Narrating machines and interactive matrices: a semiotic common ground for game studies

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ABSTRACT
Between playing a game and enjoying a narration there is a semiotic and semantic common ground: interpretation and meaning-making. A semiotic methodology to describe situated gaming practices will be presented in three phases. At first, the intuitive concept of "meaning" will be discussed and substituted by the generative semiotic notion of "content". Then the structuralist semiotic notion of "text" will be criticized and substituted by the the concept of "interactive matrix" and "game-text", referring also to Rastier's differential semantics, Peirce's diagrams and other recent proposals in semantics of perception. Situated gaming practices will be the focal point of the last part of this paper, showing how these practices and the game-text mutually influence and modify each other during interpretation and meaning-making.

Author Keywords
Semiotics, semantics, Eco, Rastier, structuralism, interpretation, meaning, narrative.

INTRODUCTION
"Interaction: 1. reciprocal influence between two phenomenons, elements, individuals, etc [...] 4. generic social relation between two individuals or collective subjects, during which each subject continuously modifies his behavior in relation to his counterpart's behavior" *(translated from "Dizionario della lingua italiana Garzanti" – "Garzanti Dictionary of Italian Language")*

"Interaction: mutual or reciprocal action or influence" *("Merriam's-Webster Online Dictionary")*

Players never play alone, even electronic games are played against computer-generated antagonists or, in case of games without explicit opponents, against some kind of system or environment or set of rules designed to keep a certain level of competition. While this can appear self-evident in a certain sense, nevertheless a satisfactory study of "situated play" should be based on a more complete understanding of the interaction between a game and its player: this is the minimal context in which games produce their meaning-effects of competition, cooperation and mutual interference with players. Hence the primary focus of this proposal is to develop a basic semiotic and semantic framework for games and computer games in particular. Only when an heuristic describing the "player – video game interaction" will be satisfactorily developed, it will be possible to scale it up to describe a wider context including, for example, multiplayer online gaming.

A SEMIOTIC COMMON GROUND
Ludologists, for example Eskelinen [5] and Frasca [9], and game-designers such as Costikyan [2] have proposed different criteria to draw the line separating games from stories. Without resuming the debate about the presence, the function and the characteristics of stories in game, it would be helpful to propose a different approach to this problem hoping to synthesize various positions in a common paradigm.

If a video recording of a game of Tetris is analyzed using Russian formalist narratology, it would not qualify as a narrative. There is neither protagonist nor antagonist on screen and the fabula is potentially endless: these anomalies are enough to put Tetris outside the boundaries of the great majority of narrative theories. Of course, it is possible [12] to propose other second-order interpretations about it – and their importance will be shown in the following paragraphs – but for the moment it will be sufficient to say that no narrations are evident at a first analysis.

On the other hand, if the video output of an adventure game such as The Secret of Monkey Island would be recorded and analyzed using Propp's paradigm [15, 18], many anomalies would be obviously detected but it could still qualify as a narrative. There is a protagonist and an antagonist, each one with different helpers, there are different quests and there is an ending. The main anomaly would be, of course, the repetitiveness of the *syuzhet*, including several long and uneventful segments in which the protagonist tries a great number of unsuccessful actions or wanders in search of clues. In the end, a video recording of The Secret of Monkey Island could be a simple and somehow abnormal audiovisual narrative, from a Russian formalist perspective.

In facts, these two computer games have both been very successful commercially, despite their apparent diversity. Game studies still lack a general model to explain why simple games can be fun and addictive even narration, at least in the sense in which Propp or Genette use this term, is absent from the game. A very radical consequence could be to deduce that the practice of gaming is completely different

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from reading a novel or watching a painting. In this radical hypothesis, the narrative structure of The Secret of Monkey Island would be only a layer covering a more abstract organization, such as some kind of hypertext-like maze. Such hypothesis seems unconvincing in its radical approach.

