Do We Need Real-Time Hermeneutics? Structures of Meaning in Games

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ABSTRACT

Games differ from most other forms of media by being procedural and interactive. These qualities change how games create and transmit meaning to their players. The concept of "real-time hermeneutics" (Aarseth 2003) is analysed in order to understand how temporality affects the understanding of games. Temporal frames (Zagal and Mateas 2010) are introduced as an alternative way of understanding time in games.

Keywords

Games, hermeneutics, interpretation, temporality, meaning

INTRODUCTION

Interpretation is a necessary part of how we experience all media. Texts, pictures and videos do not simply show or state something, but they present different possibilities for interpretation. They mean something. What that something is depends on the context of the interpretation (Duchamp's *Fountain*, a urinal in an art gallery), on the person doing the interpreting (a historian of war as opposed to a general commanding an army) and on the object being interpreted (a piece of computer code, an advertisement, a holy text).

Different cultural and historical contexts influence how things are seen, and subsequently, how they are. Theories and paradigms of interpretation are also part of the context of interpretation. These contexts change; so does the meaning of the object. Consider the swastika, a religious symbol whose meaning changed drastically with the events surrounding the Second World War. Not all changes are this drastic. The meaning of all cultural objects is in a (usually) slow, but constant state of flux.

People approach objects of interpretation with different purposes. These purposes inevitably change what the possible meanings of the object can be. Interpretation always includes application, or how the understanding gained from the interpretation is going to be used, and to what end (Gadamer 2004). Application guides the process of interpretation towards some ends, and away from others.

Objects lend themselves to different forms and amounts of interpretation. A statement of propositional logic enables fewer interpretations than a work of art. With respect to meaning, poetry is more ambivalent than prose, which is more ambivalent than scientific literature. This is not a measurement of value, but simply an observation of different qualities in different forms of expression.

Understanding how meaning is constructed in games enables us to, not only understand games better, but to construct better games. Game development is not only graphical development and coding – creating narratives and worlds of meaning is also important. This is especially central to developing serious games, which often deal with persuasion (advergames, political games, persuasive games etc.) or education (simulations, training scenarios, teaching games etc).

This paper analyses how games as an object of interpretation change this process of meaning-making. This requires understanding the specific properties of games and how they differ from other objects of interpretation, especially other forms of media. In order to do this, the following questions are considered:

1. What is interactivity and how it is understood? How does this affect the understanding of games?
2. Can the concept of "real-time hermeneutics" used in clarifying the meaning-making in games?
3. How can temporality and the concept of real-time further be analysed?

First, the question of how games differ from other forms of representational media is explored.

GAMES AS PROCEDURAL SYSTEMS

Games are a form of procedural media: they are systems with certain internal logics. Salen and Zimmerman (2004, 50) define systems as follows:

A *system* is 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.

Games as systems can be framed in several different ways, each emphasizing certain aspects of the game. The internal logics of the game are a way of seeing them as (more of less) logical systems. But one can also consider the experiential and cultural aspects of these systems (Salen and Zimmerman 2004). Experiential aspects are those aspects that are created in conjunction with the player (interaction) and cultural aspects are those that relate both to the culture in which the game was created and in which it is played (context).

Games are not just any kinds of systems: they are procedural systems. As Bogost (2007, 4) writes:

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.

Games are these types of procedural systems. The internal logics of games are based on algorithms, which create changes in the structures within games. This in turn changes the meanings games create. Thus, we need a procedural understanding of what games are. Wardrip-Fruin (2009, 157) writes 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).

If we only interpret the audio-visual elements of games we miss what really separates them from other forms of media: their procedural nature. He (Wardrip-Fruin 2009, 158) continues:

> 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.

By concentrating on interpreting the level of presentation the depth beneath is ignored. However, this does not mean that the right level of study always lies at the level of code. Studying the code would be a case of "software studies" (Manovich 2002), which is valuable in itself in understanding digital objects. But in order to understand the meanings created by games, it is usually sufficient to consider the level of mechanics or procedures (Wardrip-Fruin 2009).

