Gameotics: A Game Analysis Method Based on Semiotics

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Abstract. The applied research in Games employs numerous instruments to carry out its investigations. The search for scientifically based analysis demands strategies that are in line with expectations regarding the efficiency and effectiveness of their studies. The intrinsic heterogeneity of games also requires that the mode of research be opportunely flexible and straightforward, to cover a greater diversity of elements. Such convergence in diversity can occur through the standard set of playful impulses of language, ritual, and myth; and its relations with the natural signal aspects of the games: interface, mechanics and narrative. Considering these specific characteristics of the games focusing on their experiences provided through the signs created, specific experimental research procedures can be applied as a possibility of research methodology. In this sense, Semiotics, as a study on systems and phenomena of signification, has the appropriate attributes to be used in the scientific research of games endowed with the mentioned aspects. Several kinds of research on Games have already been made through Semiotics, but there is no description of procedures for its application, allowing Semiotics to be adopted in a schematic way of studying these contexts. For this reason, it is proposed a fundamental methodology that enables the use of Semiotics as research structured in Games considering its intrinsic characteristics of signification and experimentation. The definition of the method is based on the correlation between the categories Primeity, Secundity and Terceirity of Semiotics articulated with the interface, mechanics, and narrative of the research object, that is, the Game. In support of the theoretical rationale of the proposal, a summary methodology guide will support researchers in their application. Associating Semiotics with Games in a structured model allows for the logical cohesion of study and analysis activities, generating uniform results, but respecting the specificities of signs and experiences of each Game. To confirm the proposal, it will be applied in Study Cases with analog and digital games, demonstrating its organization, application, and flexibility of adoption.

Keywords: Game design · Semiotics · Game analysis

1 Introduction

The games have been experienced by man since antiquity, being understood by practically any individual. According to the professor and historian Huizinga [1], "(…) every thinking being can understand at first glance that the game has an autonomous

reality (…)". The popularity of games has been driven by digital platforms, especially those based on screen devices, as they allow for collaborative and competitive gaming to be experienced almost anywhere, with diverse interaction designs. Also, such technologies promote the discovery of new games by players and extend the possibilities of creation by game designers. As games have been applied in different contexts, from pure fun to serious games that seek to train their players to perform critical activities in the real world. The scope and multiplicity of its interaction applications lead several researchers to try to understand how the elements of the games are related and how they create their meanings to produce the appropriate experiences during their use.

However, there are no specific game analysis methods that are effectively admitted by the scientific community that could be practiced by researchers. The applied investigation in games operates numerous instruments to carry out its investigations. The search for scientifically interactive audio-visual analysis also demands strategies that are in line with expectations regarding the efficiency and effectiveness of their subjects. The intrinsic heterogeneity of games also requires a mode of research to be opportunely flexible and straightforward, to cover a greater diversity of elements. Such convergence in diversity can occur through the standard set of playful impulses of language, ceremony, and story; and its relations with the natural sign aspects of the games: audio-visual interactive interface, mechanics, and narrative. Considering these specific characteristics of the games focusing on their experiences provided through the created signs, specific experimental research procedures shall be applied as a powerful investigation methodology. In this sense, Semiotics, as a study on systems and phenomena of signification, has the appropriate attributes to be used in the scientific research of games endowed with the mentioned aspects. Several types of research on games have already been made through Semiotics, but there is no description of procedures for its application. By creating these procedures, Semiotics could be allowed to be adopted in a schematic way of studying audio-visual interaction components in games.

