# Story and Narrative Structures in Computer Games[1]

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# Abstract

Computer games can involve narrative and story elements integrating different forms of interactivity and using different strategies for combining interaction with non-interactive story and narrative elements. While some forms of interactive narrative involve simple selection between fixed narrative sequences, computer games more typically involve the integration of narrative with game play based upon a simulation substrate. These three forms, simulation, game play and narrative, involve pre-authored time structures at different levels of time scale. Simulation involves the lowest levels of time structure, with authored principles specifying how time develops from frame to frame based upon physics, the representation of game objects and their behaviour, and discrete event simulation. Games involve pre-designed game moves, types of actions that may be realized as abstractions over patterns of low level changes at the frame level. Linear and interactive narratives form the highest level of pre-designed time structure, framing low-level simulation processes and intermediate level game moves within a high level structure typically based upon classic models of narrative form. Computer games may emphasise one or more of these primary forms as the focus of meaning in the play experience. Story construction within computer games is a function of how these different levels of time structure interact in the play experience, being the result of pre-designed narrative content, story potential and the actual unfolding story created by the actions of the player. There are many strategies for integrating these forms. However, a crucial issue in the design of story content is the relationship between how the resulting game experience relates to user play preferences. In particular, categories of play style can be extended to include preferences for how story content is experienced, based upon audience, performance and immersionist orientations to story. Perceived tensions within computer game form, such as the tension between game play and narrative, are explained, not as fundamental formal issues, but issues of player preferences and how these are satisfied or not by different strategies for story content within a game system.

# Introduction

Integrating story elements in computer games has been a source of heated debate focussed upon fundamental questions about the nature of a game and the nature of a narrative (eg. [36]). The association of interactivity and narrative is often regarded as a fundamental paradox within the conception of interactive narrative (eg. [19]). This ongoing conceptual debate can be attributed at least in part to two significant factors. The first factor is that any debate over definitions tends to weaken or undermine strong interpretations of the meanings of the terms involved, since the terms do not have any absolute meanings and the boundaries between complex phenomena are generally vague. This factor can be eased by the use of definitions that are not interpreted as the *real* meanings of terms, but instead provide distinctions that lead to a coherent strategy for design. In this case, we do not search for any absolute conceptions of "game" or "narrative", but use definitions that lead to clearly distinguished and systematic ways of analysing, conceiving of, and designing game systems. From a design perspective, the best definitions are those that lead to the most clearly articulated and distinct design options.

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A second and perhaps surprising factor in the discussion about the relationship between gameplay and narrative is that the issue has not generally been considered in relation to the preferred play/interaction styles of players. The "tension between game play and narrative" is manifest in statements like "cut scenes break immersion in the game" or "the game play is repetitive and has nothing to do with the story". Another player referring to the same game may find its strategy for intermixing story and narrative to work perfectly well.

While this problematic relationship has been interpreted as a fundamental formal problem ([1], [11]), the diversity of views involved suggests that the problem is really a matter of fundamental but unacknowledged differences in the kind of experiences that different players are seeking. This paper presents a model in which different strategies for realising story and narrative within games are related to specific player preferences. The result is a framework in which perceived tensions between game play and narrative are accounted for as clashes between game play stylistic preferences one on hand and the formal structures of a specific game on the other. It can also be seen that these tensions have no privileged status in relation to other tensions between play preferences and game forms. Player preferences can be associated with specific kinds and combinations of game mechanics, as well as different strategies for integrating story forms with game play, including linear, nonlinear and emergent narrative structures. Hence this framework can contribute towards a structural approach to well formed game design aimed at specific player styles and preferences.

# Player Types, Motivations and Play Styles

Different players may want very different kinds of experience from a game, and the interrelationships between player motivation, game mechanics and play style may be complex. A particular concern in game design is that a player may play in a style different from the play styles that a game is designed for. The play style goals of a game design should be explicit as a basis for deciding not only what styles to accommodate in the game mechanics, but also if and how to create the freedom for players to improvise around the mechanics if their play preferences are not strongly accommodated.

An influential scheme for categorising play styles has been developed by Richard Bartle ([2], [3]). Bartle's scheme[2] is derived from discussions between highly experienced MUD[3] players on the topic of "What do people want out of a MUD?". Bartle's categories represent forms of player enjoyment identified in these discussions. The categories are:

- *Achievers* driven by in-game goals, usually consisting of some form of points gathering (eg. experience points, levels, or money).
- *Explorers* driven to find out as much as they can about the virtual world, including mapping its geography and understanding the game mechanics.
- *Socializers* use the virtual world to converse and role-play with their fellow gamers.
- *Killers* use the virtual world to cause distress to other players, and gain satisfaction from inflicting anxiety and pain on others.

Bartle notes that these categories are fuzzy and that players may cross over, although one play style tends to dominate the preferences of any given player. The categories represent differences in preferred activity, and these differences are reflected in the language and discourse patterns of the different respective player types. Bartle suggests that the categories derive from two dimensions of distinction, one between *acting* upon (killers and achievers) and *interacting* with (explorers and socialisers), and the other between *players* (killers and

[2] Bartle (2004) proposes a third dimension for this scheme and discusses alternative categorizations; this paper focuses on the initial four category system, both for simplicity and due to the added validation and refinement supplied by Yee's (2002) study.

[3] MUD is an acronym for Multi-User Dungeon, a text-based form of shared virtual world.

socialisers) and the *world* (achievers and explorers). Bartle also identifies specific game features favouring each category while suggesting that achieving a balance between the play styles is an important factor in the ongoing success of a virtual world.

John Kim [13] has examined player style in the context of live-action and table-top role-playing games (RPGs). This has let to the development of what he has referred to as the *Threefold Model*, regarded as a way of grouping many aspects of "group contracts" into logical categories. The group contract is a kind of collective agreement between a specific group of players covering every facet of how the game is to be played: mechanical rules, how scenarios are constructed, what sort of behaviour is expected of player characters, how actions not covered by the rules are resolved, the allowance of outside distractions, etc.. The categories of the Threefold Model are:

- *Drama*. The dramatist style values how well the in-game action creates a satisfying storyline.

- *Game*. The "gamist" style values setting up a fair challenge for the players (as opposed to the player characters). The challenges may be tactical combat, intellectual mysteries, politics, or anything else. The players will try to solve the problems they are presented with, and in turn the game master (GM) will make these challenges solvable if they act intelligently within the contract.

- *Simulation*. The simulationist style "values resolving in-game events based solely on game-world considerations, without allowing any meta-game concerns to affect the decision. Thus, a fully simulationist GM will not fudge results to save PCs or to save her plot, or even change facts unknown to the players. Such a GM may use meta-game considerations to decide meta-game issues like who is playing which character, whether to play out a conversation word for word, and so forth, but she will resolve actual in-game events based on what would "really" happen."