Although most of what has been written here pertains to digital games, the same applies in principle to non-digital games. There may not be "code" running the game, but there are rules that govern how the game is played, and this is the level of detail under examination. "Digital" is not a sufficiently analytical category of distinction (Aarseth 1997).

INTERACTIVITY

As shown earlier, and argued more thoroughly by e.g. Crookall et al (1987), Aarseth (1997) and Salen and Zimmerman (2004) games can be seen as interactive systems[1]. In order to understand the different meanings created by these systems, we must also take into account the input of the interpreter – the interaction with a player. As Avedon and Sutton-Smith (1971, 438) write:

> 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.

That meaning is partly a product of the pre-understandings and opinions of the interpreter is in no way a controversial hermeneutic statement (e.g. Grondin 1994). This is true of all objects of interpretation, and thus also of games. In this sense Avedon and Sutton-Smith do not say anything new. What is different is the nature of games as objects of interpretation. Understanding games as interactive systems creating meaning requires understanding their relation to the interpreter, or player. This requires understanding what interaction is with regard to games. But as Aarseth (1997, 48) shows, this is not a simple problem:

> 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.

What then is meant with interactivity is not self-evident, but rather a complex question with no apparent answer (cf. Kiousis 2002). Interactivity has many interconnected meanings, many of which are ideological. To comprehend what interactivity means with regard to games we must separate the ideological meanings from the analytical ones.

Three Forms of Interaction

To understand interactivity, it helps to understand interaction. Jensen (1998) separates three different forms of interaction in three different academic fields: sociology, communications and informatics[2]. Each of these fields emphasizes different aspects of interaction. In sociology, the concept is defined as happening between two or more people, who are in "symbolic interaction" (Jensen 1998). It is related to a certain situation, which usually requires physical proximity and negotiation of meaning, i.e. communication. Interaction requires communication, but not the other way around.

In communications, the idea of interaction is divided. In the cultural studies tradition it relates to the concept of interpretation. The relation of a text to the reader has been characterised as interaction (e.g. Iser 1989, after Jensen 1998). While there certainly is a relation between the text and the reader that shapes the meaning created from this exchange, using the term interaction is probably not the best choice: it can be usually referred to as interpretation.

In the interpersonal communication tradition, interaction acquires a meaning more closely resembling the one found in sociology. This is probably due to the object of study being more closely related to the one in sociology. Other senses of interaction within communication studies relate to the way media messages are distributed and how an illusion of interaction is created in media. More generally, 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" (Jensen 1998, 189–190). Not surprisingly, in media and communication studies it seems that interaction is often seen in the context of how it relates to media.

Interaction in the informatics is related to interaction between people and machines, usually referred to as human-computer interaction (HCI) or man-machine interaction. Interaction was introduced to informatics as a concept to describe the changes made by a user to batch processing computers during the processing. In this sense, interaction takes place when a person operates a machine. Two humans using computers to communicate is not interaction in this sense, and is referred to as computer mediated communication (CMC). While interaction in informatics is seen in some sense analogous to the way the concept is used in sociology, it also has a meaning of control not very compatible with sociological understanding of interaction. This meaning comes from the view of seeing a human operating – i.e. controlling – a machine as interaction. The distinction Jensen (1998, 200) makes between interaction and interactivity is useful here:

> 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 interdependent' (but not mediated communication), and to use the concept of 'interactivity' to refer to media use and mediated communication.

In summary, the three forms of interaction are:

1. Social communication between two or more people (in sociology),

2. Audience's relation to media (in media studies), and
3. Human-computer interaction (in informatics).

A Definition of Interactivity

As can be seen from these examples, interactivity carries very different meanings in different fields of study. This work is situated near the cultural studies tradition of communications, but understanding interaction as interpretation or closely relating to interpretation is insufficient if interpretation is the subject being studied, as is the case here. Thus, a different concept of interactivity is needed. Jensen (1998, 201) gives the following definition:

> 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.