Instead, what will be proposed is that there could be a semiotic common ground between playing and enjoying a narration: interpretation and meaning-making. The sketch for a description of situated gaming practices will be completed in three phases. At first, the intuitive concept of "meaning" will be discussed and substituted by the generative semiotic notion of "content" [11]. Then the structuralist semiotic notion of "text" will be criticized and substituted with the concepts of "interactive matrix" and "game-text", referring also to Rastier's differential semantics [16], Peirce's diagrams [8, 13, 14, 17] and other recent proposals in semantics of perception [8]. Situated gaming practices will be the focal point of the last part of this paper, showing how these practices and the game-text mutually influence and modify each other during interpretation and meaning-making.

MEANING, CONTENT AND COMPUTER GAMES

"Il est extrêmement difficile de parler du sens et d'en dire quelque chose de sensé"

A.J. Greimas, Du Sens [10]

Discussing meaning-effects and meaning-making in computer games could appear inappropriate and therefore needs some clarifications. In linguistics, semantics is the subfield that is devoted to the study of meaning, as borne on the syntactic levels of words, phrases, sentences, and sometimes larger units of discourse, generically referred to as texts. The main objection that could be opposed to the present work is that "meaning" is a concept specific to linguistic systems and consequently it is unfit to be applied to computer games. Therefore, two theoretical moves are required to justify a semantic approach to games: first the introduction of Hjelmslev's theory of "purport" [11] and its segmentation in "plane of expression" and "plane of content" and, later, a shift from a referential sense of "meaning" to a more relational one.

Hjelmslev [11] defines "purport" as a whole system of possibilities including every linguistic, perceptive and conceptual experience. The purport is a continuum, not yet semiotically formalized, containing sounds, colors, spatial configurations and images – these elements are used by languages and other signifying systems as a "plane of expression" – but also objects, events, facts, relations, experiences and thought – these elements constitutes the "plane of content" of a signifying system. Every system, every language and every culture divide the two planes along different paths: this accounts for the semantic variability between the ways in which languages categorize, for example, different shades of color.

Every signifying sign is, in Hjelmslev's terms, a function uniting two forms, a content form and an expression form, and two substances, the content substance and the expression substance. The expression substance is the material substance wherein a sign is manifested, including sound, writing but also other visual and spatial elements; the expression form is the way expression substance is organized and subdivided in interpretable portions. The content substance is composed by concepts, thoughts and also objects and relations, organized by the content form.

By accepting Hjelmslev's theory, it is finally possible to shift from the "meaning" of a computer game to its "content". Now the definition of plane of content should be re-examined: an element of the plane of content could be every object or thought in the world that is is connected to an expression by a sign function. If such theory is applied to computer games, then it is possible to consider every component of the game appearing on-screen as an expression. The plane of content in electronic games contains both semantic values used to interpret what happens in the game and rules and relations between the elements in the games. For example, in the game Pac Man, the content for the protagonist include semantic values such as /yellow/, rules-based content such as /cannot traverse walls/ and relations such as /if he eats a bonus then he will be able to eat ghosts for ten seconds/.

In the end, this first move away from a naive definition of "meaning" has freed a semantics of computer games from a too strict analogy with spoken languages and has cleared some inconsistencies of the term "meaning" when applied to interactive objects. On the other hand, Hjelmslev's structural semiotic methodology establishes some excessively rigid boundaries to be completely useful for a description of situated gaming: these features will be criticized in the following paragraphs in order to find a broader and more dynamical analytic methodology.

TEXTS AND COMPUTER GAMES

Semiotics, following one of the numerous definitions that have been proposed, studies "signification systems" and its main analytic focus is why and how "something" makes sense for someone. This "something" has been recognized, over the course of the years, first in the concept of "sign" and subsequently in the one of "text". "Text" has been one of the key theoretical points of structuralist semiotics since Hjelmslev and for the following decades: structuralist semioticians define it as a closed, cohesive, coherent and stable entity which is the only focus of an analysis, therefore excluding everything outside its boundaries. Structuralist and generative semiotics claim that every object that can be framed like a text can be the object of an analysis: written texts of different kinds (literary, journalistic, advertising...), visual elements (pictures, movies or plays, photographies...), everyday objects (packagings, cellular telephones, public spaces...).

