reception and its possibilities of dispersion) and that is not limited to the functional description of the machine.

Sample

Following the configurative model proposed by Vargas-Iglesias (2018) and the classification of functions done within it, the relation of the abductive function with all of the others was tested. In order to do so, a sample of video games of every elementary genre was taken, with varying degrees of difficulty, and the abductive function was analyzed, where appropriate, in each one of them. The choice has been made to limit the sample to the field of video games and not extend it to the one of traditional games due to two reasons: an ontological one, since it will be assumed that while all games can be simulated as video games, the opposite does not hold true; and a pragmatic one, since video games and traditional games belong to different industrial realities, and this reality is consubstantial to the epistemological sense of this study.

For this purpose, the online database Mobygames.com and the universe of video games released for Windows were employed. The database, used in prior academic studies (Balland, De Vaan, & Boschma, 2013; Faisal & Peltoniemi, 2018; Mollick, 2012), was chosen due to it containing the largest document repository of video games to date. The operative system was chosen taking into account the fact that (1) the PC platform avoids that the game difficulties derived from peripheral controllers in consoles in the case of some genres (First Person Shooter, Strategy) interfere in the statistic validity and (2) it is the platform that has the largest array of genres among all the many available platforms in the database, thus guaranteeing a universe where all abductive possibilities are present and, consequently, a random selection of games with statistic value in this field. The criteria for the game selection were

- a. Quantity-wise, every configurative genre {Action, Strategy, Puzzle, RPG} was taken as a universe, and a sample was taken from each one of them. A systematic random selection of games was done in each genre ($N \frac{1}{4} 1,200$, $n \frac{1}{4} 300$), with a confidence interval fixed at 95% and margins of error of +3 (Action), +5.5 (Strategy), +5.3 (Puzzle), and +4 (RPG).
- b. Quality-wise, the cases whose dependent function could be identified with each configurative genre were chosen. By doing so, games such as *Tetris* characterized for their conversion of the inductive function into one dependent on the intuitive function {A(P)} were classified within the configurative genre Puzzle (function P), as it is the dependent function. Likewise, a game like *Scrabble*, which displays two independent variables in the formula describable as {S/P}, could be indistinctly categorized as both Puzzle and Strategy. This decision was made so that hybridizations would not disorganize the internal validity of the results.

As a result, the volume of video games produced was taken as the qualitative criterion, due to it being considered a credible index of the structural predisposition of the distinct genres, simultaneously focused on their adequacy to the demands of

popular consumption and the technological possibilities of the medium. The sense of a quantitative methodology oriented toward obtaining qualitative conclusions is based on the assumption that, in macrohistorical terms, the trends in game design tend to adapt to the needs of users. This idea is supported in the currently prevailing consensus regarding the conception of genre which focuses the denominative activity of genres in the viewer, as per Devitt (1993), Miller (1984) or Russell (1997), thus turning the viewer into the attractor of any later definition by either critical or industrial institutions, with all that this implies in the order of content production.

Therefore, if it is to be assumed that the survival of structures in video games depends on the latter's rentability and that it is directly linked with the commercial role of the users and their experience of satisfaction, said rentability appears as an adequate index from which conclusions are to be inferred regarding the forms of convolution that, as stated in this article, substantiate the elementary genres. Understanding video games as a medium implies the impossibility of understanding them separately from the user's dimension, even in their configurative facet and despite their recursive nature.

With this epistemological choice in mind, the purpose of this sample was to determine, in an industrially established empirical reality, the capability and tolerance of the configurative genres to be articulated in the form of the three possible abductive functions (overcoded, undercoded, creative) and to use this as a basis for providing readings that allow an understanding of the relationship between the abductive (human) and configurative (computer) signals. By doing so, a theoretical, empirical, and interpretative groundwork is laid, from which the possibilities of design can be considered while taking the concrete aspects of reception into account. Distinct criteria were thus followed in order to define the abductive behavior, according to the functional identity of every elementary genre.

In the case of Action, overcoding was associated with the needlessness of articulating foresight capabilities in order to advance in the game, and it was determined that said capabilities would decodify the genre regime. As for Puzzle, it was established that overcoding is to be associated with games driven by firmly established and permanent rules; said "strong" coding is undone; that is, it tends to encourage an increasingly creative thought process, in that Puzzle games require an increasingly more marked use of lateral thinking and thus resolution procedures that are not immediately attributable to rules.