These categories have both similarities to and difference from Bartle's. In particular, Bartle's system does not have a category corresponding to the dramatists. Kim's gamer (or gamist) category appears to be the same as Bartle's category of achievers, while Kim's simulationist category appears more loosely analogous to Bartle's explorer category. Bartle's socialisers and killers are missing from Kim's system. Although Bartle includes role-players within the socialiser category, in a general sense *all* of Kim's categories cover role players and, as seen below, role playing cannot be simply equated with the Kim's dramatist category. These differences may be indicative of a different purpose behind the systems, largely resulting from the different form of games involved. Live-action and table-top RPGs require social agreement in order to effectively realise the game, since the rules are implemented manually. However, it is plausible that the socialiser and killer categories could equally well provide the foundations of the social contract required for manual implementation of game mechanics. Bartle is dealing with computational worlds in which the social contract is generally implicit and enforced by the software mechanics of the virtual (game) world engine. In this case the categories become ones of play preference within the space of possibilities supported by the system, and the dramatist style becomes a plausible category omitted from Bartle's scheme.

Yee [37] has built upon Bartle's scheme, adding just such a category (the *immersionist*), modifying the other categories and also dropping the explorer category. Based upon empirical data provided by questionnaires answered by 6700 players, followed by statistical factor analysis, Yee identifies the following categories representing the primary high level grouping of responses:

- *Relationship* (socialisers): This factor measures the desire to develop meaningful relationships with other players in the game - usually in the form of a supportive friendship. Players who score high on this factor usually make good friends online, and tend to have meaningful conversations with their online friends, which usually involves talking about real-life personal issues. In times of need, these players can usually count on their online friends for emotional support. These players also tend

to feel that they have learned things about themselves from playing the game, as well as gaining a better understanding of real-life group dynamics.

- *Immersion*: This factor measures the desire to become immersed in a make-believe construct. Players who score high on this factor enjoy being immersed in a fantasy world they can wander and explore. They tend to role-play their characters, and use their characters to try out new personalities and roles. They enjoy being in the company of other role-players. They also appreciate the sense of being part of an ongoing story, and oftentimes will think up a personal history and story for their characters.

- *Grief* (killers): This factor measures the desire to objectify and use other players for one's own gains. Their means may be both overt or subtle. On the overt side, they may enjoy dominating other players by killing them on the battlefield, or by taunting and annoying them. On the more subtle side, they may enjoy manipulating other players for their own gains, such as deceiving other players through clever scams, or begging for money and items. In either case, satisfaction comes from some form of manipulation of other players for personal gain.

- *Achievement* (achievers): This factor measures the desire to become powerful within the construct of a game. Players who score high on this factor try to reach the goals as defined by the game. They try very hard to accumulate rewards. For example, they try to optimise their experience point gains to reach the next level as quickly as possible. Or they may try to accumulate as much high level gear as possible. Or they enjoy doing massive amounts of damage to non-player characters (NPCs). The underlying theme is a desire to get bigger numbers. But the satisfaction comes from feeling powerful.

- *Leadership* (which can be regarded as a subcategory of socialisers): This factor measures the gregariousness and assertiveness of the player. Players who score high on this factor prefer to group rather than solo. They are often assertive individuals and usually drift to leadership positions when in a group. Because a group led by an indecisive leader often gets fragmented, the assertiveness of these players probably allows them to be effective group leaders in the game.

The game provides an important context underlying successful engagement and immersion for players with all of these motivations. It is in particular the presence of game play and unfolding stories that provide a sense of depth and purpose for socialisation, as well as the immediate input and play mechanics for achievers, killers and immersionists.

Interestingly, Kim's categories of Drama (story and narrative), Game and Simulation as driving principles for social gaming contracts also underlie the independent isolation of these factors as formal systems within computer games. Aarseth [1], Frasca [9] and Juul [11] focus on the question of the relationships between narrative and game play in computer games. Frasca [10] focuses on the nature of a game as a simulation. Lindley ([17], 18]) brings these elements into a three-way relationship and highlights the three formal systems in terms of existential dependency, a hierarchy of temporal design concerns, and different and complementary sets of methodologies for design. The mechanics of a computer game may realise the designed formal structures at all three levels, but players may be more or less free to play creatively in a style of their preference, in tune or at odds with the design emphasis in the computer game artefact.

This freedom also underlies the many roles that a player may have in relation to their character and the game world, discussed by Pohjola [29] in the context of live-action role-playing as a question of identity and immersion. Different strategies for identification and immersion suggest very different strategies for narrative and story construction in computer-based role-playing games. Based upon Pohjjola's discussion, it is possible to remodel the dramatist and immersionist categories into at least the following three attitudes towards drama/story/narrative within a game:

- the *audience*: passive reception of a narrative, ie. being told a story; this is the model implicit within the use of predefined *cut scenes* in commercial computer games to convey story elements designed by the game developers

- the *performer*: active performance of a character role within an unfolding story; further distinctions here might be made in terms of the degree to which the role and/or the story are predefined, as opposed to being created by the performer prior to or during the performance

- the *immersionist*: immersion of the player in the character, ie. the player/character distinction is dissolved into a unified *persona* within the game world; here too there is a question of the degree of character predefinition required to encourage immersion

While Bartle [2] has proposed specific game features supporting and encouraging the different specific play styles in his system, since he had no dramatist/immersionist category the features required to support this play style remain unspecified. Bartle's later work [3] nevertheless presents a model of the degree of immersion of a player with their character along a continuum ranging from the avatar at one extreme to the persona at the other, reflecting the performer/immersionist distinction. The avatar is a dramatically empty shell, being an instrumental vehicle for the player within the game world. The persona is, as described above, the immersionist state of total player identification with their character, representing the player's being within the game world. Between these extremes lies the performed character.

Bartle's [2] categories of play style emerged from what he describes as heated discussions about what makes a game good, the resulting distinctions accounting for differences of taste underlying player conflict. Similar controversies around the use of cut scenes in computer games can be seen to reflect different player preferences in relation to the story aspects of games, not only between gamers who are not interested and others who are interested in the story, but also between the different tastes for how story elements are manifested, a conflict between preferences for being told a story (the *audience* play style), performing a story (the *performer* play style) and immersion within a story (the *immersionist* play style, specialised here from Yee's use of the term in order to align the term with its use in role-playing theory).

These distinctions provide a perspective for the following analysis of methods and game features addressing issues of story and narrative. It is first necessary to define some basic terms in narrative theory, and then to consider how these terms map onto interactive computer games. It is then also necessary to consider the overall design of time structures in computer games, interrelating the simulation substrate of games with higher level time structures involved in the design of games and narratives. Different strategies for realising narrativity in relation to the player preferences in relation to story are mapped out in terms of these different levels of temporal design.

