

Interpreting Games: Meaning Creation in the Context of Temporality and Interactivity

Chaker Mhamdi

University of Manouba (Tunisia)
Al-Buraimi University College (Oman)
Buraimi, Oman

Abstract

The concept of interpretation applied to texts, videos, pictures, posts and all other types of media is varied. Objects are open to different forms of interpretation and games, as objects of meaning, are no exception. Explicating meaning creation in games will create a better understanding of game functions and their effects. This study explores how games alter the process of meaning creation through investigating their detailed properties and differentiation from other forms of media as objects of interpretation. This study argues that understanding meaning creation in games entails more than an examination of the presentation layer by a deeper analysis that considers interactivity and temporality. It contends that due to the interactive nature of games, the role of player participation is vital because gamers influence the operative mechanics of games and hence their meanings.

Keywords: *interpretation, games, temporality, interactivity, meaning*

1. Introduction

Due to the increasing development of telecommunication technology information has become the currency of meaning, fulfilling McLuhan's prophetic dictum "the medium is the message" (1964, p. 7). The digital revolution has placed information at the center of communication discourse, international relations and politics, economics and socio-cultural studies. It is consistently argued that we are living in the "information age" which has resulted in notable changes to societal communication, culture and human interaction (Mhamdi, 2017). Consequently, information and knowledge have become aggregated in the sphere of information technology. In this context, it is hardly accepted nowadays that children, for instance, are educated and formed solely by educational institutions. This is because the digital revolution has transformed the processing of information as knowledge acquisition (Mhamdi, 2016).

To process information, the concept of interpretation is important because understanding and experiencing texts, videos, pictures, posts and other types of media requires interpretation by the audience or user. Every medium attempts to represent its object and offers various possibilities concerning the way interpretation is constructed. A media object means something, but how that is interpreted depends on the context, how the object is constructed and, most importantly, how the interpreter, at least in part, contributes to the construction of that representation. Schema theory which is strongly associated with the cognitive approach further focuses on the interaction between the readers' background knowledge and interpretation. Schema theory advocates that comprehending texts and objects requires the interaction between readers' past experiences and texts/objects which creates mental frameworks that help readers comprehend and create new experiences (Al-Mohammadi, 2014, p 265-268). In other words, readers' past experiences are related to new experiences which may include the knowledge of "objects, situations, and events as well as knowledge of procedures for retrieving, organizing and interpreting information" (Kucer, 1987).

Various historical and cultural contexts affect how things are perceived, and consequently, what they are construed to represent. Interpretation theories and paradigms are an integral part of the context of interpretation. As these contexts vary, the meaning of an object also changes. Objects of interpretation are approached by people for different purposes and motivations that

determine their purported representations. Probable meanings of these objects unavoidably change according to those purposes. Interpretation usually involves how the understanding reached through the interpretative process will be utilized and for what purpose (Gadamer, 2004). This is how an application (the medium) may channel the interpretative process toward an end while excluding other possibilities.

Objects are open to various degrees of interpretation, some more than others. For instance, a piece of art work may motivate more interpretations than other types of objects. Regarding meaning, prose is less ambivalent than poetry, while it is more ambivalent than a scientific discourse. Games, especially video games, include numerous objects that lend themselves to a wide variety of interpretations. Investigating meaning construction in this milieu allows for a better understanding and improved game construction. The development of games involves graphics and coding, but more importantly, creating narratives and meaning construction, to which the player can contribute to varying degrees (Al-Mohammadi & Derbel, 2013).

This study investigates how video games, being objects of interpretation, alter the process of meaning construction. To successfully conduct this investigation, it is necessary to understand the detailed properties of games and the way they differ from other forms of media as objects of interpretation. To achieve its objectives, this paper seeks to answer the following questions:

- (1) How does the concept of interactivity influence the ways in which games are understood?
- (2) How does temporality affect and clarify the nature of meaning creation in games?

2. Games as Systems

Games are systems with specific logic. They are a form of media. A system is defined as “a set of things that affect one another within an environment to form a larger pattern that is different from any of the individual parts” (Salen & Zimmerman 2004, p. 50). As systems, games are open to several different ways of framing where each frame determines some aspects of a game. A game can be perceived as a logical system due to its internal inference systems. However, these systems also have experiential and cultural aspects (Salen & Zimmerman 2004). The experiential aspects are created in concurrence with the players’ interactions with the game while the cultural aspects are related to the context of the game creation and the situation where the game is played.