For this reason, we propose a simple methodology that enables the use of Semiotics as structured research in games considering its intrinsic characteristics of signification and experimentation. The definition of the approach is based on the correlation between the categories firstness, secondness, and thirdness of Peirce's Semiotics [4], combined with the interface, mechanics, and narrative dimensions of the game defined by Schell [6]. In this sense, the objective of this work is to present a methodological proposal based on Semiotics concerning game design as a mechanism to assist researchers in the scientific production and publication of their studies. For this, three similar pillars are considered as theoretical bases, and these are the play impulses defined by Huizinga [1]: language, myth, and ritual; the design dimensions of games organized by Rogers [3] and Shell [6]: interface, mechanics and story; and the categories of the Peirce's Semiotics as demonstrated by Nöth [2], and Santaella [4]: firstness, secondness, and thirdness. In support of the theoretical basis of the proposal, a brief guide will support researchers for the practical application. Associating Semiotics with games design in a structured model provides a logical cohesion of study and analysis activities, generating uniform results, but respecting the specificities of signs and experiences of each game. To confirm the proposal, it will be applied in Case-Study with analog and digital games, demonstrating its organization, application, and flexibility of adoption. The proposal is structured in a

simple and flexible way, to be adopted in researches of analogical and digital games with a scientific basis. Thus, it will be possible for researchers and interested in the game studies area to develop analyzes with adequate foundation, increasing acceptance by the scientific and community.

2   Games

The parallel world of the game allows the player to interact outside their reality and offers possibilities and restrictions that do not apply in the real world. McGonigal [7] argues that "the real world simply does not offer the carefully crafted pleasures, the exciting challenges, and the powerful social bond gained in virtual environments so easily." This concept is what Huizinga [1] defines as a magic circle: "within the circle of the game, the laws and customs of daily life lose validity. We are different and do different things." McGonigal [7] further argues that "it is possible to see how (games) can represent an intentional, active, powerful, and, most importantly, extremely useful escape."

There are several theories that seek to elucidate and describe the nature and meaning of the game. According to Huizinga [1], the theories range from approaching the game like energy discharge or a need for relaxation to preparing young people for future responsibilities to exercising collaboration or competition. However, there is a similarity between these perspectives, since "(they) start from the assumption that the game is connected to something other than the game itself" [1]. There are other definitions of what qualifies as a game and the action of playing, such as SUITS [3] which states that "playing a game is a voluntary effort to overcome obstacles". Rogers [3] complements the concept of gaming is an activity that requires at least one player, has rules and has a winning condition.

Victory or defeat is related to the goal of the game, which "focuses attention and continuously guides the player's participation throughout the game" [7]. For Schell [6], the game is defined as a problem-solving activity that is playfully viewed. Voluntary participation requires that the play consciously and willingly accept the goal, rules, and feedback of the game [7].

The games have been applied in different contexts, from simple fun to serious games that seek to train their players to perform critical activities in the real world. The scope and multiplicity of its applications lead various researchers to seek to understand how the elements of the games are related and how they create their meanings to produce the appropriate experiences during their use. Shell [6] explains that "the game enables the experience, but it is not the experience". The player experience is defined as (…) a set of sensations that the game provides during its use, which involves the performance of activities, and the memories that remain after use [8].

In this sense, the designer's concern is focused on the experience he wants to create with the game. To recreate an experience in a digital game, Shell [6], the game designer must discover the essential elements that define the actual experience and how the game can capture this essence. As defined by Zimmerman [9], the goal of game design is to create meaningful play interaction. In other words, Martinho [8] explains that experience is an interpretation, made by the player, of the activity of playing the game.

Mechanics is the natural feature of the game, where it is found in its most functional form. Mechanics are the rules of the game and make the interactions and relationships between aesthetics, technology, and game narrative exist [6]. Rogers [3] defines game mechanics as what creates the dynamics of the game when there is player interaction. The interaction with mechanics occurs through playful interaction in the aesthetic meaning that the game offers.

There are several other significant elements in digital games that should be highlighted because their characteristics are important for the application of this research. The space of the game concerns spatial dimensions and limits; objects are anything that can be seen or manipulated; actions are what the player can do; the rules define the space, objects, actions and their consequences, as well as restrictions on actions; skills transfer focus from play to player; the probability is the uncertainties or surprises of the game [6]. Among the elements contained in the game design process, the skills can be highlighted in the research, since this involves physical, mental and social issues, obtained through experiences in the game. According to McGonigal [7], "(…) the emotional and social rewards we really seek require active, enthusiastic and self-motivated participation."