Regarding Strategy, it was determined that the intersubjectivity that defines this genre would be the starting point to distinguish the different abductive behaviors. Thus, said coding is significant in that the importance of foresight in the decisions of the other is minimized and therefore the game is primarily based on immediate management; on the other hand, this coding is undone as the difficulty of understanding the opponent increases. Finally, in the case of RPG, overcoding was associated with the simplicity of its missions and quests; it was also taken into account that said coding would be undone with an increase in difficulty of the implicated intellectual processes.

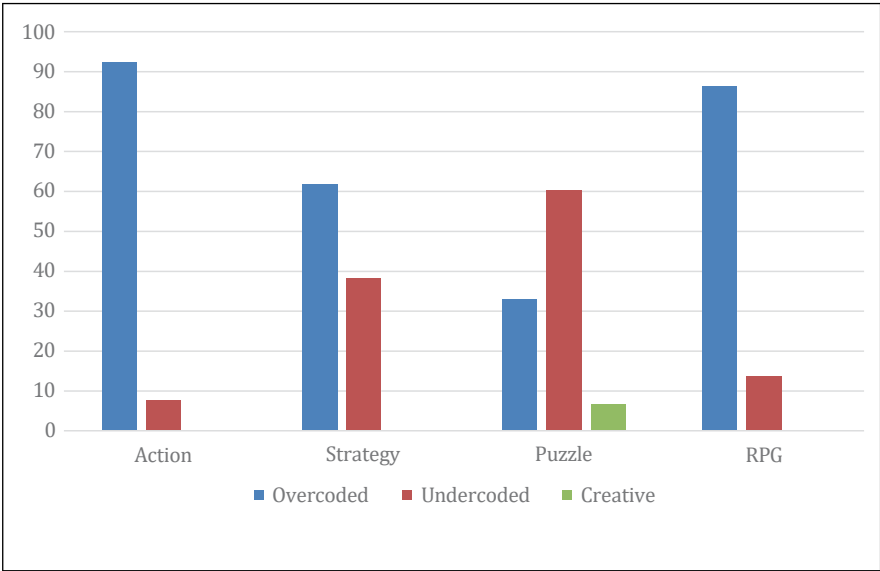


Figure 1. Graphic display of the abductive behavior.

Table 1. Analysis of the Abductive Modalities Within the Four Configurative Genres.

Abduction	Action (%; $n \frac{1}{4} 300$)	Strategy (%; $n \frac{1}{4} 300$)	Puzzle (%; $n \frac{1}{4} 300$)	RPG (%; $n \frac{1}{4} 300$)
Overcoded	92.3	61.7	33	86.3
Undercoded	7.7	38.3	60.3	13.7
Creative	0	0	6.7	0

Results

As can be observed in Figure 1 and Table 1, the statistics obtained highlight the distinct modulation of the abductive modalities within the four elementary configurative genres. Next, the form in which the abductive coding occurs in each genre will be described and, following this, an interpretative reading of the relationships between the configurative signals {A, S, P, R} and the abductive signals {overcoded, undercoded, creative} will be performed. The obtained data will provide the basis for this reading. This approach is carried out for the purpose of reaching conclusions about the way in which the latter signals display variations according to their specific convolution relationships regarding the former. In order to do so, a key fact has been taken into account: The abductive signal, based on the human capability for producing hypotheses, has the nature of increasing the closer it gets to its creative solution. Therefore, since the codification implies a repression

of the abductive signal, it can be established that this signal follows the following logic: overcoded < undercoded < creative. This will help in understanding its statistical variations in results as increasing or decreasing regarding its ideal condition (a monotonically increasing function), in either case, a product of the convolution relationship.

Regimes of abductive coding. Regarding Action, by itself the most defined of the four configurative genres, it is worth noting that it is almost completely defined in terms of overcoded abduction. This can be explained in that any form of decoding implies an interruption of the relation between the player and the game. Said interruption is associated with the decision made by the player in terms of means and not ends, that is, the undercoded abduction runs counter to the configurative premises of the game, being instead downgraded to those games linked to a strategic implication {S(A)} such as *Silent Hunter III*, *Tom Clancy's Rainbow Six: Lockdown*, and *World of Warships*. The overcoded abduction, on the other hand, would be the one which relates to genres in which Action is not limited in any function regime {A, A/R, A/P} and is thus interpreted by the player as immediate. Such are the cases of *Doom*, *Mirror's Edge: Catalyst*, *Call of Duty: Black Ops* {A}, *Bound by Flame*, *Mass Effect 2*, *Vampire: The Masquerade* {A/R}, and *The Cave* {A/P}.