Games are also procedural systems. Bogost (2007) states that:

Procedural systems generate behaviors based on rule-based models; they are machines capable of producing many outcomes, each conforming to the same overall guidelines. Procedurality is the principal value of the computer, which creates meaning through the interaction of algorithms (p. 4).

Games are thus procedural systems founded on algorithms which change their structures. Accordingly, meanings created by games are also changed hence the concept of procedure is important.

Wardrip-Fruin (2009) also argues that “in the world of digital media, and perhaps especially for digital fictions, we have as much to learn by examining the model that drives the figurative planetarium as by looking at a particular image of stars or even the animation of their movement” (p. 157). Thus, if only the audio-visual constituents of games are interpreted, their procedural nature, which actually distinguishes them from different types of media, will be overlooked. As Wardrip-Fruin (2009) points out, “trying to interpret a work of digital media by looking only at the output is like interpreting a model solar system by looking only at the planets” (p. 158). There is more to explicating the creation of meaning in games than the presentation level.

However, this does not suggest that the suitable level for explicating games lies at the coding level. Code comes under the rubric of “software studies” which is useful in understanding digital objects (Manovich, 2002). However, instead, it generally suffices to consider the procedural level and the underlying mechanics of game creation and their usage (Wardrip-Fruin, 2009).

It is evident so far that the argument pertains to digital games, but this does not preclude applying the analysis to non-digital games. The absence of “codes” running the game does not entail the absence of rules that regulate how to play the game which is the matter being

investigated. Being “digital” does not make all games a distinctive analytical category (Aarseth, 1997).

3. The Interactive Nature of Games

Several studies, such as Crookall et al. (1987), Aarseth (1997) and Salen and Zimmerman (2004), argue that games can be considered as interactive systems. This approach would perceive games as “cybernetic systems” (Wiener, 1965) which are self-regulating and interact with themselves as well as their surroundings (Salen & Zimmerman, 2004). Explicating the various meanings created by these systems entail taking into consideration the intervention of the player during the interaction with the game, known as “the interpreter’s input.” In this regard, Avedon and Sutton-Smith (1971) state that “there is overwhelming evidence in all this that the meaning of games is, in part, a function of the ideas of those who think about them” (p. 438).

Creating meaning based on the opinions of the interpreter is by no means a controversial hermeneutic statement (Grondin, 1994). This phenomenon is common in all objects of interpretation. Hence, what is novel in this statement is not its claim per se, but rather its applicability to games as objects of interpretation. Thus, to understand games as interactive systems that create meaning one must consider their relation to the player/s or interpreter/s input. This necessitates an explication of interaction in relation to games, but this is not an easy task. As Aarseth (1997, p. 48) explains:

The word interactive operates textually rather than analytically, as it connotes various vague ideas of computer screens, user freedom, and personalized media, while denoting nothing. Its ideological implication, however, is clear enough: that humans and machines are equal partners of communication, caused by nothing more than the machine’s ability to accept and respond to human input. Once a machine is interactive, the need for human-to-human interaction, sometimes even human action, is viewed radically diminished, or gone altogether, as in interactive pedagogy. To declare a system interactive is to endorse it with magic power.

Accordingly, the meaning of interactivity is not palpable, but rather an intricate question without an evident answer (Kioussis, 2002). There are various interconnected meanings related to interactivity, most of which are ideological. Understanding the essence of interactivity in relation to games requires a clear separation of analytical meanings from the ideological ones.

3.1 Types of interaction

According to Jensen (1998), there are three varieties of interaction as defined in sociology, communications and informatics. Each of these highlights certain aspects of the concept. In sociology, Jensen (1998) argues that the concept of interaction is defined as taking place between two or more people in “symbolic interaction”. It is associated with certain situations that always necessitate physical proximity and communication.

In communications, the concept of interaction is controversial. The cultural studies tradition suggests that interaction relates to the notion of interpretation. The relation between the text and its reader is considered an interaction (Iser, 1989; Jensen, 1998). Although the meaning of text is largely the outcome of a certain exchange between the text and the reader, to use the term “interaction” may not be the most appropriate choice. It is commonly referred to as interpretation.