Another significant element is the game interface. According to Schell [6], the goal of the game interface is to make players feel they have control over their experiences. The player usually has two types of interfaces in digital games: one physical and one virtual. The physical interface is what the player sees, hears, and touches the game world, while the virtual interface provides information that prevents disturbing the player's interactions [6]. Other important features of the interface relate to how the player fulfills his wishes (if it is suitable to be used without difficulty), and how feedback occurs to the player to let him or her know about the game and affect them to create sensations from their experiences [6].

Due to the subjectivity of the gaming experience, mainly caused by the significance of its elements, specific testing activities need to be performed to ensure a proper design process. Subjectivity occurs because of the difference in players' profiles and the different ways in which they play and perceive the game [6]. Of the different types of tests that can be performed in games, the most relevant for this research is the gameplay test, which "serve to test the gaming experience and not to find programming problems" [8] (Fig. 1).

Games are built based on four different elements, defined by Schell [6] as:

- **Mechanics**: these are the procedures and rules of the game. The mechanics describe the purpose of the game, how players can or can not reach it and what happens when they try.
- **Narrative**: This is the sequence of events that unfold in your game. It can be linear and predetermined (closed) or branched and emergent (open).
- **Aesthetics**: this has to do with the appearance, sounds, smells, tastes and sensations of the game. Aesthetics is an extremely important aspect of game design as it has the most direct relationship to a player's experience.
- **Technology**: We are not referring exclusively to "sophisticated" technology here, but to any materials and interactions that make the game, such as paper and pencil, plastic parts or high power lasers possible.
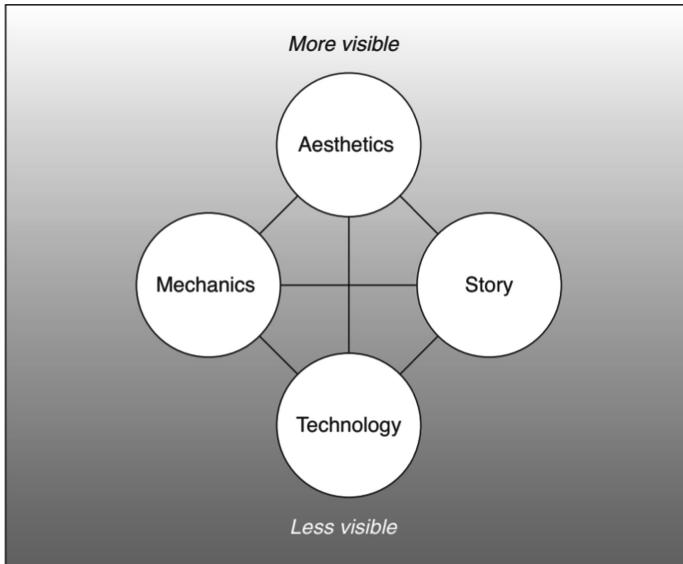
Fig. 1. Elements of games.

For Gameotics proposal, all elements above will be used, except Technology, as it is the base for building other ones in the games.

3   Semiotics

The Gameotics structure identified and conceptualized was based on the Normative Sciences of Charles S. Pierce, and later deployed in dichotomous actions. The Normative Sciences of Peirce defines:

- **Aesthetics**: what constitutes the admirability of an ideal (…), what would be sought under any circumstances.
- **Ethics**: The logic of how we should think must be an application of the doctrine of what we deliberately choose to do.
- **Semiotics**: deals with the inferences and arguments we are prepared to approve [4].

Drawing on the logical or semiotic philosophy of Charles Sanders Peirce, Santaella [5] seeks answers to the challenges posed by reality, believes that there are specific logical and cognitive roots that determine the construction of verbal, visual, sonic and all the variety of signs processes that they generate, reinforcing that such roots are much deeper and latent than the surface of channels and messages can lead us to perceive. Such matrices remain as the basis of language and human interaction from the earliest times with its materialization in stones and papyri up to the present day traveling global digital media in the most diverse devices imaginable.