Much like Action, both Strategy and RPG display a structural incapability to promote creative abductive thought in the player. This would imply the simulation of an independence of rules and mechanics, something that is impossible in these cases. In the case of Strategy, this impossibility is due to every action of the player being counterbalanced by the virtually twin action of another player and thus being limited to speculation within a necessarily conventional area of rules, without allowing any thought that transcends said limits. Due to its deductive logic, which originates from Strategy's formal logic, RPG has a similar restriction imposed by the marked definition of the genre according to methods limited to exploration and resource trading.

In the case of Strategy, the overcoded abduction is associated with genres that assume the existence of the opponent-other, such as in the subgenres Massive Online Battle Arena, Build and Battle, Tower Defense, and generally in Real-Time Strategy; that is, genres whose strategic core is limited by an intuitive function {A(S)}: Such are the cases of *Warhammer 40.000: Dawn of War*, *Stormrise*, *Wicked Defense*, and *Space Colony: Steam Edition*. The undercoded abduction is, however, related to genres in which the figure of the opponent plays a major role, that is, those in which the turn-based mechanics force the player to think in a more intense intersubjective manner, from Tactical and Operational Wargames (*UFO Online: Fight for Earth*, *Endgame: Syria*, *Heroes of Civilizations*) to classic games such as chess and tic-tac-toe {S, S/P, S/R}.

As for RPG, it is important to clarify the concept of difficulty: The criterion employed for its definition has been the level of complexity inherent to quests. While some quests can be difficult to implement, they are based on largely

established precedents whose knowledge significantly simplifies their resolution. Therefore, these types of quests have been understood as being simple. Due to the deductive quality of this genre, an ideal player who recognizes and takes advantage of the traditional prescriptions of the genre for their gain should be assumed.

As such, the overcoded abduction can be translated into a prominence of fighting and simple missions, such as in the majority of Action Role-Playing Game, Rogue-like, and Massive Multiplayer Online Role-Playing games {R, A/R}. Some examples of these cases offered by the sample are *The Elder Scrolls V: Skyrim*, *Baldur's Gate*, *Diablo III*, *Neverwinter Nights*, and *Ultima Online*. The undercoded abduction occurs due to a larger presence of the adventure, understood as a journey and not so exclusively focused on upgrading the avatar, contextualized in large maps and where decisions are related with somewhat complex missions; some of these missions can include puzzle solving or advanced strategic developments which incorporate structures of said nature to the strategic dimension that is implicit in the genre {P/R, S(R)}: Such are the cases of *Sleep Is Death*, *S2: Silent Storm*, or *Darkest Dungeon*. Puzzle is undoubtedly the most complex of all four genres, in that it is the only one where a properly creative abduction is possible. This can be explained on the grounds of the possibility, offered by the inductive function of this configurative genre, of designing a rule that requires foresight in order to undo the conventional conceptions of genre from the player's behalf. This will be discussed further later on in the study.

Regarding the analyzed examples, it can be established that, in the case of Puzzle, the abduction is overcoded when mechanics and rules match, as is the case in traditional puzzles, sudokus, and tile-matching games, among others {P}: *Bejeweled*, *Divide by Sheep*, and *GooCubelets*, are some examples extracted from the sample; in said subgenres, knowing the rule and applying it in a systematic and proper manner would guarantee a victory. When there is a distance between rules and mechanics, it is undercoded: Knowing the former does not guarantee a victory, since circumstance-dependent elements that force the player to negotiate rules using their imagination come into play: Such is the case with the Maze Game, Action Puzzle, and Point-and-click genres {A(P), R(P)}, such as *Tetris*, *Irisu Syndrome* or *Lakeview Cabin Collection*. Finally, it is creative when the player has to "invent" the rule that allows them to win the game, as is the case in Goldberg's machine-designing games, construction games (*Crazy Machines*, *Kill the Bad Guy*, *Mechoecho*) and especially games with settings distanced from conventional logic, such as those set in non-Euclidean perspectives {P}: *Hocus*, *Rememoried*, or *Braid*.

Statistic reading of the different abductive functions. The high disparity between the overcoded (86.3%) and undercoded (13.7%) options in the RPG genre, as well as the second option being limited to a practically marginal field, are factors that suggest a conflict between the abductive and configurative signals: As the abductive signal increases (undercodification) in what would be its ideal function, so too does its compatibility with the configurative order decrease in terms of convolution. Due to the deductive nature that the square of opposition reveals in this genre, it can be

specified that, inasmuch as abduction sticks to a system of rules, it will support the function that is characteristic of the RPG genre. As such, the abductive undercodification going against the deductive function explains the statistic terms that it offers in this case.