In this theoretical framework, there have been different proposals for dealing with unstable, non-linear and, in a very general sense, "interactive texts". For example, Italian structuralist semiotician Alessandro Zinna [19] published a comprehensive investigation about "electronic writing artifacts", including in this genre also hypertexts and computer games. Zinna defines electronic writing artifacts as texts containing multiple textualities, each one of which is brought to existence by some pragmatic action of the reader, such as clicking on a link. Consequently, "interactivity", in Zinna's terms, is defined by the presence of some spots in which the text's fruition is suspended and need the reader's action to be resumed.

This kind of flattening of games into hypertexts and into proper texts is not convincing for different reasons that will be explored in the next paragraphs.

Games and structuralism

The hypothesis proposed in this work is that video games are not "texts" as orthodox structuralist semiotics define them but rather "interactive matrices" whose function is to produce single, small textual fragments. What can persuades not to classify video games between orthodox structuralist texts are two particularly obvious anomalies in the interactive portions of the games:

- while a proper text is stable in its expression substance and can be read several times without ever changing, on the contrary the course of a game can vary considerably between a session and the following one. That is true also if the same player plays two games consecutively.
- a traditional text, as an example a novel, exists also if nobody reads it. On the contrary the expression substance of a video game comes to existence only in the moment in which someone undertakes ludic activity. Moreover, if electronic games are not played they remain in the state of matrix and do not actualize a single proper text.

If, after considering these anomalies, we decide to consider every single game as a completely independent text, different from all the others produced by that particular computer game, the impasse we just experienced is in great part neutralized. A single game-text constitutes a text that, although it is quite different from literary or cinematographic ones, is at least stable in its expression substance.

Games and practices

Therefore the present model will step outside traditional structuralism in order to outline an effective semiotic procedure describing how video games make sense. The problem of the uncertain semiotic status of computer games can be solved if we consider Rastier's [16] definition of text as *"an actual empiric linguistic sequence, produced in a determined social practice and recorded on a media"*.

NARRATING MACHINES AND SEMIOTIC DEVICES

While the distinction between a plane of content and a plane of expression is indeed very useful, the excessive rigidity of Zinna's [19] and other structuralist methodologies has already been shown. A different model, more similar Aarseth's concept of "cybertext" [1], could be much more analytically productive.

Starting from Rastier's definition of text, video games will be described as "narrating machines", not texts but interactive matrices, semiotic devices for the production of many textual fragments (single game-texts), each one different and independent from all the others. A description of the semiotic mechanisms in narrating machines will be sketched in the following paragraphs.

Elements of an interactive matrix

The matrix is an overabundant semiotic agglomerate existing before the formation of any single game-text and containing all the semantic, narrative, figurative and strategic resources that will be actualized during the ludic activity. It is a complex semiotic object comprising different functions and different instances, such as victory-conditions, interfaces, links or semantic, figurative, strategic and values-related repertories.

Repertories

By accepting the hypothesis for which a narrating machine generates different independent game-texts, it is necessary to find an explanation for their great variability. In other words, it is easy to notice that in some games, for example, certain audiovisual portions are shown on the screen and not in some others. The consequence of this consideration is to assume that the semiotic elements that can be actualized in the game-text are included in the matrix in a greater amount than what it is effectively shown in the game-text. For this reason, different "repertories" should be individuated inside the interactive matrix, acting as logical containers for semantic elements that can be actualized during gameplay.