# General Terms From Narrative Theory

Structuralist narrative theorists have derived a model of several layers of narrative meaning (Figure 1). The structuralist approach was initially formulated in the structural linguistics of Sausseure (summarized in [34]). Sausseure made the fundamental distinction between a language (la langue) and the speech acts facilitated by the language (la parole). This general principle inspired a structural approach to general cultural analysis in which specific social forms are seen as manifestations of an underlying generative system.

Structural narrative theory involves more than Saussure's simple two level system. Specific narratives are understood as the instances in time that express stories. Such an instance can in general be referred to as a text, where "Text is a spoken or written discourse which undertakes the telling of the events in a story" [31]. Only the text is available to the reader. The concept of text has been generalize to cover audio-visual media, since many of the ways narrative functions semiotically are the same across different media forms. *Narration* is then

the act or process of production of the text. The text itself is *the narrative*. This level of narrative structure has also been referred to as the *discourse* level [4].

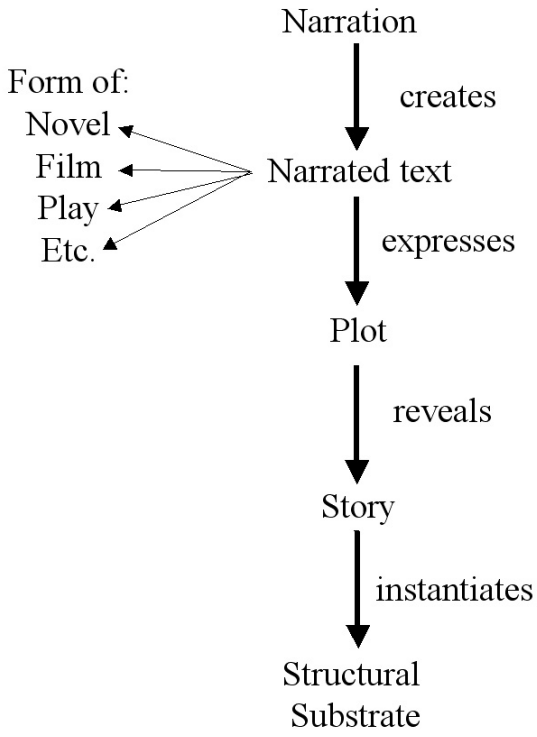


Figure 1: Layers of meaning in narrative texts.

In general, the text of a narrative expresses a story where "'Story' designates the narrated events, abstracted from their disposition in the text and reconstructed in their chronological order, together with the participants in these events" [31]. An impetus behind the identification of the story as a separate level of meaning from the narratives that express it is the fact that the same story may be expressed in many different narratives, either within the same medium or across different media. Between the levels of narrative and story, however, is a further question of which aspects of the story are expressed by a narrative. This is the level of the *plot*, where "… plot, story-as-discourse, exists at a more general level than any particular objectification, any given movie, novel or whatever … Its function is to emphasise or de-emphasise certain story-events, to interpret some and to leave others to inference, to show or to tell, to comment or to remain silent, to focus on this or that aspect of an event or character" [4].

Structuralist narrative theorists have also sought general structures underlying the formulation or generation of stories. Vladimir Propp's [30] pioneer work *Morphology of the Folktale* presents an analysis of the structural generative system underlying a genre of Russian folk tales. Within this system, a typical folktale is built around seven types of character (or more specifically, spheres of action corresponding to performers), namely 1) the villain, 2) the donor, 3) the helper, 4) the princess (and her father), 5) the dispatcher, 6) the hero and 7) the false hero. The names of the characters containing these functions differs from tale to tale, but the type of actions they perform are always the same. A function can be "understood as an act of a character, defined from the point of view of its significance for the course of the action" [30]. Propp presents the system as having a fixed number of thirty-one possible plot functions. Not all of the functions are necessary in any given story, but where they occur they always have the same sequential order.

This level of generative substructure is analogous to Saussure's language level. From the generative substrate it is possible to create a great many stories. Each story can be the

source for many plots, and each plot can be expressed in many narratives. Viewing this as a hierarchy, it can be seen that, beginning with the narrative level and going down to the structural substrate, each level down has an increasing generative potential in terms of the number of actual narratives that it facilitates and by which it is expressed. Propp's specific model has been applied within other narrative genres and analogous systems are plausible for forms of narrative that it does not obviously account for.

# Mapping Narrative Terms Onto Computer Games

Irrespectively of the general status of structuralist narratology within the contemporary study of narrative systems, the model is very useful when applied to the analysis and design of interactive narrative and story construction systems, and the identification of several levels of narrative meaning clarifies the relationships between different strategies for interactive narrative and story construction. However, models of narrative meaning developed to account for verbal and textual narrative cannot be applied naively to interactive digital media systems and computer games. How narrative concepts are to be interpreted depends a great deal on the specific form of digital media system in question.

If an interactive media system has what might be called a medium level of granularity in the media chunks that are interactively selected, then the narrative levels can be applied in a more straightforward way. Examples of media systems of this kind include classic hypertexts and interactive movies having a link structure (described in detail below) through which the viewer/reader chooses a path. Interactivity in this case can be created either within or between levels in the classic narrative model. Branching within levels involves providing authored branching pathways from which the reader/viewer may select *within* a representation of the story, plot or narrative levels. In this case:

- a branching narrative in the strict sense provides interactive selection of narrated elements conveying particular plot elements in particular ways

- a branching plot structure provides alternative pathways through the representation of an overall plot related to a common story; the events, characters and settings of the story remain unchanged, but those narrated to the reader/viewer are interactively determined

- a branching story structure involves interactive selection/determination of a representation of specific set of events, characters and settings constituting a story based upon a predefined set of potential events, characters and settings

The simplest way of structuring interactive story systems is to provide a branching structure connecting media components that represent story and plot elements by narrative components (eg. blocks of text, sequences of video). In principle the branching structure itself could be a representation of the generative substrate, the (interactive) story, the (interactive) plot or be part of the surface narrative. In all cases the components associated with nodes in the branching structure are narrative components.

Systems in which the different narrative levels are *represented separately* are likely to be research systems in which the user experience is frequently synthesised dynamically (and interactively), rather than using a pre-authored branching structure. Interactive synthesis of the narrative in this case may include one or more of:

- creation of a story from a structural substrate; the substrate may be a system of a-temporal relations from which a specific temporal order will be created in response to reader/viewers interactions or specifications

- creation of a plot from a story

- creation of a specific narrative from a plot

The substrate used for story generation may be the kind of story-oriented structure described by Propp, or it may be a thematic representation. For example, the Auteur system ([26], [27]) is a story/plot/narrative generator, while the Automatist [25] and FRAMES [16] systems are plot/narrative generators based upon a single story. All of these systems are theme-driven (implicitly or explicitly), and create linear presentations by dynamically linking video segments. The video segments represent the story and plot. Generation of the linear presentation may be based upon additional formalised representations of the meaning of the video segments at one or more of the levels of narrative meaning (structural substrate, story or plot) and/or other interpretations or descriptions of the video components.