Numerous studies and theories of reader-response reveal that meanings do not solely reside on texts and objects and reading activities are not just a decoding process of extracting meanings from texts and reproducing them. Reading is perceived as an interaction and a dialogue between texts/objects and readers where the readers’ background knowledge plays an important role in the creation of meaning (Tierney & Pearson, 1994; Al-Mohammadi, 2014; Al-Mohammadi & Derbel, 2015). In this same line, when reading texts and images, readers are allowed some freedom of interpretation (Kress, 2004; McCloud, 1993). This interaction is labeled a “two-way process involving a reader and a text” (Rosenblatt, 1982, p. 268).

In interpersonal communication, the meaning of interaction is close to that found in sociology,

that is, it occurs in a symbolic context. This is most probably because the object of study resembles that being studied in sociology. Another understanding of interaction from a communication studies lens relates to the way media disseminate their messages and how media create an illusion of interaction. For instance, It has been noticed how the newly-elected U.S. president Donald Trump avoids mainstream media interrogation and uses twitter, where, as a medium, the interaction is somewhat asymmetrical. Jensen (1998) argues that the concept of interaction “in media and communication studies is often used to refer to the actions of an audience or recipients in relation to media content” (pp. 189-190). Obviously, it seems that interaction in media and communication studies is frequently seen within the context of its relation to media.

In informatics, interaction is between people and machines, and known as “human-computer interaction” (HCI). This concept of interaction was introduced to informatics to depict how a user adapts to batch processing computers. In this way, interaction happens when people operate machines. In this sense, people communicating through computers cannot be interaction, but rather a “computer-mediated communication.” However, it seems that, in informatics, interaction in some way corresponds to the concept in sociology as related to communication. It still entails a means of control that departs from the sociological understanding of interaction, but is symbolic in a mechanical sense in terms of the actual transaction. Jensen (1998) makes a useful distinction between interaction and interactivity stating that “it would be expedient to retain the concept of ‘interaction’ in its original, strong sociological sense to refer to ‘actions of two or more individuals observed to be mutually independent’, and to use the concept of ‘interactivity’ to refer to media use and mediated communication” (p. 200). Thus, interaction is a social communication between two or more people in sociology, a relation between audience and media in media studies, and HCI in informatics.

3.2 Defining interactivity

The present study of interactivity is situated within the cultural studies tradition of communications. However, perceiving interaction as interpretation seems to be insufficient when interpretation itself is the object of study. Hence, a different understanding of interactivity is necessary. In this context, Jensen (1998) states that “interactivity may be defined as: a measure of a media’s potential ability to let the user exert an influence on the content and/or form of the mediated communication” (p. 201).

Jensen (1998) additionally subdivides interactivity to four sub-notions: “transmissional interactivity”, “consultational interactivity”, conversational interactivity” and “registrational interactivity”. The first two sub-concepts of interactivity are associated with making choices. Transmissional interactivity “lets the user choose from a continuous stream of information in a one way media system without a return channel” (p. 201). Consultational interactivity allows the user to choose “by request, from an existing selection of preproduced information in a two-way media system” (p. 201). Conversational interactivity “lets the user produce and input his/her own information in a two way media system” (p. 201). Registrational interactivity is “a measure of a media’s potential ability to register information from and thereby also adapt and/or respond to a given user’s needs and actions” (p. 201).

An essential factor of Jensen’s definitions of interactivity is their connection to the medium. This definition seems to be close to the interaction studies in informatics. Consistent with this approach, Kioussis (2002) suggests two additional elements:

Interactivity can be defined as the degree to which a communication technology can create a mediated environment in which participants can communicate (one-to-one, one-to-many, and many-to-many), both synchronously and asynchronously, and participate in reciprocal message exchanges (third-order dependency). With ... human users, it additionally refers to their ability to perceive the experience as a simulation of interpersonal communication and increase their awareness of telepresence (p. 372).

This argument adds the necessity for an exchange of information found in communication. Third-order dependency translates as a rapport between exchanged messages, which is reference

to earlier transmissions. This seems to fit well with interactivity as the definition overtly discusses the technology of communication. Moreover, the definition refers to the users' ability to categorize the exchange as communication. For Kiouisis (2002), "communication, in this context, can range from simple information transfer to sophisticated movements in video games or through the worldwide web, thereby encompassing linear and non-linear communication paths" (pp. 372-373).