Repertories can be further subdivided in:

- figurative repertories, comprising the audiovisual elements that can be present in the game-text, including static elements, like images, or dynamic ones, like animations. Algorithms for the real-time generation of graphical elements can also be catalogued in these repertories.
- narrative and strategic repertories, containing all the narrative segments that can be actualized in the game-text and the algorithms establishing whether an event takes place or not in the game system. The matrix does not contain neither syuzhet neither fabula. Or, in other words, it does not

contain only one syuzhet and fabula: inside an interactive matrix there is an indefinite number of virtual plots which are incompossible in a single game-text. In practice, if a game develops in a certain way, consequently the correspondent game-text will follow a certain plot and there will be no other plots in that same game – but successive games could, of course, be different.

- semantic and values-related repertories, containing values and axiologies in the game and their possible interactions with the avatar.

The elements contained in the repertories are organized by the player's activity and by the correspondent reactions of the system: such interactions determine the actualization of elements drawn from repertories during the course of the game.

Victory and defeat conditions

The hypothesis from which this proposed model originates is that the player interacts with the interactive matrix actualizing one of the many possible game-texts. But saying that the game consists only in this conversion would miss the fundamental point of ludic activity: except some very particular cases, gamers play video games in order to win. A video game session ends with the player's victory if he succeeds in completing certain fundamental actions, variable from game to game. These actions can be, as an example, kill all the monsters or to exit a maze or to complete a Gran Prix before other racers. These fundamental actions could be defined "victory conditions". Apart a great variety of possible victory conditions, another key point for ulteriorly describe video games is how open those conditions can be. In other words, not only nearly every video game has different victory conditions, but the most advanced ones let the player, in some measure, establish his own conditions. In parallel with victory conditions, it is necessary to characterize defeat conditions. It is possible to discriminate two types of defeat conditions: those that consist in the impossibility to attain victory conditions and those that, instead, lead to the immediate end of a videoludic session. In other words, in the first case the player "remains blocked", meaning that he is not in condition for continuing its videoludic performance because he does not find, as an example, an object that allows him to arrive at a determined place: in this case the performance does not finish abruptly, but it gets lost in one be intermediate moment of the narration. The second case, instead, consists usually in the "death of the protagonist" causing the videoludic performance to end because of a wrong action.

Cooperation and competition

The player is in conflict with the video game system, he plays to win. At this point it is required to estimate and to formalize the contribution both of the cooperation and of the competition between player and video game system in relation to the production of the game-text. Since this model considers the interactive matrix a text-producing device, then it is obligatory to acknowledge the player some authorial properties: at minimum the one to decide whether the game-text will exist or not *(does he play?)* and whether the protagonist will reach the end of the history or not *(does he play correctly?)*. In synthesis, the player engages against the video game in an activity that is at the same time both competitive and cooperative. It is cooperative because the user is supposed at least not to produce aberrant behaviors – such as refusing to play, or deliberately killing his own avatar – and it is competitive because of the agonistic nature of the game. Therefore, the video game, in a sense, demands to be played, it invites the player and teaches him how to play through different codified strategies.

It would be a mistake to assert that the two instances, the competitive and the cooperative one, are in mutual conflict. On the contrary, both collaborate in synergy to the realization of the player's videoludic experience.

Model reader and model player

Before continuing the description of the cooperation between player and matrix, it is important to introduce the concept of "Model Reader" from interpretative semiotics. The first scene of "The Curse of Monkey Island – Monkey Island 3" could be used as an example, when the protagonist meets Wally, a character that he met before, during "Monkey Island 2". Umberto Eco writes [4]: *"Many texts make evident their Model Readers by implicitly presupposing a specific encyclopedic competence. For instance, the author of Waverley opens his story by clearly calling for a very specialized kind of reader, nourished on a whole chapter of inter-textual encyclopedia: «What could my readers have expected from the chivalrous epithets of Howard, Mordaunt, Mortimer or Stanley, or from the softer and more sentimental sounds of Belmore, Belville, Belfield and Belgrave, but pages of inanity, similar to those which have been so christened for hall a century past?»"*. Between asking the reader or the player to recognize Wally from Monkey Island 2 and to recognize Belmore, Belville, Belfield and Belgrave there are no evident differences.