Contemporary interactive 3-dimensional computer games, including action games, strategy games and role-playing games, represent a more complex case to which narrative models cannot be applied in a straightforward way. This is because these games are *fundamentally and qualitatively different* from traditional linear narrative forms in the following ways:

- the player is a joint reader/author at some levels of narrative structure

- more semiotic levels have textual manifestations

- those text levels are *generatively interdependent*

This is best considered by examining each of the levels of the classic narrative model and looking at how this can be applied to 3D computer games (also considered with different emphasis in [8]). The analogous relationships are represented on Figure 2.

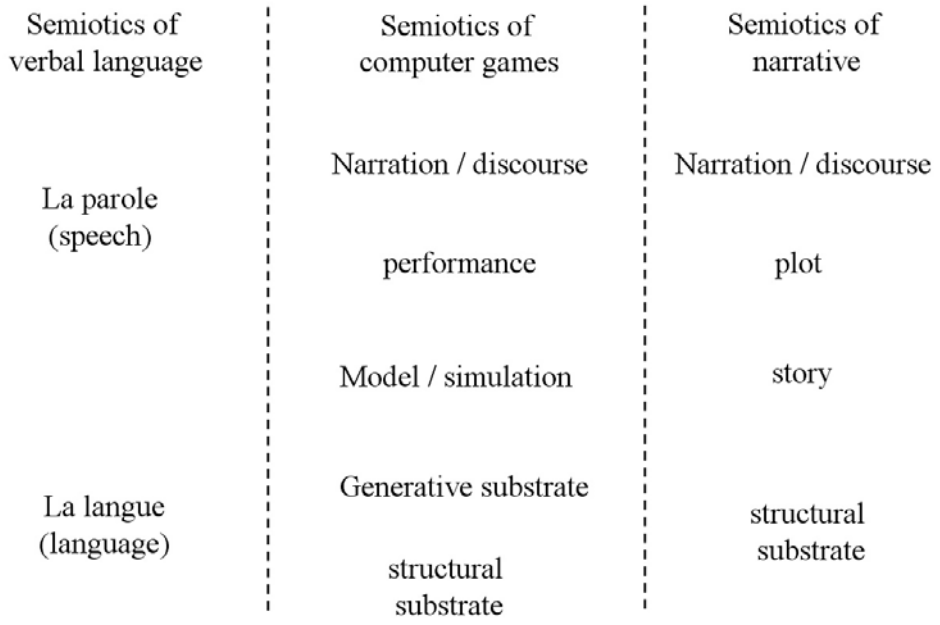


Figure 2: Relationships between levels of semiotics structure in verbal/textual language, linear narratives and computer games.

The narration or discourse level can be mapped onto what appears on the computer screen, regarded as an audiovisual artefact extended in time. If one were to watch the screen while someone else is playing, the artefact would effectively be a movie. However, a game is clearly not intended to be experienced (primarily) in this way; it is intended to be played and the player has a major role in determining what occurs in the unfolding history of the screen. The player may be presented with some elements of predefined narrative, potentially including non-interactive cinematic cut scenes and in-game stories and histories (revealed, for example, via in-game simulated books or dialog texts). The player then has a role in creating the context for and bridging sequences between these narrative elements by their play

behaviour within the scope of possible behaviours provided by the system designers. The player is, then, a partial author of the narrative constituted by the screen history of play.

Disregarding for the moment the non-interactive elements of a game narrative (such as an overall story arc framing play and delivered via cut scenes), the analogy for the plot level of classical narrative can be regarded as that part of the game story as revealed to the player through the screen. This is, however, the primary focus of the player as a performer within the game world. The plot is not something delivered to the player, but something actively created by the player in interaction with the game system and its (often very large) implied space of possible detailed plots. Since the creation of the plot requires very intensive interaction (this being the focus of player engagement and immersion), it may be more accurate to refer to this level of meaning as a *performance level*, rather than a plot level. A plot is a representation of a story as revealed through an act of narration by a narrator for a viewer/reader/listener, while the game play performance is an act of partially creating a story of which the performance is understood to be a part and is performed for the pleasure of the performer.

The game *story* is the total implied game world history as determined by the pre-designed potential of the game in interaction with the game play actions of the player. Not all of the story is revealed to the player; this is most clearly seen in the case of simulation-intensive games like *SIM City*. The player performs in the plot, as revealed by the computer screen; in the case of *SIM City* the performance amounts to performing game moves such as creating building zones, setting tax rates and providing budgets for municipal services. Most of these actions are performed on the screen in a medium scale isometric view of the city. However, the total city is continuously simulated. The history of the simulation is analogous to a story, while the history of the screen view through which the player performs control of the simulation is analogous to a plot. Hence it is perhaps more accurate to refer to this as a *simulation level*, rather than a story level. The sense of this concept is to capture what the player does as a performance within and in relation to the game world, as well as how this performance affects what happens "behind the scenes" that the player may not have direct and explicit knowledge of. The result, in retrospect, may be a story, but the degree to which the player apprehends the unfolding simulation as a story is a function of the design of the game mechanics and the predefined narrative elements of the game, together with the player's mode of assimilating the experience. Some game designs will encourage the apprehension of the play experience as an experience of "being in a story" more strongly than others. This amounts to game design to support and encourage the immersionist and (dramatic) performance modes of game play described above. Viewing the layers of game time semiotics too strongly in terms of traditional narrative concepts of plot and story loses sight of these being design orientations that may be worked for, against or ignored in the design of the game. However, viewing the layers in terms of performance and simulation acknowledges the scope for designing for different play styles, including those that are not about story: achievement, griefing and socialising.

Looking finally at the level of the structural substrate, this must be subdivided into two different levels in the case of interactive 3D games:

1. the general, cultural structural substrate, as addressed by Propp [30]. This can be understood as a paradigm of distinctions by which the experiences delivered by a game are comprehensible within a culture or a subculture. This level must include not only implicit systems for apprehending narratives, but also for apprehending games as games, and simulations as simulations.

2. the specific generative substrate built into a game engine and providing the basis for computationally realising the player's experience in relation to the player's performance choices.

2. is the foundation of all interactive 3D computer games and represents a radical difference from traditional narratives. A system of texts represents it (design documents, high level models, software code, machine code and game data), and it has a physical representation as a pattern of electromagnetic fields interpreted symbolically as ones and zeros, and when

translated as a physical pattern into a computer it can be interpreted to realise the form referred to by players as “the game”. At the level of design principles for realising specific play styles, this can be referred to as the *game framework* (explained in more detail in [8]).