Semiotics can be defined as "a general, formal and abstract theory of research methods used in the most varied sciences" [4]. The most current formulation of

semiotics refers to science concerned with investigating and understanding signs, signification, and communication. This science is based on phenomenology, that is, on the investigation of "the ways in which we apprehend anything that appears to our mind" [4]. This same basis is shared by aesthetics, ethics, and logic. Peirce's main concern was with the basis of scientific thought and truth. Because he understands that no reasoning can be constructed in a purely symbolic way, without signs, he deepened his researches by creating a general theory of signification. This general theory is divided into three branches:

- **Speculative grammar**: "study of all types of signs and forms of thought they represent" [4].
- **Critical logic**: based on species of a sign, studies the types of reasoning that each supports or structure (abduction, induction, deduction).
- **Speculative rhetoric** (or methodology): from the forms of critical logic, studies methods based on different types of reasoning.

Our focus will be on the first of these branches, the speculative grammar, which can be understood as the in-depth study of signs. What is a sign? "(…) the sign is anything of any kind (a word, a book, a library, etc.) that represents something else, called the object of the sign, and which produces an interpretive effect on a mind real or potential, which is called the interpretant of the sign" [4]. Pierce categorized the signs and thinking in three main categories:

- **Firstness/First/Quality/Icon**: it maintains a relation of sensorial or emotional proximity between the sign, the representation of the object and the dynamic object itself.
- **Secondness/Secundity/Reaction/Index**: it has the physical connection with its object, as, for example, a footprint is a "clue" of who passed.
- **Thirdness/Representation/Symbol**: it is a law; in relation to its object and sign, is a symbol, a social convention.

4   Gameotics Proposal

Considering the three elements of games described at item 2 about Games and the three main categories described at item 3 about Semiotics, Gameotics proposes a view crossing these six components, as shown below:

1. **Aesthetics:** Icons, Indexes, Symbols.
2. **Mechanics:** Icons, Indexes, Symbols.
3. **Story:** Icons, Indexes, Symbols.

These dimensions can still be restructured allowing another perspective of the relations, being it necessary for the researcher to identify the organization most suitable for its purposes, as follows:

1. **Icons**: Aesthetics, Mechanics, Story.
2. **Indexes**: Aesthetics, Mechanics, Story.
3. **Symbols**: Aesthetics, Mechanics, Story.

The cross-analysis of these elements allows the different semiotic characteristics to be differentiated in their dimensions. Through the vision of the various aspects and their relations, both the player and the researcher of the game will be able to identify the intrinsic or emergent siginifcações by their relations.

5   Case Studies

To verify and validate the Gameotics proposal, the analysis will be applied in two different games as case studies, being one analog (Chess) and another digital (SimCity 2000). To exemplify the different proposed structures the first game will start from the elements of the game to the semiotics, while the second will start from semiotics to the elements of the game.

5.1   Analogic Gameotics Case Study: Chess

1. **Aesthetics**
   1.1. **Icons**: the pieces have similarity with the object that they represent, like Tower, Horse, Queen, and King.
   1.2. **Indexes**: the board has a physical connection with a war terrain, as the pieces fight for territory during the play.
   1.3. **Symbols**: the pieces format and sizes, as the board size, are based on world conventions.
2. **Mechanics**
   2.1. **Icons**: the pieces move in a similar way to what they represent, like the Horse who can jump pieces or the linear movement of the Tower.
   2.2. **Indexes**: when a piece is captured, it leaves the board representing that it is dead or out of the "war" (game) for a while.
   2.3. **Symbols**: the pieces moves and the win/loss criteria are based on world conventions.
3. **Story**
   3.1. **Icons**: the game represents two armies battling, using different types of fighters.
   3.2. **Indexes**: check situations oblige opponent to review their strategy.
   3.3. **Symbols**: the game story can be told by the conventional numbered board positions and pieces movements (Fig. 2).