But requesting non-trivial knowledge to the player or to the reader would not only be definitely elitist but also unrealistic. It would force Woody Allen's spectators to know the geography of Manhattan, it would force the players of Monkey Island 3 to recall correctly and completely what happened in Monkey Island 2. Since it is evident that this does not actually happens, it must be possible to formalize a more flexible definition to better understand the cooperation between text and reader and game and player.

Eco's solution is to define the "Model Reader strategy" as meta-instructions for the actual reader, called Empirical

Reader. Model Reader instructions stand between definitions of the ideal Empirical Reader and requests for reader's cooperation. Such approach can be usefully ported to computer games. It could be possible to roughly explicate the meta-instructions for a "Model Player strategy" in the first scene of Monkey Island 3:

- if the Empirical Player is familiar with Monkey Island 2, he should recognize Wally and this should generate some meaning-effects (pleasure to meet an known character, surprise for his different outfit...),
- if the Empirical Player is not familiar with Monkey Island 2, he is asked by the system to cooperate and, in order to better enjoy the gaming experience, pretend to recognize Wally.

Again, Umberto Eco writes [4]: *"at the same time the text [from Waverley] creates the competence of its Model Reader. After having read this passage, whoever approaches Waverley (even one century later and even if the book has been translated into another language – from the point of view of a different intertextual competence) is asked to assume that certain epithets are meaning «chivalry» and that there is a whole tradition of chivalric romances displaying certain deprecatory stylistic and narrative properties. Thus it seems that a well-organized text on the one hand presupposes a model of competence coming, so to speak, from outside the text, but on the other hand works to build up, by merely textual means, such a competence."*.

Cooperative instance

Video game are designed to invite the player to continue playing even after one game ended with a defeat. The strategies programmed in the matrix for this purpose are fundamentally of three different kinds. On one side, the system enacts some didactic textual strategies, giving the user the minimal competences needed to carry out his gaming. It should be noticed that these didactic strategies are, for specific planning, intentionally inadequate: the Model Player Strategy in the matrix is geared towards users who are able to complete the most basic ludic actions, but at the same time often ignore some crucial elements, whose learning often constitutes one of the most satisfying goals. In addition to making players competent enough to play, the cooperative instance should induce players the adhere to the values proposed in the video game. In other words, players are asked to "get in character", to feel empathy with the avatar through different strategies of axiologization of the values present in the matrix: non-interactive sequences, such as cinematic introductions to the video game itself, are often fundamental for this purpose.

At last, the system has to supply an adequate feedback to the player in order to let him orient his strategy towards the video game's victory conditions.

Competitive instance

While, in modern semiotics, the presence of manipulatory strategies in several types of texts – such as advertising – is well known and well described, it is surprising from a semiotic point of view that videoludic interactive matrices use competitive strategies against the player. In other words, the video game also "plays against" its user: a circumstance that would be exceptional if it was done, for example, by a literary text rather than by a game. It makes sense to assert that an everyday object is not designed to oppose more than the strictly necessary resistance to its user. In other words, it would be aberrant if the "empirical designer" of, for example, an automobile wanted to complicate its use. Video games, on the other hand, are by definition simulations of a some type of challenge taking place between at least two subjects in mutual competition. A video game requiring two "empirical players" opposed one against the other constitutes the simplest case of competitive instance: in this circumstance every participant opposes his own strategies to those of the others. If, instead, there only is a single player then the interactive matrix takes charge of generating the competition, actualizing one or usually more opponents.