For a game designer, the value of structural models like those developed by Propp is to inspire design concepts for game frameworks supporting immersive and performative game play. Such design principles are poorly developed, while current methods for achieving narrativity in computer games most strongly favour the audience style of narrative engagement. To show why this is the case, and to map out alternatives for immersive and performative game play, it is necessary to look more closely at the time scales of pre-designed game time structures, beginning with the simulation level at the smallest time scale, passing through game design at the medium scale, and up to narrative design at the largest scale.

# Simulation

A simulation can be defined as: *a representation of the function, operation or features of one process or system through the use of another*.

Computer games are heavily based upon simulation, particularly the perceptual manifestations of game objects, their behaviour, the game space and/or environment, and systematic interactions between game elements. Established simulation techniques may be used for the design of the simulation level of a computer game. Methods from discrete event systems simulation include stochastically modeled simulation object arrival and service processes, queues of various kinds, networks interconnecting these elements, and response behaviours of simulation objects to queues, including balking, reneging, and jockeying. Simulation of physical game world characteristics involves continuous systems simulation of the motion and physical interactions of game objects based upon kinematics and dynamics, having a verisimilitude based upon sample (or simulation) rates (ie. frequency of time cycles) and quantisation accuracy (ie. the number of bits used to represent a continuous value, like a length, distance or mass).

In games, simulation extends to the simulation of cognitive and emotional states and behaviours of game characters. While this has been a general goal of AI research, in games the issue is one of achieving interesting aesthetic functions of game characters; hence games require what Mateas [21] refers to as *expressive AI* in addition to any concerns they may have with the simulation of general forms of decision making or emotional affects.

For game worlds, the simulation model may be a model of a system or world that is a fiction or *fabrication*. Some game systems are simulations of real physical systems (eg. flight simulators), but the simulative aspects of most games have rather arbitrary requirements for verisimilitude. For example, most interactive 3D games include the simulation of a three dimensional Newtonian world having a uniform gravitational field. Beyond that they may present a model of a fictional world and its contents for which the question of correspondence to any perceived external reality is mostly beside the point.

A game that is primarily a simulation may involve none of the repetitive goal-oriented activities characteristic of game play, there may be no obvious end state, other than the player getting bored, and they may have none of the specific predefined patterns in time or generative foundations for predefined temporal patterns (above the object level) characteristic of authored stories or narratives. Long-term time patterns that emerge over the course of running a simulation model can be completely different for different simulation runs, and may include time patterns that have never been anticipated by the designers of the model.

Design concerns at the simulation level of a computer game are focussed upon the smallest level of time scale in creating game dynamics; this is the level of the simulation tick, the discrete time increment corresponding with the time interval between successive graphical frames or frames of an animation sequence. This is *not* the level of game moves, but the level of the implementation of game moves. For example, a move may be to fire a missile, while

the simulation level is concerned with determining where the projectile is within the game space at the time of a specific frame based upon its position in the previous frame together with its current velocity, mass and the simulated forces acting upon it. This is also the level at which design decisions regarding the representation of space are made, concerning issues such as the quantisation of space, or how continuous space is to be divided up for digital representation as a basis for determining, for example, where a moving character is at a specific time after receiving the command to walk to a specific goal point.

# Games

Since games are here being contrasted with stories and simulations, it is possible to work with what may appear to be a rather narrow definition of a game. Hence a game will be defined as follows:

*A* game *is a goal-directed and competitive activity conducted within a framework of agreed rules*.

This can be referred to as the *ludic* or *ludological* definition of game, the kind of definition at the base of traditional game theory. Note that this definition captures many features of the definitions considered by Juul [12], in particular encompassing Juul's first three defining characteristics of games: rules, quantifiable outcomes and values assigned to those outcomes. The definition does not include Juul's additional criteria of player effort, player attachment to outcomes, or negotiable (real-life) consequences. These latter criteria are issues of pragmatics that are independent of the internal formal system of the game and highly subject to external accidents of history and context. Our definition leads to the possibility of recognizing the formal system of a game at work where the players may not self-consciously regard their activity as playing a game (including, for example, the reference systems with themes noted by Klabbers, [14]). However, the discussion presented here is concerned with games as entertainment, and the particular entertainment form of the commercial computer game.

### Game Rules

It is often said that learning to play a game involves learning the rules of the game (eg. [15]). However, the above definition does not require this. It *does* require that activity obeys the rules, and that players implicitly or explicitly agree to those rules. As Juul [12] notes, one of the advantages of computer games is that the machine enforces the rules, relieving the player from the need to know all of the rules in detail and supporting rule sets far too complex for purely manual operation. Manual game play requires learning the rules, computer game play does not.

The rules may include the specification of a valid game space, specification of the components used for play, turn protocols, valid moves and their conditions of validity; rules establish what as a player you can or cannot legally do, and what the consequences of actions may be within the game.

### Time Structures of Game Play

*Game Moves*

A *move* within a game is an abstraction over player action, mapping action to a specific significance within the rule set and independent of local, personal and idiosyncratic variations in performance; a move is a connotation of a physical action allowed and facilitated by the semantic framing of the game (I can move a chess piece on the board at any time, but I only make *a move* in the game of chess when I'm playing the game, and then I am limited to a very small set of choices of how to legally move different pieces). Hence a player performs actions having conventional connotations as moves within the formal system of the game. Those actions are likely to be highly stylised according to the game, and actions too dissimilar to the stylised set will be regarded as fouls or cheats if their performer intends them to have

in-game significance, or as *extra-ludic* actions potentially frustrating other players if they are not intended to have in-game significance.

The definition of game moves represents an intermediate level of temporal design in a game system. Moves represent the player's space of possible in-game significant actions, and it is in the role of a chooser and initiator of moves that the player is constituted as a player. This is the core and focus of cognitive engagement of the player with game play, and the nature, modes of selection, and density of moves determines the essential quality of play for a game. It is also in the choice of moves that play style preferences are expressed (together with more open indicators, such as the form and content of inter-player chat). While players may improvise within the freedoms allowed by a design to shift game play towards the play style of their preference, it is good design practice to target specific play styles. As Bartle [2] notes, specific game features support and promote specific styles of play.

While Bartle has proposed specific features encouraging play in the respective styles of achievers, socialisers, killers and explorers, this principle can be extended for story-oriented players and their specific play preferences. In this case different strategies and moves may be suitable for each of the story-oriented play styles: the audience style, the performer style and the immersionist style. As explored in more detail below, the audience form of story orientation may be best served by presentation of predefined story and narrative structures to players having a relatively passive role in relation to the story. However, for the performers and immersionists, game moves are needed that represent interesting performance primitives from a dramatic perspective. For all players, game moves provide a version of what Mackay [20] refers to as *fictive blocks*, basic fragments or units of fictional/narrative significance that may be strung together to form a higher level narrative. Mackay takes fictive blocks divorced from their original context to be equivalent to Schechner's *strips of imaginary behavior*, patterns that constitute a repertoire of potential behaviours that are performed by an actor in new arrangements in ways that may appear spontaneous and unrehearsed. Fictive blocks derived from popular culture sources (films, television, literature, etc.) are understood to circulate broadly within a culture, where they are available for reappropriation by its participants for the creation of new narratives (novels, movies, role playing game sessions, etc.).