4. Instant Interpretation

The interpretation of games is affected by the fact that they are in regular procedural change and in continuous interaction with players. The time taken to interpret a game is of immense importance because interaction takes place while in play. The factor of temporality must be taken into consideration when interpreting games. The "real-time hermeneutics" being discussed here derives from Aarseth's (2003) argument that "while the interpretation of a literary or filmatic work will require certain analytical skills, the game requires analysis practiced as performance, with direct feedback from the system. This is a dynamic, real-time hermeneutic that lacks a corresponding structure in film or literature" (p. 5).

Except for experimental cinema and literature, which may be interactive, the audience does not participate in the performance (Aarseth, 1997). It is certain that the audience is part of the performance, but obviously not like a gamer who has active agency when playing a game. A work of literature or cinema may not reach its full potential if the audience succeeds in grasping "the essence" of the work (Weberman, 2000). Checking one's understanding of a piece of literature or cinema by comparing it to prior works and other interpretations contextualizes its meaning. Contrary to this, a player makes interpretations while playing the game which influences his/her actions, and hence, his/her success or failure in the game, as set by its objectives. This does not suggest that a certain game has a single interpretation, but rather that a game supports some interpretations while opposing others.

It is necessary to explicate the concept of temporality to unpack the concept of real-time interpretation. Aarseth (1997) suggests a simple way to analyze time in games. Transiency is one of Aarseth's "traversal functions" for cyber texts (p. 63). He states that "if the mere passing the user's time causes scriptons to appear, the text is transient; if not, it is intransient" (p. 63), where scriptons are "strings as they appear to readers", as opposed to textons, "strings that exist in the text" (p. 62). This distinction is not the focus of the current study, but Aarseth's perception of temporality is that games can be either "transient" or "intransient" is relevant. Applying Aarseth's conception of transiency to games, it can be considered that in some games, time lapses with the player doing nothing and this latency affects the transient outcome of the game; while in intransient games there is no latency affect. For instance, players can take as much time as they need to ponder their next move during turn-based games without any risk. However, this is not the case with other types of games where a failure to respond instantly may result in the player being shot.

Pointing to interactivity in relation to time, Kiouisis (2002) states that "scholars have pointed out that interactive experiences do not always have to be 'fast' or in 'real time', as seen in the example of email" (p. 369). In this case, "real-time" is still perceived as similar to fast interaction. But, this does occur in all cases. Clarifying this concept, Kiouisis contends that:

The notion of real time is also problematic because it suggests that instantaneous feedback is required for an interactive experience. The shift in the literature to discuss 'flexibility' has helped to address such issues. Indeed, many forms of communication with new media, which most researchers would concur are interactive, have delays in response times (e.g. email may be returned after one week, yet is still considered interactive by most) (2002, p. 369).

There are various speeds of interactions that can still be considered occurring in "real-time." "Real-time" is not usually quick, nor is it always instantaneous. Hence, the different speeds of "real-time" must be explored to achieve a thorough explication of the impact of temporality on game interpretation.

Zagal and Mateas (2010) argue that temporality can be analyzed by utilizing "frames of temporality" for diverse aspects of a game. This analysis can be conducted by the notion of state

change. Four temporal frames that can be employed to analyze time in video games. These are “real-world time, game world time, coordination time, and fictive time” (Zagal & Mateas, 2010). The things that take place around players while playing are referred to “real-world time.” “Game world time” is defined by the abstract play of actions of the game and the virtual game world. The coordination of players’ turn-taking and rounds during a game is the focus of “coordination time.” Finally, “fictive time” is shaped by narrative means, which can include narrative time and discourse time, or by employing socio-cultural labels. These four frames often happen simultaneously or successively. Zagal and Mateas (2010) offer an example of the co-existence of the four frames as follows:

As a player interacts with the game world, she physically manipulates a controller (real-world control events) ... to cause events in the game world. When, the player cause[s] game world events, we say that the game world is available. When there is no perceived delay between the control manipulation event (e.g. Button press) and the corresponding game world event (e.g. Character jump), her actions are immediate. In PAC-MAN, the game world is available because the player is always allowed to move Pac-Man, and he moves immediately because there is no delay between input and action (p. 853).

Clearly the frames interact with each other as well as with the player. Different frames permit multiple fusions of various time categories, which help in exploring the issue of temporality. Zagal and Mateas (2010) developed this framework to better understand the intricate concept of “real-time.”