5.2   Digital Gameotics Case Study: SimCity 2000

1. **Icons**
   1.1. **Aesthetics**: all the buildings, terrains and other constructions have similarity with the objects that they represent.
   1.2. **Mechanics**: the game is an city simulation, recreating situations that occur in real life.
   1.3. **Story**: real-life city stories can be part of the learning process to play the game effectively.
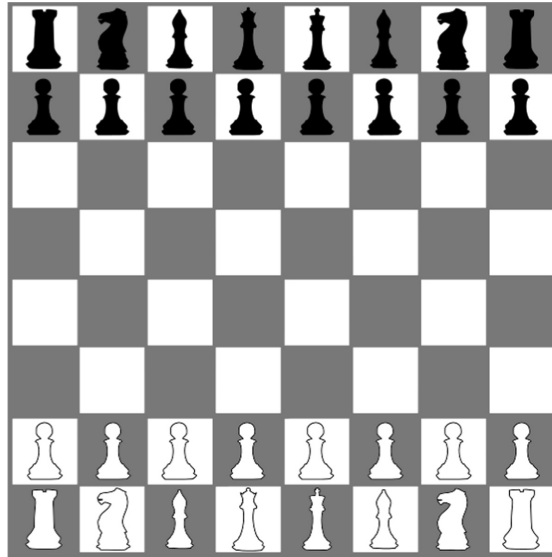
Fig. 2. Chess board game and pieces.

2. **Indexes**
   2.1. **Aesthetics**: sub terrain game objects are represented to allow the gamer note and interact with.
   2.2. **Mechanics**: the game user interface shows important city data to the gamer.
   2.3. **Story**: gamers can create their own story by playing the game.
3. **Symbols**
   3.1. **Aesthetics**: visual information in the interface follows interaction design conventions, like icons, pointers, windows, and menus.

Fig. 3. SimCity 2000. EA games

3.2. **Mechanics**: the interface action buttons allow direct interaction in the game mechanics.

3.3. **Story**: SimCity 2000 gamers and non-gamers can understand the story created as the simulation follows social conventions (Fig. 3).

6   Conclusions

This paper presents an overview of two different disciplines that integrate in an articulated way creating the Gameotics concept. Initially, it was presented the definition of games, its relation with the player, culture and society. We have described the main elements of the games (aesthetics, mechanics and story), and how they relate to form a complex and meaningful interactive system. It was also presented the concept of Semiotics and its significant triad, starting from the points in common with represented objects, passing through clues of the representation and finally arriving at the meanings defined by conventions.

The objective of articulating such disciplines is to offer game researchers a perspective of double-dimensional analysis. For this, the dimensions of the games were considered in relation to the levels of signification offered by Semiotics. In this sense, two perspectives were presented. One starting from the dimensions of the game to its meanings and another starting from the meanings to the dimensions of the game. It will be up to the researcher to evaluate the perspective most appropriate for the purpose that seeks to achieve the meanings of the game.

Two Case Studies were used to represent the different perspectives of analysis, one using an analog game and another a digital game. Thus it was possible to verify that the semiotic analysis of a game is independent of the technology used since it is focused on the meaning of game design. In this way, it was possible to demonstrate the applicability of the proposed method, in a flexible and simple adoption. Detailed analyses of the significance of the games can be made while maintaining the proposed Gameotics structures articulating elements of game design with levels of significance of semiotics.

References

1. Huizinga, J.: Homo Ludens. Taylor & Francis, London (2003)
2. Nöth, W.: Handbook of Semiotics. Indiana University Press, Bloomington (1995)
3. Rogers, S.: Level Up! The Guide to Great Video Game Design. Wiley, Hoboken (2014)
4. Santaella, L.: Matrizes da linguagem e pensamento: sonora, visual, verbal: aplicações na hipermídia. Editora Iluminuras Ltda, São Paulo (2001)
5. Santaella, L., Feitoza, M.: Mapa do Jogo. Cengage CTP, São Paulo (2008)
6. Schell, J.: The Art of Game Design: A Book of Lenses, 2nd edn. CRC Press, Boca Raton (2015)
7. McGonigal, J.: Reality is Broken. MIT Press, Cambridge (2012)
8. Martinho, C., et al.: Design e Desenvolvimento de Jogos. FCA, London (2014)
9. Zimmerman, E.: Rules of Play. MIT Press, Cambridge (2003)