In the case of a computer game, fictive blocks have a tangible and predefined form created by the game authors as the constrained set of valid game moves that the player may choose from at any particular point in the unfolding play experience. Since the set of predefined games moves constitutes a player's in-game-character repertoire of performance primitives, the scope and nature of the available moves has a direct bearing upon the ability of the player to engage in various play styles. Players may improvise around what the system makes it easy for them to do, but it will always be easier to play in the style encouraged by the system. Some move types facilitating various play styles include (see also the suggestions in [2]):

- *achiever*: all moves falling within the formal definition of a game used here and aimed at advancing the competitive position of the player/character in relation to other characters, including both or either of player characters (PCs) and non-player characters (NPCs); all moves that increase the level of achievement of the player/character in terms of the achievement measures built into the game (eg. game levels, accumulated wealth, skill levels, progress through a game level structure)

- *killer/griefer*: all official and unofficial moves that can be used to the detriment of other players and/or their characters; an obvious example is combat moves used to inflict damage on other player-characters

- *socialiser*: moves for managing official in-game social groupings, such as the hierarchical vassal/lord structures of *Asheron's Call*, or the guild structures common within many MMORPGs; moves for managing player-oriented social functions, such as open chat facilities and the ability to form friend lists, also common in MMORPGs

In relation to story-oriented player preferences it is possible to propose:

- *audience* style: moves for reading in-game narrative material, such as opening and reading virtual books presenting game scenario and fictional game world history material, and moves for conversational interaction with NPCs, all of which are common within RPGs. (Cut scenes, of course, are not moves.)

- *performer*: moves associated with the expression of predefined character roles for player characters. Character roles are most commonly defined in very broad terms using the concepts of functional classes (Mage, Fighter, Cleric and Thief being traditional AD&D classes from which most, if not all, RPG games are ultimately derived) and feature-determining races (humans, elves, dwarves, orcs, etc.). Moves for the selection (or not) of in-game *quests* can also be regarded as performance-oriented moves.

- *immersionist*: it is less clear what specific functions and moves support a player experience that deepens from the performance of a character to the development of a persona. Eladhari [7] suggests that developing a persona requires freedom for personalising a character; in the current context this suggests having more freedom than required for performance-oriented play, although immersion may also require a long presence within the game world by the player.

Two important points should be made in relation to story orientation. One is that much of what may be provided within a game to satisfy story preferences may be outside the scope of user-selectable moves. For the audience-oriented player, story material may be presented as a framing high level narrative delivered via cut scenes marking pauses in the main performance of game moves; story in this case does not constitute game play but is often intended by designers as a kind of reward for the player. The performer may also benefit from the same moves and techniques supporting the audience orientation, but in this case the story information functions to inform the player about the character to be performed and the higher level story that provides a context and meaning for the performance.

This leads on to the second point, that current design conventions for computer game mechanics and moves supporting dramatic performance and immersion are of limited effectiveness and in general poorly developed. Role definition systems like classes and races result in easily implemented functional and instrumental consequences in terms of the basic physical model of the game world and the functions of combat and economic systems. However, these devices do not seem to have any intrinsically greater support for performers and immersionists than they have for achievers (and griefers). The design of classes and races involve balancing capacities between classes and between roles, in familiar “rock/paper/scissors” patterns relating to the achievement criteria of a game, founded more in the specific conception of game form behind the definition used here than in considerations of dramatic characterisation. In-game quests provide a gesture towards the goal-based interpretation of dramatic roles used by dramatic actors. However, in the context of stage and film drama, role conflict is used to generate dramatic interest. This is relatively uncommon for game quests, which usually have the form: “get/take object/information X <from/to character Y> in place Z <and bring it back to me>”. In single player games it is easier to set up quest goals in conflict with goals of various NPCs, but for multiplayer and massively multiplayer computer games, conflicting dramatic player character goals are yet to be explored (although this is a technique used extensively in live-action role-playing games).

*Game-play Gestalts As Patterns of Moves*

Learning to play a game, making progress within a game and completing or winning a game are matters of learning how to interact within the game system and its rules in a way that supports progress. Most contemporary computer games are based upon game play predominantly oriented towards the conception of gaming captured in the basic definition of a game presented above. For the achievement-oriented gamer playing an achievement-oriented game, learning to play is not generally a matter of learning the game rules, but of

learning a *game-play gestalt*[4], understood as a *pattern of moves* (interaction) within the game system. Playing the game is then a matter of performing the gestalt. It is what the player does, within the system and as allowed by the rules of the game. Repetition is actually fundamental to achievement-oriented game play, since it is in repetition that the player learns the skills of play and demonstrates refinement leading to increasing progress and difficulty of mastered game play. In computer games, where the machine enforces the rules, this may lead to players having very poor conscious appreciation of what any of the rules actually are; instead they have learned successful (and unsuccessful) patterns of interaction by trial and error.

A game-play gestalt can have many forms for a particular game, capturing different playing styles, tactics and approaches to progressing through the game and (perhaps) eventually winning. In general, it is a particular way of thinking about the game state from the perspective of a player, together with a pattern of repetitive perceptual, cognitive and motor operations. A particular game-play gestalt could be unique to a person, a game, or even a playing occasion. Recurrent game-play gestalts can also be identified across games, game genres, and players. Some examples of game-play gestalts in computer games include:

*Action games*: shoot while being hit, strafe to hiding spot, take health, repeat

*RPGs*: send fast character to lure enemy away from pack and towards character group, all characters kill enemy, take health, repeat

*Strategy Games*: order peasants, send to work, order soldiers, send to perimeters, repeat while slowly expanding the perimeters (up to the point of catastrophic win/lose); OR: move x archers to tower y every n minutes to head off the enemy camel musketeers from the east who arrive every n minutes

*In General*: confront barrier, save if barrier overcome, reload and retry if unsuccessful

Such patterns may or may not be explicitly designed for by the creators of a game. If designers do take them into account, it may be in supporting the development and emergence of these patterns in play, rarely by forcing them on the player. Hence game-play gestalts are time patterns of game play devised by users in interaction with the game system.