He further divides interactivity to four sub-concepts: **transmissional interactivity**, **consultational interactivity**, **conversational interactivity** and **registrational interactivity**. Transmissional and consultational interactivity both relate to making choices. Transmissional interactivity "lets the user choose from a continuous stream of information in a one way media system without a return channel" and consultational interactivity lets the user choose "by request, from an existing selection of preproduced information in a two way media system" (Jensen 1998, 201). Conversational interactivity "lets the user produce and input his/her own information in a two way media system" and 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" (Jensen 1998, 201). The latter applies to both explicit choices and automated adaptation, based on passive surveillance.

A central element of Jensen's (1998) definition is that it relates interactivity to the medium. Interactivity is seen as defining the media, and thus the technology used. This places the definition given by Jensen (1998) close to the informatics branch of interaction studies, as defined by him. Kiousis (2002, 372) gives a similar definition, but adds two elements, third-order dependency and human experience:

> 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 regard to human users, it additionally refers to their ability to *perceive* the experience as a simulation of interpersonal communication and increase their awareness of telepresence.

Third-order dependency translates as a relationship between exchanged messages, i.e. reference to earlier transmissions. This condition adds the requirement for an exchange of information, e.g. communication. This is appropriate, as the definition explicitly discusses communication technology. Additionally, the definition refers to the ability of human users to identify the exchange as communication, referring back to the concept of CMC. Kiousis defines communication as follows (2002, 372—373):

Communication, in this context, can range from simple information transfer to sophisticated movements in video games or through the world wide web, thereby encompassing linear and non-linear communication paths.

This seems to cover the different ways interactivity and communications intermingle in Jensen's (1998) model.

This has been a very limited view of how interactivity can be understood, but hopefully sufficient for our purposes (for more on interactivity, see e.g. Bucy 2004; cf. Ricardo 2001; Björk & Holopainen 2003). Our discussion must encompass both HCI and CMC aspects of interactivity, as games are played with and without other players.

REAL-TIME HERMENEUTICS

The fact that games are in constant procedural change and in interaction with their players affect how they can be interpreted. The interaction happens while the game is played, making the time taken to interpret an important issue. The temporality of the interpretation must be taken into account when considering the hermeneutics of games. The real-time hermeneutics under discussion here comes from Aarseth (2003, 5):

> 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 hermeneutics that lacks a corresponding structure in film or literature.

There is no performance by the audience in cinema or literature[3]. The audience is certainly part of the performance, but not in the same sense as a player is part of the act of playing a game. And while the audience may fail to grasp the meaning of the work, this is in no way evaluated by the work itself. The only way of confirming if one understands a work of literature or cinema is by comparing it to the interpretations of others, and in a wider sense, to the view the culture around one holds.

This is contrary to what happens in games. The interpretations a player makes during the game influence his or her actions, and subsequently, success in the game. For example, if one interprets the Koopa Troopa-turtles in *Super Mario Bros.* (Nintendo Creative Department 1985) as friendly and tries to hug them, it will probably result in the plumber-protagonist Mario losing his life. In this case, we can say that it is the wrong interpretation to make. This does not mean that there is only one possible correct interpretation of the game itself, but that the game supports some and opposes some interpretations.

This is in line with what Jensen (1998) writes: games are an interactive (in the sense of interactivity) media. The example from *Super Mario Bros.* is HCI interactivity, but for example *World of Warcraft* (Blizzard 2004) contains both HCI and CMC interactivity. Both must be taken into account.

Temporality

In order to understand real-time hermeneutics some conception of temporality is required. The simplest way of analysing time in games is to follow Aarseth (1997). One of his traversal functions for cybertexts is transiency (Aarseth 1997, 63). He writes:

If the mere passing the user's time causes scriptons to appear, the text is transient; if not, it is intransient.