MAKING SENSE OF A GAME: SEMANTICS AND INTERPRETATION

When examining a standard non-interactive text, such as a novel, the reader's practice produces an interpretative trajectory establishing various relations between semantic values present in the text and between other values that, even though they are missing from the text itself, are related to the present ones basing on the reader's previous interpretations. Following Eco's [4] terminology, this collection a reader's previous interpretants, the results of interpretations, will be called *"encyclopedia"*. In Rastier's paradigm, this interpretative trajectory determine a meaning of the text [16]. Going back to the definition of text as *"a sequence produced in a determined social practice"*, it is obvious that the practice of reading is different from that of gaming, even if they can fit the same definition. Gaming requires a continuous interpretation and a continuous production of game-text: if a player, for instance, sees his avatar near an enemy, then he could decide to start a fight after which he would pick up some treasure dropped by the defeated monster. In brief, when a user is playing a game, his interpretative acts are based on

1. semantic knowledge about the gaming practice and about that game in particular *(what are the winning condition? is it possible to win or lose?)*

2. semantic data present in the game at the moment of the interpretation *(such as the enemies' position, direction and speed)*

3. experience gained through previous interpretations *(what should I expect from this kind of game? what was the outcome of a strategy in a previous game?)*

Adapting Rastier's semantic theories to interactive objects, these three points constitute a local and temporary interpretative trajectory – analogous in many aspects to those created when reading linear texts. Therefore it is possible to say that this is a very generic core model for meaning-making in computer games: the production of a fragment of "game-text" is the consequence of the production of an interpretative trajectory based on a temporary, often real-time, configuration of semantic values.

Such model is compatible with an approach derived from C.S. Peirce's pragmaticism, in which the concept of "sign" is extremely wide, encompassing linguistic signs, thoughts, objects and situations and its meaning overlaps with its pragmatic effects. In this framework, it is possible to say that every temporary and local semantic configuration in the game causes the player to generate a series of interpretants, which according to Peirce could be thoughts but also actions, in a continuous process of perception, interpretation and reaction.

How games are situated in practices

This semiotic and semantic model for computer game analysis still lacks the possibility to account for the mutual modification between the interactive matrix, game text and the gaming practice. A satisfactory description of these mechanisms could, at a later time, be scaled up to encompass inter-personal gaming practices such as multiplayer gaming.

The starting point to include this feature in the present model is to consider again Rastier's [16] differential semantics. The minimal sign, in Rastier's model, is called morpheme and its content is called sememe. Rastier's theory has been developed on language, but it is possible to extend it to computer games: for example a falling block in the game Tetris constitute an indivisible, minimal sign – and therefore a morpheme – whose corresponding sememe could be /yellow/, /four-block long stick/, /able to rotate/, /able to move left/, /able to move right/ and /falling/. Each unit of content composing a sememe is called a seme. Rastier has defined his theory "differential semantics" because each seme acquires a value only in opposition to other semes. For instance, the semes /able to move left/ and /able to move right/ acquire their values because of the difference between themselves and in opposition to the sememe "boundary of the playing area" which contains the seme /impossible to pass through/. The concept of interpretative trajectory has already been presented in this work: now it is possible to clarify that this trajectory follows organizations of taxemes and semes which, in non-linear semiotic objects such as games, continuously change their relations and values. A certain number of semes is explicit in the interactive matrix, other semes interacts with the interpretative trajectory without being present in the matrix: they enter the interpretative process from the player's encyclopedia, as previous knowledge about the game, preferences, styles of play or as component of a gaming practice.

Deleuze and Guattari [3] introduced the concept of *"smooth space"* opposed to *"striated space"*: a striated space is a metaphor describing a field traversed by lines of resistance. These lines can be more or less resistant, applying consequently more or less constraint to a subject's action – in some cases certain movement are simply difficult, in some other are forbidden. Deleuze and Guattari's metaphor represents the way a generic text or an object or whatever spatial relation reacts to certain practices. This model has been applied to games by Ferri [6, 7], using a common pinball as an example: the "pinballspace" has certain striations, such as an uniform downward tilt, some barriers and four impenetrable outer boundaries, and other smooth areas. In Fusaroli's model [8] appears instead the concept of "field" to describe a similar situation. Both "pinballspace" and "field" represent an elegant representation of the continuous interpretative action and the consequent creation moment by moment of the game-text.