*Higher Level Temporal Structure in Games*

As noted above, player engagement within a game experience is strongly associated with the choice and performance of game moves. Without any higher level designed time structures informing the play experience, the potential for choosing moves results in a very loosely predefined time structure such that games by themselves are not strongly a priori time-structured in their design above the level of the definition of types of game moves. Many specific types of move have some time structure within their definition, at least implicitly within the rule-derived constraints bounding valid ways of performing a move together with the simulation level mechanisms involved in implementing it. For example, the game move “move to point [X, Y]” takes as long to execute as required by the simulation of velocity of the moving unit in relation to the simulation of spatial extension represented by the virtual distance within the synthesised game space from the current position to the [X, Y] move destination. But this is only a time structure within the move, and the temporal structure of game-play gestalts, formed by patterns of moves, is an emergent structure developed during play by a player. Even a game like *Snakes and Ladders*, in which progress is a matter of very constrained movement across a highly structured grid, supports a very large space of possible combinations of moves on the board, corresponding to an equally large space of possible time structures (the extent of a game object move in this case being determined by the performance of player acts having probabilistic outcomes, ie. the throwing of dice).

[4] A *gestalt* may be understood as a configuration or pattern of elements so unified as a whole that it cannot be described merely as a sum of its parts.

For this reason, the purest examples of game form cannot be regarded as heavily time-structured artefacts above the definition of specific types of moves and the general time-structuring goal of winning. However, there are larger scale time structures specific to game form. These larger scale structures are reflected in the language of rounds, bouts, matches, tournaments, seasons and campaigns. The most primitive complete game experiences, at which a point of win or lose is reached, are bouts or rounds. Significantly, higher level structures tend to be highly repetitive patterns of these simple game experiences; they are largely concerned with the organization of opponents, extending the simple competitive situation of a game to include a broader field of opponents with a view to obtaining a global performance or game play ranking obtained by accumulation of the results of many bouts.

In order to discuss these higher level structures more clearly, the following somewhat arbitrary working definitions are proposed:

- a *bout* or a *round* is the single performance of a game between opponents resulting in a win/lose state[5]
- a *match* is a series of bouts of the same game between the same opponents
- a *contest* is a series of rounds of different games between the same opponents
- a *league* is a series of rounds of the same game between different opponents
- a *tournament* is a series of rounds of different games between different opponents

These structures may be organised into hierarchies, lattices or networks. For example, performances within a tournament may each have the form of a match. High level game structures have their own rules, including rules for the accumulation of the results of bouts and rules for matching competitors in ongoing events. A multi-game structure requires a *principle of accrual of results*. That is, various formulae may be used for accumulating wins and loses, and degrees of win/loss, into an overall competitive ranking, or for the identification of a set of *champions* across various categories. The structure may also include *elimination events* in which losing competitors are eliminated from further competition, or the game system may include *principles of handicap* by which differences in demonstrated game play expertise are compensated for to provide for less predictable outcomes in ongoing competitions.

These are match, contest, league and tournament rules that have no impact upon low level game rules or the abstract form of moves within each specific game type. The time structure among these higher level game groupings is incidental to the essential performance of the players. Even more strongly, it can be stated that the high level structures of game forms have little to no dependence on specific time orders. Their primary meaning is the ranking of player competence; time-ordered competitions are a convenience for identifying this ranking. In principle it doesn't matter at all what the sequencing of competitions is, as long as it leads to an order of player competence (hence the common freedom to choose the sequence in which one defeats one's opponents in the case of more open computer game levels). So at this level too, games are not primarily time-structured designs, and high level time structure does not impinge upon low level game rules or the basic experience of play. This is a critical distinction between the temporal form of games and those temporal experiences (such as movies) that have a strong a priori linear time structure (or set of potential linear time structures) created by their designer. In computer games, instances of combat are individual bouts (these are experiences of playing single games, by the definition above), while levels are organized as a series of matches, contests, leagues or tournaments. If a higher level game structure is designed to present players with a specific sequence of game experiences, activities and opponents, serving to shape the emotional tone and intensity of the experience, the form is starting to move away from pure game form, more strongly integrating variants of authored narrative as manifested in the pre-specified sequential design.

*Tactics and Strategy*

[5] There may be more than two opponents, and each opponent could either be an individual or a group; opponents may also be synthetic, eg. the NPCs of a computer game.

Tactics can be regarded as higher level and conscious game play patterns developed by players. Hence there is a progression of scale in play patterns: moves are primitive meaningful game actions, performed within the game space, using relevant game objects and conforming to the rules of the game. In turn-based games, the completion of a move (or a specific number of moves required or allowed by the game rules) generally signals the end of a particular player's turn. A pattern of moves developed by a player as a method of making progress within the game is a gameplay gestalt. Tactics can be defined as gameplay gestalts or patterns of gameplay gestalts that are consciously chosen by a player in response to the actions of an opponent or other aspects of a developing situation. Tactics are selected with the aim of winning bouts or rounds of a game. A strategy can then be understood as a higher level policy or plan, consciously followed by a player with the aim of winning a match, a contest, a league or a tournament.

# Linear Narrative Form

As defined above, a narrative is an instance of expressing a plot. A very weak understanding of narrative may include the representation of any series of experiences that the player understands as having some kind of overall unity. However, strong conceptions of narrative conform to very specific and detailed structural models.

A common example of a very specific model of narrative form used in computer games, and especially for action games (and also commonly used in role-playing and strategy games), is the *three-act restorative structure* [5] ) borrowed from literature, drama and film scriptwriting. The three-act restorative structure has a beginning (the first act) in which a conflict is established, followed by the playing out of the implications of the conflict (the second act), and is completed by the final resolution of the conflict (the third act). The three-act restorative structure includes a central protagonist, a conflict introduced in the first act involving a dilemma of normative morality, a second act propelled by the hero's false resolution of this dilemma, and a third act in which the dilemma is resolved once and for all by an act that reaffirms normative morality. Each act within the three-act structure culminates in a point of crisis, the resolution of which propels the plot into the following act, or to the final resolution.

This model, derived from Joseph Campbell's analysis of the structure of myths, is a dominant formula for structuring narrative in commercial cinema [35]. The three-act restorative model is also widely used for designing a high level framing narrative for computer games (eg. [32]). When used in games, the central conflict form often manifests recursively (ie. the structure is repeated at different levels of temporal scale). For example, the overall restorative three-act model may be applied to frame the game experience as a whole, the game starting with cut scenes that introduce the central conflict, with the dramatic arch being completed when the user finishes the game. At this level the story is usually not interactive, since act one, key scenes or plot points within the story of act two, and the playing out of the consequences of the final resolution in act three are typically achieved by cut scenes, sequences of non-interactive, pre-rendered video or non-interactive animation sequences. The next level down within the recursive structure is that of the game level. The game level is designed for the pursuit of a goal, that of the player reaching the end of the level, which progresses the player through the second act of the higher level three-act structure of the game narrative. There is rarely if ever a one-to-one correspondence between game levels and acts; more typically, the first act and the end of the third act are presented via cut scenes, with playable game levels summing to form a highly extended second act followed by the final resolution of the third act as the end of game play (eg. by overcoming the game boss, the final and toughest enemy, usually a demonic character at the heart of the central conflict in the story). Although the interactive play content of a game level typically has much of the structure of a match, a contest, a league or a tournament, the sense of level-specific narrative development can be enhanced by increasing difficulty through a level, or by an internal dramatic structure that emphasizes the point of completing the level, such as the defeat of a level boss, the barrier creature (or *threshold guardian*) at the end of the level. The false resolution that drives act two of the three-act restorative model at the highest structural level may be seen manifesting repetitively with each game level: when the game level is resolved (completed), the player finds themselves at the beginning of the next game level full of conflicts.