By scriptons Aarseth (1997, 62) means "strings as they appear to readers", as opposed to textons, "strings that exist in the text". The distinction is not relevant to the current question, but Aarseth's conception of temporality is. Games can either be transient or intransient. If we were to translate Aarseth's conception of transiency to games, it would say that in some games things happen if time passes without the player doing anything (transient), and in some games they do not (intransient). In a turn-based strategy game you can take all the time you need to ponder your next move; in a FPS game you will be shot if you hesitate.

Aarseth's categories of temporality are qualities of the text, but it is also possible to extend the examination to level of actual reading. If we look at the level of text, the difference between transient and intransient is a simple binary one: either a text is transient or it is not. But if we look at actual readers the temporality may in some cases be a hybrid of these two categories. In texts where the time limit is sufficiently prolonged the reader may never experience the limit. These texts are theoretically transient, but intransient for all practical intents and purposes.[4]

This leads us to considering time as a quantitative substance. While Aarseth's distinction is qualitative, we may also approach the question as a quantitative one. The distinction is highlighted with the hybrid transient-intransient texts. It is also relevant when examining game temporality.

Different Speeds of Real-Time

The concept of "real-time" obscures different types of temporalities, all more or less real-time. This relates to the discussion on interactivity. Kiousis (2002, 369) points out the relation of interactivity to time:

> Furthermore, 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.

Here, real-time is still seen equal to fast interaction. But this is not always the case. As Kiousis (2002, 369) later writes:

> 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).

"Real-time" is not always fast, and certainly not always instantaneous. There are different speeds of interactive, which may still be seen as happening in real-time – just not very quickly. Thus, it is not enough to see things as occurring in real-time or not. There are different speeds of real-time, and these need to be mapped out to reach an understanding how temporality affects interpretation in procedural systems, e.g. games.

Temporal Frames

One of the ways of analysing temporality is by using separate frames of temporality for different aspects of the game (Zagal and Mateas 2010). These can be analysed using the concept of state change. State changes can happen on the hardware level, game world level, and real-world level. The hardware level is in most cases irrelevant, because the changes happen so fast as to be imperceptible to the player. The important exceptions are hardware freezes and crashes. The real-world level changes can relate, for example, to the passing of time outside the game, i.e. changes in the context of gaming. The primary level of temporal frames is the experiential level as this is the level that directly affects the player.

The four temporal frames used in analysing time in video games are **real-world time**, **game world time**, **coordination time**, and **fictive time** (Zagal and Mateas 2010). These relate mostly to the experiential level, but there is some blurring of categories, as some also refer to the real-world level.

Real-world time is defined by the things happening around the player as he or she is playing. The passing of time affects the player and through him or her, the game. Some games (e.g. *Fable*, Lionhead Studios 2004) do this more directly, with the passing of physical time directly affecting the game time. Game world time refers to both abstract game play actions and the events of the simulated or virtual game world. When the passing of physical time in the case of *Fable* affects the time in the game, it affects game world time. Coordination time concerns such concepts as rounds and turn-taking. It coordinates the actions of several actors, whether players or AI. Games may contain systems for limiting player actions in order to keep them synchronised. These forms of temporality differ from fictive time, which is created either by narrative means (story time, discourse time and narrative time) or applying socio-cultural labels e.g. calling turns "years" or "days" (cf. Juul 2001). These frames often co-exist or occur successively, as shown in an example by Zagal and Mateas (2010, 853):

> As a player interacts with the gameworld, she physically manipulates a controller (real-world control events) in order to cause events in the gameworld. When, the player is allowed to cause gameworld events, we say that the gameworld is available. When there is no perceived delay between the control manipulation event (eg. button press) and the corresponding gameworld event (eg. Character jump), her actions are immediate. In PAC-MAN, the gameworld 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.

This example shows how these frames interact with the player and each other. The frames enable diverse fusions of different categories of time, which may then be used in creating a more fine-grained framework of temporality. Zagal and Mateas (2010) use this framework to show that the simple distinction of real-time–turn-based is not sufficiently analytical. It also helps to show how complex the idea of "real-time" is.

