

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 re-focus 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 1200 games ($N=1200$, $n=300$) in order to arrive at a set of conclusions about the behavior of the distinct video game genres in the indicated terms.

Key words: video game genres; ludology; cybersemiotics; abduction; signal processing

Beyond rules and mechanics: A different approach to ludology

1. Introduction

The study of the conditions that enable video games to exist as a singularity represents the core of modern game studies. In the late 20th century, discussions regarding the ontological nature of video games were centered around 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-Rufí, 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 towards 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 and Aarseth, 2007; Eskelinen, 2001; Hunickle, LeBlanc, & Zubek, 2004; Juul, 2003) or more specifically in genre studies (Järvinen, 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, i.e. 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.

2. Background

2.1. 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 (Juil, 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” (Juil, 2001), “play” (Myers, 2009) or “game procedures” (Fullerton, Swain, & Hoffman, 2004), referring to different aspects of the concept. Other authors such as Adams & 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), fo-

cusing 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 (Dubelman, 2016, 2017). This is the notion this work is mainly centered around. While Järvinen's (2008) definition of mechanics as “means to guide the player into particular behaviour 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 Järvinen'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 current 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/, i.e. 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 & Björk (2003), Cook (2005) and Järvinen (2008), who understand mechanics as a subcategory of rules, or the one proposed by Fullerton et al. (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 current 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.

2.2. The abductive and configurative formulae

El género es concebido en este artículo como principal unidad interactiva del videojuego. Esto es así en la medida en que la denominación moderna del concepto de género (Miller, 1984), sintetizable como “a *relationship* between textual structures and the situations that occasion them” (Frow, 2006, p. 13), resulta en cierto sentido equivalente a la comprensión del HCI de segunda generación como algo que “cannot be seen independently of the use situation” y que al mismo tiempo “does not just focus on the needs of the individual user in a specific situation” (Bødker, 1987, p. 22). Este paralelismo, dada la naturaleza cibernética del género en el videojuego, fundamenta la pertinencia de recurrir a los acercamientos de la segunda ola de HCI studies, de base cognitivista, como es el caso de la teoría lenguaje/acción de

Winograd & Flores (1986), comprometida con “the shift from language as description to language as action” (p. 76), y el acercamiento de Bannon (1991) desde la psicología cognitiva.

El carácter interdisciplinar de los HCI studies justifica el recurso a una disciplina como la semiótica (Souza, 2005), lugar de encuentro de estos acercamientos epistemológicos en una comprensión de la producción de signos mediante funciones, y por tanto mediante señales. De esto puede inferirse que “basic computer skills exhibited by contemporary user are in fact *semiotic engineering* abilities of the same sort as required from professional designers” (Souza, 2013). Si bien, como indica Tanaka-Ishii (2010), el interés de la semiótica por los lenguajes naturales ha encontrado su desarrollo principalmente en las humanidades, la vía del lenguaje formal—y con ello del “language as action” según Winograd—pertenece con más propiedad a los intereses de la ciencia y la ingeniería (pp. 5-6). De ese modo, el presente acercamiento conceptualiza en un solo dispositivo metodológico la confluencia de la psicología cognitiva de Jean Piaget, la semiótica analítica de Charles S. Peirce y la semiótica interpretativa de Umberto Eco, considerándolas como teorías enunciables desde los márgenes de la tradición teórica de segunda ola de 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, Pérez-Rufí, & Gómez-Pérez (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 ac-

cepted 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, the minimization of certainty leads to an increase in the device's heuristic potential.

According to this point of view, the closest examples in literature and cinema to video games regarding the terms of abductive reasoning would be avantgarde 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 (Béziau & 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...}. 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). Todas las posibilidades que puedan derivar de la combinación de las funciones {A, S, P, R} serán denominadas en el presente artículo “configurative functions”, es decir, aquellas que dan cuenta de una condición inferencial exclusivamente atribuible al entorno de programación.

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, i.e. the elementary configurative functions in their distinct genre combinations. Según la interpretación que Souza (2005, p. 42, 2013) realiza del uso de la semiótica de Peirce (1868) en el campo de los HCI studies, la distinción de tres facetas del signo en: “objeto” (referente), “interpretamen” (representación) e “interpretante” (meaning in the beholder’s mind), se corresponde exactamente con la relación designer-system-user: es decir, la finalidad dispuesta por el diseñador, la expresión programada que media en la consecución de la anterior y la interpretación del usuario. Generalizando esta distinción e incorporando a ella los estudios citados, puede establecerse que la solución configurativa se corresponde con la faceta de interpretamen, y la abductiva con la de interpretante. Con esto debe concluirse que ambas soluciones pertenecen a facetas diferentes del signo y por tanto compatibles en un modelo homogéneo.