The Strategy genre repeats the logic of RPG, according to which any increase in the ideal function of the abductive signal is matched by a proportional decrease due to its convolution with the configurative signal. Despite this, a closer balance can be found between overcodification (61.7%) and undercodification (38.3%). Although the prominence of the overcoded abduction is clear, the undercoded abduction is not demoted to a marginal status, as is the case with RPG. This closer degree of balance can be explained by the formal character of the genre: This implies a regulated and somewhat immediate foresight regarding the other player's decisions, which can be simulated in two clear structures: real time and turn based, which adjust and offset the abductive frequency.

Within the limits of the configurative genre of Action, a radically distinct proportion of differences between overcoded (92.3%) and undercoded (7.7%) abduction games, much like in the RPG genre, can be observed. But unlike RPG, whose structural reason suggested the need for the abduction to stick to a formal rule (based on the logics of exchange and equivalence), in this case the mediation is more of an intuitive type, in that the system of rules requires an immediate reaction regarding the player's decisions. Therefore, a derivative logic opposed to the undercodification of the abductive signal is prominent in both genres, which would explain the similarity of its behavior in both cases.

Finally, in the case of Puzzle, it is noteworthy that the frequencies of the overcoded (33%) and undercoded (60.3%) categories are the inverse of those observed in the Strategy genre. This inversion seems to be a symptom of the fact that undercodification is a value distribution that, unlike the previously mentioned cases, is preferred, in line with the inductive conditions of the configurative function of Puzzle. As such, the presence of the creative abduction (a nonexistent variant in the other three configurative genres), though limited quantitative-wise (6.7%), suggests a compatibility with the preexisting inductive function in the program.

All in all, if the capability for abduction is minimal in overcoding circumstances, the genres in which said overcoding is clearly hegemonic (Action, RPG) present a high reduction of the properly human abductive signal. In the cases in which the difference between overcoding and undercoding is minor (Puzzle, Strategy), the abductive reduction is not as drastic, and in the case of the Puzzle, it can manage to be partially compatible with the increasing function; this would be the ideal tendency of the abductive signal. According to this observation, it can be concluded that the elementary genres of video games, due to them being products of an industrial development that tends to adapt to models that satisfy users, show a slight tendency of preferring to repress the abductive signal. This is because they are either formal-deductive genres (Strategy, RPG), in which coding is an inseparable part of their definition, or are inclined toward prevalent "intuitive genetics" (Action) pre-empting the development of the inductive function (Puzzle), according to Piaget.

As stated previously, this analysis does not describe the implicit properties of the configurative models; Such a focus would imply falling into an idealism incompatible with the purpose of this article. What these sampling conditions attempt to describe is the structural order of the configurative models as observed according to the satisfaction of the average player, understood in this article as a referent to distinguish the most industrially established forms of convolution. This could plausibly be a necessary starting point to delve deeper in the human–machine relationships that could take place in video games.

Discussion and Conclusions

This article sought to define an analytical model that transcended the categories of rules and mechanics as fundamental aspects of ludology. For this purpose, two concepts that support a more integrative vision of the video game phenomenon were used as reference: The configurative function, characteristic of the program, and the abductive function, characteristic of the player. This shift in the focus of the ludological perspective was an attempt to move away from a classical cybernetic perspective that only takes the game system into account and move toward a cybersemiotic approach that considers the specificity of the Peircean aspects of the sign: representamen (configuration) and interpretant (abduction). Said aspects would be represented by the convergent systems of the game—in that it is a set of rules that are given in a specific manner to the player’s experience—and the player—in that it is the competent organism in relation to the game to a degree.

As such, an attempt was made to demonstrate the specific way in which these two systems interact with each other. Due to this relation being the product of two functions, the concept of convolution was used to describe this phenomenon. In order to understand the specific forms of convolution, the behavior of the abductive signal was empirically examined according to the configurative singularity represented by each of the four elementary genres: Action, Strategy, Puzzle, and RPG. The results showed the different ways in which the abductive signal is modulated by the configurative signal.

This reinterpretation of the cybernetic paradigm on which modern ludology is based is an attempt to overcome the questions posed by Sicart (2008), in line with his definition of mechanics as “methods invoked by agents, designed for interaction with the game state.” Said methods, present to a degree in the game system, would be invoked by an abductive signal within the limits made possible by a configurative signal. Therefore, the possible ways in which the methods could be invoked would be due to the abductive dimension, that is, the dimension related to the human capability of generating hypotheses.

A legitimate question could be proposed regarding the extent to which the existence of said methods is an aspect that can be fully assigned to the conscience of a game designer. As such, the distinct definitions of mechanics, some examples being that of Jārvinen (2008) and the one by Sicart mentioned earlier, agree that they can

be exclusively linked to the foresight of a will that precedes that of the player. Other definitions, such as Juul's (2001), previously cited as theoretical support of the consideration of the player having a certain degree of independence in relation to the simulation, are more restrained in this respect.