Time and Narration

This discussion on temporal frames can be contrasted with Juul's (2004; 2005) theory of game time. He considers games as **state machines**, with the player initiating changes in the game states that move the game forward. The actions of the player and the changes of the game happen in **play time**; play time is "time span taken to play a game" (Juul 2005, 142). The time that progresses within a game is **fictional time** (Juul 2005). The relation

between play time and event time is **projection** (Juul 2005, 143), "projection of the play time on the event time". For Juul "real-time" means a 1:1 projection of play time to event time. As can be seen from earlier, this relation can be seen as more complex.

Juul's concepts of play time and event time can be contrasted with Genette's (1987) concepts of **narrative time** (time of narrating the story) and **story time** (time within the story)[5]. Genette (1987, 95) analyses different relations between these with the following formulas:[6]

1. Pause: NT = n, ST = 0. Thus: NT ∞ > ST
2. Scene: NT = ST
3. Summary: NT < ST
4. Ellipsis: NT = 0, ST = n. Thus: NT < ∞ ST

These categories can be used in clarifying what Juul (2005, 151) calls "violations of game time", one of the examples being pausing the game. Pauses are not unique to games: they can also occur (for example) in literature (as per Genette 1987). Nor do pauses have to be seen as "violations", but simply variations. According to Juul (2005, 160) there are five important distinctions between the categories of time he uses and the categories of traditional narratology:

1. "The fictional time is not predetermined when the player plays the game.
2. Games tend to be chronological. -- A story is a predetermined sequence, and users are aware of this in their reception of the game/story.
3. The actions of the player have a dual quality of occurring in play time and also being assigned meaning in the fictional time in a game is more direct than the connection between story and discourse.
4. Abstract games do not have a fictional time, and therefore have only one level.
5. Games often project incoherent worlds that cannot be described using a coherent timeline."

These seem to be meaningful differences, although not all of them equally so: literature and cinema tend also to be chronological, with exceptions similar to the ones found in games. The distinction between abstract games and games that contain a fictional narrative is important, but this can further be elaborated with the temporal frames presented earlier. Abstract games have game world time (A happens before B), but do not necessarily have fictive time, e.g. narrative.

Additionally, Juul (2004; 2005) uses the concept of **dead time** to describe time in games that is experienced as dull, repeating and not entertaining. "Dead time is when you have to perform unchallenging activities for the sake of a higher goal" (Juul 2005, 155). This varies from play time and event time by being a category of experience of time, not a category of temporality in the media itself. This highlights the need to separate the experience of time from the passage of (fictional or objective) time, as also Zagal and Mateas (2010) emphasise.

DISCUSSION
Again, how do games differ as objects of interpretation from other hermeneutic objects? First, they are procedural systems. Second, they are interactive. Third, they are temporally complex.

We can clarify these points by turning back to hermeneutics. Understanding games as interactive procedural systems is made easier with the distinction made by Weberman (2000). He distinguishes between **relational** and **intrinsic properties** (Weberman 2000, 54):

> 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.

While most objects of interpretation are relatively temporally stable, games change due to their procedural nature. This change may be relatively minor, or may lead to drastic changes in the properties of the game (not on the level of code, but on the level of interaction and experience). In some cases, games may be considered as changing in their intrinsic properties, as procedural interaction creates unforeseen results. This differentiates games from other hermeneutic objects, which do not have changing intrinsic properties.

The temporality found in games is more complex than it first seems. This makes interpretations about them difficult – real-time hermeneutics does not seem a simple concept, but a collection of interrelated concepts. There is also distinct problem with real-time hermeneutics that is highlighted by the concept of incompleteness.

Incompleteness

The idea of intrinsic and relational properties has a temporal dimension. Using the language of Gadamerian hermeneutics (e.g. Gadamer 2004), Weberman (2000, 52) puts it as follows:

> 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.

The object of understanding is underdetermined in the sense that at least some its meaning is determined by the specific historical context (i.e. horizon) in which it is situated. As this context changes, so does the meaning. Weberman (2000, 53) discusses the examples of artworks, texts and historical events, but the same applies to games:

> 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.