No obstante, debe asumirse que el videojuego representa una diferencia apreciable respecto a otras aplicaciones: mientras que en las segundas la forma de relación ha de ser “one-shot” (Souza, 2005, p. 90), es decir, directa y sin ambigüedades que ralenticen la relación con la interfaz, el primero se basa precisamente en la relación hasta cierto punto conflictiva con la expresión del programa. 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 around 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 paper.

2.3. 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 paradigmization 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 i.e. 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 cultural studies, sociology and aesthetics.

3. Method

3.1. 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, & 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.

En la medida en que un juego puede “jugarse a sí mismo”, sin la intervención de un jugador humano, su conducta desvela pistas sobre su faceta configurativa: 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 (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 byproduct of said relation.

In more specific terms, this concept refers to a mathematical operation that, in the LTI systems (systems that are invariant in time, e.g. the distinct levels of a videogame), transform two functions f and g within a third one ($f * g$) 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.

Esta operación implica alterar el foco del acercamiento ludológico sobre la relación regla/mecánica en la medida en que la relación configurativa/abductiva no se corresponde con aquella: regla y mecánica describen una relación exclusivamente atribuible al programa y por

ello no son vinculables mediante el concepto de convolución, mientras que configuración y abducción describen procesos relativos respectivamente al programa y al usuario. La relación dinámica que la convolución procura entre las últimas es privativa, por tanto, de un paradigma de human-computer relation que sea coherente con una heurística del jugador (con las sutilezas que esto implica respecto a la recepción y sus posibilidades de dispersión) y no se limite a la descripción funcional de la máquina.

3.2. 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. 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 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=1200, n=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 purpose of this sample was to determine the capability and tolerance of the configurative genres to be articulated in the form of the three possible abductive functions (overcoded, undercoded, creative), y a partir de esto realizar lecturas que permitan entender la relación entre la señal abductiva (human) y la configurativa (computer). Con ello se pretende disponer de una base teórica, empírica e interpretativa a partir de la cual pensar las posibilidades de diseño considerando los aspectos concretos de la recepción. 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, es decir, tiende a dar espacio a un pensamiento crecientemente creativo, en la me-

didada en que los juegos necesitan an increasingly more marked use of lateral thinking y por tanto procedimientos de resolución no inmediatamente atribuibles a la regla.

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.

3.3. Results

As can be observed in Image 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, se realizará una lectura interpretativa de las relaciones entre las señales configurativas {A, S, P, R} y las señales abductivas {overcoded, undercoded, creative} a partir de los datos obtenidos. Este acercamiento pretende alcanzar conclusiones sobre la forma en que las segundas acusan variaciones según sus determinadas relaciones de convolución respecto a las primeras. Para ello se ha tomado en cuenta que la señal abductiva, en tanto basada en la capacidad humana para la producción de hipótesis, es de tal naturaleza que aumenta en la medida en que se acerca a su solución creativa. Esto llevará a entender sus variaciones estadísticas en los resultados como incrementos o decrementos respecto a su condición ideal (a monotonically increasing function), productos de la relación de convolución.

[Table 1. Analysis of the abductive modalities within the four configurative genres.]

[Image 1. Graphic display of the abductive behavior.]

3.3.1. 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, i.e. 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)}. 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.

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 (MOBA), Build and Battle, Tower Defense and generally in Real-time Strategy; i.e. genres

whose strategic core is limited by an intuitive function $\{A(S)\}$. The undercoded abduction is, however, related to genres in which the figure of the opponent plays a major role, i.e. those in which the turn-based mechanics force the player to think in a more intense intersubjective manner, from Tactical and Operational Wargames to classic games such as chess and tic-tac-toe $\{S, S/P, S/R\}$.

As for RPG, the overcoded abduction can be translated into a prominence of fighting and simple missions, such as in the majority of ARPG, Roguelike and MMORPG games $\{R, A/R\}$. 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 $\{P/R, S(R)\}$.

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 indicative 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, sudoku and tile-matching games, among others $\{P\}$; 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 $\{A(P), R(P)\}$. Finally, it is creative when the player has to "in-

vent” the rule that allows them to win the game, as is the case in Goldberg's machine-designing games, construction games and especially games with settings distanced from conventional logic, such as those set in non-Euclidean perspectives {P}.