There have been several occasions where players, using abduction, have found ways of agency within the game's design unforeseen by the game's developers. A good example is the case of Jeremy Mattheis, owner of a YouTube channel under the name of GoldVision, through which he streamed a pacifist run of *Grand Theft Auto V* (Rockstar North, 2013) for 3 years. In that case, a configurative paradigm of RPG (deductive function) was reassigned (with difficulties, as the player himself has stated to the press) according to the appliance of a creative abduction signal, which is an option exclusive to Puzzle's configurative paradigm (inductive function).

In these cases, the concept of "abductive gap" can be proposed, in itself a variation of the "narrative gap" found in Wolfgang Iser's (1972) theory of reception, as well as the correlation proposed by Bogost (2006) in his notion of "simulation gap" (pp. 129–136). In this case, the concept does not refer to a "hole" that the player "must fill" in order to understand the text, but rather one that the player "can fill" in a nonexclusive manner and without coercion by any designer, or even as a subversion of the limits that the designer could set. This theory would set the bases for a challenging debate about the limits of discourse and interpretation in video games (Ferri, 2013; Pe´rez-Latorre, 2015; Pe´rez-Latorre & Oliva, 2017).

In the core of the abductive gap, there is the ergodic dimension that Aarseth (1997) mentions as the cornerstone of cybertext. However, the effort put into the process of the work is also, in this case, an ideological effort. The simulation gap via which, according to Bogost (2006), "players carry subjectivity in and out of the game space" (p. 135) is forced to the point that subjectivity is imposed over the game system's programmatic expectations.

Eskelinen (2012, pp. 313–326) warns of the difficulty of theoretically reconciling the "implied player," that is, the programmed player from the perspective of ludology, and the "real player," that is, the empirical player from the perspective of social sciences. In the face of the accusations against the formalism proposed by ludology, Eskelinen defends this proposal's capability to "offer critical views on the game's so far greatly overlooked capability to model human behavior, real societies and social relations" (p. 325). This waiver of an empirical player, although it has without a doubt proved to be incredibly useful toward understanding video games, nevertheless limits the discussion about the ergodic aesthetic to a threshold that does not consider the modal variations between the regulated foundation of video games and an empirical subject that to a degree diverges from it.

The aim of this article is to offer a tool that, by interpreting ludology through the lens of a second-order cybernetics logic, reconciles both dimensions in a dialectic gesture. The equidistance regarding the player-centric and game-centric approaches (it is important to note that the latter approach has never in reality been the focus of ludology) is necessary if one wishes to articulate an approach that understands

agency in two directions and not only one. Ludology, understood as per the logics of first-order cybernetics and exclusively studying the programmed system, does not contemplate the possibility of an “indocile player” who does not adhere to the imposed orientation of mechanics and forces the emergency of the game to create sense: Here is relevant the example of *Grand Theft Auto Pacifist* which was described previously, as are other experiences in the artistic sphere such as the creation of Magnasanti, a dystopia of absolute social control designed by urbanist Vincent Ocasla for 4 years within the limits of *SimCity 3000* (Maxis, 1999), a video game distinguished precisely for its liberal management principles. In other words, without contradicting the rules of the game, these examples display the way in which unexpected discourse effects are reached. Said discourse effects can also be considered subversive regarding the game and that they bear the seed of critical reflection. The formalization of the alteration possibilities of a given game function on the behalf of the player is one of the benefits suggested by this theoretical approach.

Besides the contribution in the aesthetic field, the sociological and cultural approach also represents an urgent goal. In the last years, there have been some noteworthy analyses (Casey, 2014; Conway, 2014; Cypher & Richardson, 2006; Jenssen & Jenssen, 2014; Muriel & Crawford, 2018a, 2018b) that recur to Bruno Latour’s actor–network theory to think about the sociological and political dimensions in the agency relationships within gamified processes. The tool of analysis presented in this article, developed within a cybersemiotic paradigm and thus related to the same interests as Latour’s sociology, provides a useful device before the symmetrical comprehension of the video game–player agency relationships.

The abductive relation, a key element in wayfinding cognitive processes, is yet to be defined regarding its capabilities of reassigning the configurative function. Nevertheless, this concept could be used to conceptualize a denomination that is inaccessible from a current formalist perspective—due to the limits of the theory that utilizes rules and mechanics as its units of analysis—and by doing so, allow the possibility of it being assessed in orders such as aesthetics, cultural studies, or sociology, heretofore unforeseen in the ludological and proceduralist contexts.

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