Recently, Fusaroli [8] proposed also a formalization of some perceptive mechanisms as Peircean diagrams. In other words a diagram, in Peirce's terminology, is a concatenation of practices in which each one influences the following: in this sense, perception is a process in which every step resonates and mixes with the others. Fusaroli's focus was semantics of perception, especially dealing with ambiguous situations that could have been hard to make clear from a narrative point of view, but his rereading of Peirce's diagrams can be useful also in this work.

ASSEMBLED MODEL

Finally, a whole model for a semiotic description of games – whose components have been so far presented one by one – can be completely presented.

A computer game is an interactive matrix, a system of possibilities producing a single game-text each time a player interacts with it. Different elements of the matrix can be actualized, inserted in the game-text, depending on the player's actions. Every element in the matrix (for example the avatar, the fictional space in which characters move but also victory and defeat conditions and even more abstract relations) has a content, a semantic value, a sememe which can be broken down in several semes, some of which define figurative qualities (such as Pac Man is /yellow/) and some others define procedural rules-based properties (such as Super Mario /can kill monsters jumping on them/). Gaming is an interpretative practice which shares some qualities with perception and meaning-making of a standard text, but is different for many other aspects. Both a linear text and a computer game are interpreted generating an interpretative trajectory that finds repetitions, resonances or oppositions between semes, but in interactive environments there are semes, such as antagonists' positions, changing every

moment. Moreover not every seme participating at the definition of the interpretative trajectory is originally and explicitly present in the matrix: some of them are provided by the players' encyclopedia, their repertory of previous interpretations and socially shared knowledge. Widening the field of the in-game interpretation to a broader range of semes coming from socially shared knowledge makes the analysis more complex but at the same time includes more articulated subjects such as MMORPGs.

The practice of perception and, in the case of computer games, reaction to the competitive instance can be described [8, 13, 14, 17] as a Peircean diagram: a temporally linear sequence of practices, each one of them influencing the following ones. Differently from linear media, the gaming practice does not seek primarily informations or aesthetic pleasure but is orientated toward victory conditions. Since the semantic configuration of the elements in the matrix changes constantly, therefore also the gaming practice must evolve moment by moment.

In relation to the logic structure of a game, the interaction between the matrix and a gaming practice is formalizable as operations on a "pinballspace" [6] or in a "field" [8] where the avatar must cope with the limitations – the striations – while taking advantage of its possibilities – the smooth areas.

The semiotic model proposed in these pages does not consider explicitly narrative structures. Reconsidering the problem of narratives in games as it was formulated in the beginning of this work, it is still possible to account for narrative structures within the present framework. This model neither requires them nor denies them – if narrative elements are present between the other semantic relation inside the interactive matrix, then they participate to the player's interpretation-making process and therefore they must be semiotically described. If, on the other hand, they are not present, then a description in terms of "pinballspace" still accounts for the interpretative trajectory in the game.

SEMIOTIC SPECIFICITIES AND FUTURE DEVELOPMENTS

This models attempts the creation of a common framework for differential semantics, semiotics of interaction and games studies. Computer games are described as narrating machines, interactive matrices that generate game-text through the users' practices. Procedural rules-based content has been redefined as part of the semantic values present in the system, and another part of semantic values are brought to the game-text from the players' encyclopedia [4], a logical repertory of previous interpretations and socially shared knowledge. In this way, it is possible to formally describe the context in which gaming is situated and its reflection on players' strategies.

The promising features of this model awaiting future development are:

- its scalability, as it is possible to imagine other layers of meaning-making – such as narrative structures – on top of the core one already described,
- the availability of other semiotic analytic tools, such as literary semiotics or visual semiotics, ready to describe possible other layers,
- the constitution of a common descriptive framework based on meaning-making makes a comparison between games and other media possible, while preserving their specificity.

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