It is in this sense that objects of understanding are "incomplete". Their meaning is never completely exhausted by the interpreter trying to understand the objects in their current context, for it is possible that the context changes, and thus the meaning also changes. This makes the meaning both continually incomplete and inexhaustible.

However, there is a way to enrich the interpretation. While there is no one complete and final interpretation to be made, there is the possibility of improving interpretations. This is made possible by temporal distance. As time goes by, the context of interpretation widens and new relations enter the picture. This enables making new interpretations that take into account earlier ones. Gadamer (2004, 297—298) writes:

> The important thing is to recognize temporal distance as a positive and productive condition. It is not a yawning abyss but is filled with the continuity of custom and tradition, in the light of which everything handed down presents itself to us. -- But the discovery of the true meaning of a text or a work of art is never finished; it is in fact an infinite process. Not only are new sources of error constantly excluded, so that all kinds of things are filtered out that obscure the true meaning; but new sources of understanding are continually emerging that reveal unsuspected elements of meaning.

Time gives room for better interpretations to emerge. This is an encouraging conclusion when history is concerned, but not so when considering real-time game hermeneutics. There is rarely the possibility of temporal distance when playing a game.

However, interpreting games may contain two different questions of interpretation. First, what is the meaning of the game itself as an object of understanding? And second, what interpretations does the player make during the game? The first question helps us in understanding games in general, and shows the relevance of hermeneutic inquiry. The second, however, is not helped particularly by the observations made on temporal distance. This question of player interpretation is perhaps better answered with the help of temporal frames.

CONCLUSION

When considering the meaning in games, we have to take into consideration their procedural nature, interactivity in its full meaning and their temporality. It is not enough to see the surface, but one must go deeper and see the processes that create the meaning – to look not just at the stars, but also at the effects that drive them, as Wardrip-Fruin (2009) put it. This requires understanding games as systems that change at the procedural level.

However, this is not enough, as games are also interactive systems: the player must also be taken into consideration. Games are interactive in two senses: 1) they enable interaction between players i.e. multiplayer games, and 2) they are an interactive media that the user controls. The player affects their operation and therefore their meaning. This makes hermeneutic inquiry a necessary part of understanding games.

The temporal dimension must also be taken into account. Games as objects of understanding have a meaning that changes with time. This makes their meaning constantly incomplete; there is no final interpretation of what a game means. Fortunately, temporal distance gives us a broader horizon of interpretation, enabling better interpretations as time goes by. This should be taken into account when discussing the preservation of games for future research. What seems insignificant for us may prove to be important for later researchers.

Unfortunately, this does not help the player much in forming interpretations during the game. Instead, he or she must rely on different cultural meanings filtered though temporal

frames and the fact that games as interactive systems give feedback on the success of interpretations. Better interpretations lead to better gaming, and so players can know if they are misunderstanding by failing to succeed in their goals.

ENDNOTES

[1] One way of understanding the situation would be seeing games as cybernetic systems, as per Wiener (1965). Cybernetic systems are self-regulating systems that interact with itself, and its surroundings (cf. Salen and Zimmerman 2004).

[2] The rest of this chapter follows closely Jensen (1998). All references are to this work, unless otherwise noted.

[3] This excludes many forms of experimental cinema and literature, which may be interactive (see e.g. Aarseth 1997).

[4] If the reference period is sufficiently long, all texts are transient in the trivial sense of being temporal. All that is material is impermanent. In this sense digital texts may be more lasting, as perfect copies can be created of them. There is also the opposite example of Frasca's (2001) OSGONs (one-session game of narration), games which can be played only once.

[5] Juul (2005) uses the concepts of discourse time and fictional time, but does not explicitly refer to Genette, citing Chatman (1978) instead.

[6] ST = story time, NT = narrative time, 0 = no story or narration progression, n = story or narration progression; happens or is narrated once or several times.

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