3.3.2. Statistic reading of the different abductive functions

The increased 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) en lo que sería su función ideal, so too does its compatibility with the configurative order decrease en terminos de convolución. 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 función ideal de la abductive signal is matched by a proportional decrease debido a su convolución con la 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 by the inductive nature of the configurative function of Puzzle. As such, the presence of the creative abduction (a non-existent variant in the other three configurative genres), though limited quantitative-wise (6.7%), suggests a compatibility with the pre-existing inductive function in the program.

4. Discussion and conclusions

This paper 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 towards a cybersemiotic approach that considers the specificity of the Peircean regimes of secondness (relation) and thirdness (mediation). Said regimes would be represented by the convergent systems of the player, in that the player is the competent organism in relation to

the game to a degree, and the game, in that it is a set of rules that are given in a specific manner to the player's experience.

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, es decir, aquella relativa a la facultad humana para generar hipótesis.

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 Järvinen (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* for three 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 Ian Bogost in his notion of "simulation gap" (2006, 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 non-exclusive 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; Pérez-Latorre, 2015; Pérez-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, "players carry subjectivity in and out of the game space" (2006, p. 135) is forced to the point that subjectivity is imposed over the game system's programmatic expectations.

Said consideration seems appropriate in a moment where upcoming VR technology applications show a certain preference towards simulation experiences that enable a multimodal relation with the environment, especially in educational settings (Didehbani, Allen, Kandalaf, Krawczyk, & Chapman, 2016; Erra, Malandrino, & Pepe, 2018; Jeong, Lee, & Kim, 2018; Kirkwood & Price, 2013; Kober & Neuper, 2013; Martínez, García, Oliver, Molina, & González, 2014; Meurer, Stein, Randall, & Wulf, 2018; Walczak, 2009). 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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TABLES

| Abduction | Action (n=300) | Strategy (n=300) | Puzzle (n=300) | RPG (n=300) |
|------------|----------------|------------------|----------------|-------------|
| Overcoded | 92.3% | 61.7% | 33% | 86.3% |
| Undercoded | 7.7% | 38.3% | 60.3% | 13.7% |
| Creative | 0% | 0% | 6.7% | 0% |

Table 1.

IMAGES

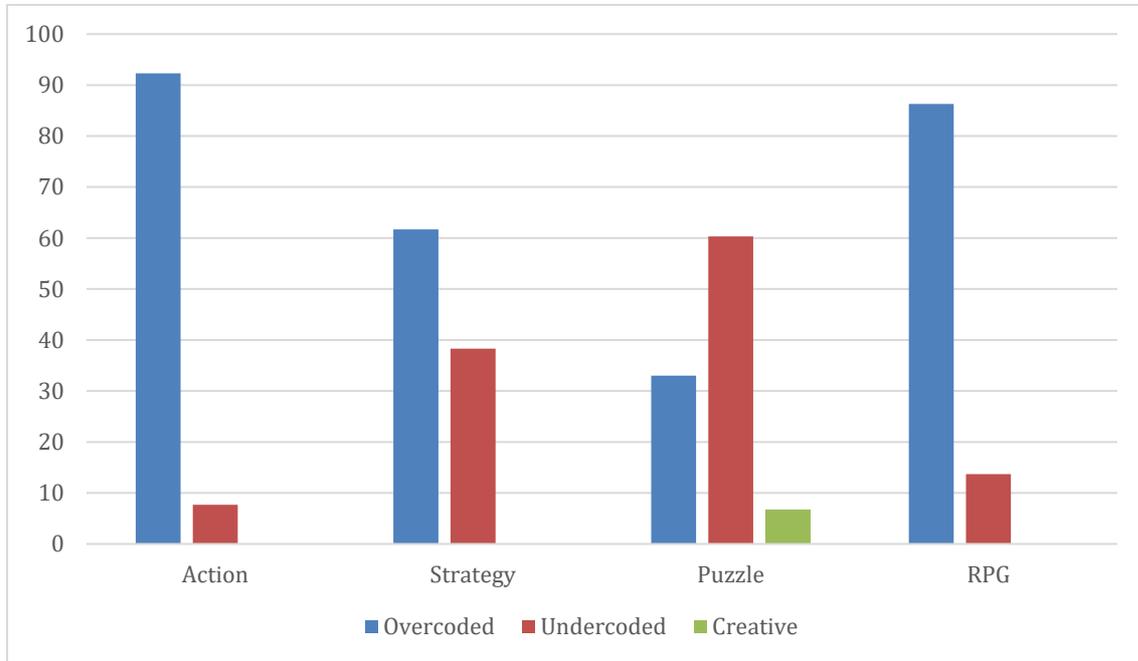


Image 1.