Juul (2004; 2005) perceive games as “state machines” where players initiate changes in the game and move it forward. The players’ actions and the changes of a game occur during “play time”, that is, the “time span taken to play a game” (Juul, 2005, p. 142) as opposed to “fictional time” which happens as the game progresses. The “projection of the play time on the event time” is how Juul perceives “real-time” (p. 143). Juul’s concepts of “play time” and “event time” can be compared with the concepts of “narrative time” and “story time.” The former refers to the time of narrating a story while the latter is the time within the story (Genette, 1987, p. 95).

5. Games as Objects of Interpretation

Games differ from other hermeneutic objects in terms of the mode of interpretation. This difference lies in the special aspects of games as procedural systems which are interactive and temporally complex. These aspects can be further clarified by hermeneutics. Weberman (2000) differentiates between “relational” and “intrinsic properties” of games as procedural systems. He states that:

Intrinsic properties are those properties that an object or event has ‘in virtue of the way that thing itself, and nothing else, is’, such as shape, size, chemical composition or having red hair. Extrinsic or relational properties are those properties of an object or event that depend wholly or partly on something other than that thing, such as being an uncle, living next door to a judge, being loved by Joe or having a red-haired brother (p. 54).

Games are not temporally stable, as most objects of interpretation are, because of their procedural aspect. The temporal transformation of games can be minor or major especially at the level of interaction. This variability distinguishes games from other hermeneutic objects. Accordingly, interpreting games is a complex task due to temporality. “Real-time” hermeneutics is more an amalgamation of interconnected concepts than a simple straightforward concept. Consistent with this position, Weberman (2000) states that “the object of understanding is indeterminate (or underdetermined); it is constituted in part by the horizon of the specific historically situated knower and changes according to what that horizon is” (p. 52).

In this sense, explicating meaning creation in objects are partly determined by their historical contexts, that is, the “horizon.” As those contexts change, so do their meanings. Discussing examples of artworks, texts and historical events, and comparing them to games, Weberman (2000) argues:

Consider, an artwork such as a Cubist painting by Picasso or Braque, a text such as the American Constitution, or a historical event such as the Russian Revolution. Our understanding of these 'objects' is quite different in virtue of the temporal distance that separates us from them. The importance of temporal distance here consists not in any alleged growth in impartiality, but in the way in which more recent events have brought out new aspects of or 'retrodetermined' the earlier phenomena (p. 53).

From this perspective, the meaning objects is "incomplete." As the contexts of objects are not static, their meanings also change. Accordingly, the meanings of objects are incomplete and never entirely exhausted by interpreters. However, the interpretation can be enriched through temporal distance. As time passes and the context changes, interactions widen and new relations may enter the picture. This enrichment offers opportunities for new interpretations which take into consideration of the prior readings. As Gadamar (2004) points out, temporal distance creates a productive condition for new sources of understanding to continually emerge and reveal unsuspected elements of meaning (p. 298).

Time can enrich interpretation through the emergence of reflexivity. This is a positive aspect as far as history is concerned; however, this is not the case when it comes to "real-time" game hermeneutics. This is due to the rarity of temporal distance during a game play. Interpreting games entails two different inquiries. First, what is the meaning of the game itself as an object of interpretation? This question is useful for a better understanding of games and it is relevant to a hermeneutic inquiry because the player develops a history of familiarity of the play until he/she gets to the next level. Second, what are the player's interpretations throughout the activity of gaming? This inquiry cannot be investigated through temporal distance, but better explored through temporal frames as has previously been explained.

6. Conclusion

As discussed, explicating meaning creation in games requires more than an examination of the presentation layer by a deeper analysis that considers procedural aspects, interactivity and temporality. This level of consideration necessitates a thorough understanding of the processes that create games and how they change as procedural systems. Additionally, due to the interactive nature of games, the role of player participation is significant. Gamers influence the operative mechanics of games and hence their meanings. Moreover, games, as objects of meaning, have a dynamic function that gives rise to issues of temporality. Though meaning creation in of games is never entirely complete, due to its temporal dynamic, temporal distance enables new interpretations as time progresses. What seems significant today may prove to be negligible in the future and vice versa.

References

- Aarseth, E. (2003, May). Playing research: Methodological approaches to game analysis. *Proceedings of the Digital Arts and Culture Conference* (pp. 28-29).
- Aarseth, E. J. (1997). *Cybertext: Perspectives on ergodic literature*. Baltimore: John Hopkins University Press.
- Al-Mohammadi, S. & Derbel, E. (2013). The effects of embedding information technologies within ELT on EFL learners' motivation and interest. *International Journal of Applied Linguistics and English Literature*, 3(1), 181-186.
- Al-Mohammadi, S. & Derbel, E. (2015). "To whom de we write? Audience in EFL composition classes". In R. Al-Mahrooqi, V. S. Thakur, & A. Roscoe (Eds). *Methodologies for effective writing instruction in EFL and ESL classrooms*. (pp. 197-208). Hershey PA, USA: IGI Global.
- Al-Mohammadi, S. (2014). "Integrating reading and writing in ELT". In R. Al-Mahrooqi & A. Roscoe (Eds), *Focusing on EFL reading: theory and practice* (pp. 260 – 274). Newcastle: Cambridge Scholars Publishing.
- Avedon, E. M., & Sutton-Smith, B. (1971). *The study of games*. New York: John Wiley & Sons.
- Bogost, I. (2007). *Persuasive games: The expressive power of videogames*. Cambridge: MIT Press.
- Crookall, D., Oxford, R. & Saunders, D. (1987). Towards a reconceptualization of simulation: From representation to reality. *Simulation Games for Learning*. 17(4), 141-171.

- Gadamer, H. G. (2004). *Truth and method*. USA: Bloomsbury Publishing.
- Genette, G. (1987). *Narrative discourse: An essay in method*. Ithaca: Cornell University Press.
- Grondin, J. (1994). *Introduction to philosophical hermeneutics*. New Haven: Yale University Press.
- Iser, W. (1980). Interaction between text and reader. In J. Corner & J. Hawthorn (Eds.), *Communication studies. An introductory reader* (pp. 1673-1682). London: Edward Arnold.
- Jensen, J. F. (1998). 'Interactivity' tracking a new concept in media and communication studies. *Nordicom Review*, 19, 185-204.
- Juul, J. (2004). Introduction to game time. In N. Wardrip-Fruin & P. Harrigan (Eds.), *First Person: New media as story, performance, and game* (pp. 137-149). Cambridge: MIT Press.
- Juul, J. (2005). *Half-real: video games between real rules and fictional worlds*. Cambridge: MIT Press.
- Kiousis, S. (2002). Interactivity: a concept explication. *New Media & Society*, 4(3), 355-383.
- Kress, G. (2003). *Literacy in the new media age*. London: Routledge.
- Kucer, S. B. (1987). The Cognitive Base of Reading and Writing. In J. Squire, *The Dynamics of Language Learning* (pp. 27-51). Urbana: National Conference.
- Manovich, L. (2002). *The language of new media*. Cambridge: MIT Press.
- McCloud, S. (1993). *Understanding comics: The invisible art*. New York, NY: HarperPerennial.
- McLuhan, M. (1964). *Understanding media: The extensions of man*. New York: MIT Press.
- Mhamdi, C. (2016). Transgressing media boundaries: News creation and dissemination in a globalized world. *Mediterranean Journal of Social Sciences*. 7(5), 272-277.
- Mhamdi, C. (2017). Framing "the Other" in Times of Conflicts: CNN's Coverage of the 2003 Iraq War. *Mediterranean Journal of Social Sciences*. 8(2), 147-153.
- Rosenblatt, L. M. (1982). The literary transaction: Evocation and response. *Theory into Practice*, 21, 268-277.
- Salen, K., & Zimmerman, E. (2004). *Rules of play: Game design fundamentals*. Cambridge: MIT press.
- Tierney, R. J., & Pearson, P. D. (1994). Learning to Learn From Text: A Framework for Improving Classroom Practice. *Language Arts*, 569-580.
- Wardrip-Fruin, N. (2009). *Expressive Processing: Digital fictions, computer games, and software studies*. Cambridge: MIT press.
- Weberman, D. (2000). A new defense of Gadamer's hermeneutics. *Philosophy and Phenomenological Research*, 16(1), 45-65.
- Wiener, N. (1965). *Cybernetics: or, control and communication in the animal and the machine*. Cambridge: MIT Press.
- Zagal, J.P., & Mateas, M. (2010). Time in videogames: A survey and analysis. *Simulation & Gaming*. 14(6), 844-868.