At the next level of the recursive decomposition of action game structure, for example, there is a series of smaller scale conflicts and challenges that may include monsters to be defeated or avoided, puzzles to be solved, or treasures, clues or keys that must be found in order to progress in the current or future game levels. Usually it is only this lowest level of the game plot that is highly interactive; these are actually the individual games played by the player (by the definition of game proposed above). The linear and non-interactive cut scenes framing game play are revealed in a predefined order, and within a level all players usually start in the same place and must have completed the same set of tasks in order to complete the level. So game play usually has little or no bearing on the story being told; the story is for the most part a structure imposed on top of, and different from, game play.

**Localising the Tension Between Narrative and Gameplay**

There has long been debate about tensions between game play and narrative in computer games (eg. Aarseth [1], Juul, [11). However, anecdotal evidence suggests that this clash is definitely not perceived by all players in relation to the same games. Lindley [17] argues that the perceived clash is due to a conflict between the attentive demands of game-play gestalt formation and performance on one hand (together with the resulting immersion in game play) and the retention of narrative context on the other. This explanation is specifically directed at games in which the narrative is presented as a predefined frame for game play, as described in the previous section. However, the explanation cannot be taken as a universal one, since many players are not dissatisfied with the way that framing narratives function. This is partly an issue of game design quality. Good game design achieves better integration of the game-play and narrative structures of the game, using methods like continuously but unobtrusively reminding the player of the narrative context (rather than having a few perfunctory cut scenes), and using cut scenes and automated animation sequences as rewards at appropriate moments within the rhythmic patterns of game play. However, even with the best designs, some players will still not like this approach.

Given the subcategorisation of story-orientation preferences among players presented above, it is possible to be more precise about the nature of this tension perceived by *some* players. In particular it may be hypothesised that: *narrative delivered as a predefined framing structure is perceived as being in tension with immersion in game play for players who do not have what has here been called the* audience *orientation to narrative reception*. This includes players who simply are not interested in narrative, being more interested in socialisation, achievement, and/or griefing, or players who are interested in story from performer and/or immersionist perspectives. For these kinds of players, presentation of predefined narrative content via cut scenes is likely to be received as an unwelcome interruption of immersion within the game. Being forced to read through lines of expository story material in virtual books or dialogs is just as likely to irritate these players as cut scenes are, leading them to hit the escape key as soon as possible or abandon whatever in-game task requires subjection to this tedium.

For players who *do* have an *audience* orientation to narrative reception, cut scenes and narrative text fragments may be perfectly fine, not only as a nice pause from the general rhythms of interactive play, but placing play in a context that allows them to assimilate it into an overall sense of being in a story.

For immersionists and performers, achievement-oriented game play is likely to be regarded with similar derision as observed between categories of players in Bartle's [2] player category system. But these players are just as likely to disdain socialisers and griefers. Hence the narrative/game play tension is no more or less of a problem than the immersionist/socialiser problem, the immersionist/killer problem, the socialiser/audience problem, etc.. In all cases it is a matter of matching (or mismatching) game mechanics with play preferences. The question for the designer is that of how many tastes to try to please, how to make it possible to allow players to choose the play styles they prefer and avoid those they don't like, and then of how to direct a game towards those players whose play styles are accommodated by the game mechanics.

# Interactive Narrative

Interactive narrative has been defined as “a time-based representation of character and action in which a reader can affect, choose, or change the plot” [23]. Derived from experimental literature, the first interactive narratives to be written were text-based hypertexts (eg. [28]). This kind of branching structure between media chunks has since been applied to multimedia and video based interactive narrative systems. The resulting experience for the reader/viewer is a linear narrative that may have a three act restorative structure irrespectively of its partially interactive mode of presentation. Traversing these systems is not game play, since it involves selection rather than problem-solving or competition. Nevertheless, branching narrative structures can also be applied within game design, as discussed below, and in this case branching decisions *may* be made automatically based upon the consequences of play.

Possible structures that an interactive narrative may have (summarised from [6]) include:

- tree (most common in text-based works due to cost)

- exploratorium, a linear structure in which the player can pause to explore the surroundings [33]

- parallel plot structure, in which different versions of the story are told at the same time and the reader/viewer can switch between the different parallel versions (see [24])

- nodal, or dead-end structure, typical for action/adventure games, involving numerous alternative paths and dead-ends, which may or may not be (but usually are) reversible, generally along a main sequence eventually leading from the beginning of the game to the end ([32], [23])

- modulated, or the dynamic labyrinth structure, provides constellations of interactive choices, but only allowing access to a new set of possible interactions after the player has experienced different parts of the story [24]. Game levels function in this way.

- an open structure in which sets of story elements are associated with different physical places; links between places are open, so the player can wander around discovering different elements of the story [33]. This is the form typical of early adventure games.

- an open structure in which there is no story arc. This is the form typical of simulation-based games, strategy games and open world-based games, like massively-multiplayer on-line role-playing games (MMORPGs) [23].

Looking at these models from the perspective of computing science, it is possible to see that they manifest three levels of structure that can be modelled in terms of formal graph theory:

1. an *atomic graph level* providing the components for defining the graph structure and behaviour representing the interactive structure of the narrative. The atomic graph level includes the following elements:

    - nodes (also called *vertices*)

    - links between nodes (also called *edges* or *arcs*)

    - constraints upon links. These may include:

        - links may be directed or not (directed means only one-way travel along the link)

- links may be conditionally available (eg. if a key is found, a plot point has been discovered, or the level boss is killed). While Murray [24] has referred to these as dynamic links, here they are referred to as conditional links, since each of these links exists at all times, with a fixed source and a fixed destination, in this sense being static but having conditions that must be satisfied before they can be traversed. Conditions upon links may include disjunctive conditions (one of A or B or … is satisfied) and conjunctive conditions (all of A and B and … must be satisfied), where the terms may be further arbitrarily decomposed into disjunctive and conjunctive conditions

- directed links exiting a node may be exclusively available (ie. only one can be chosen), inclusively available (any subset may be chosen), or may have dynamic availability (choosing one link enables and disables others exiting the same node)

- nodes may be restricted to having only one entering link, or may have multiple entering links

2. a high level *topology*, giving an author the overall shape of the interactive narrative. The graph topology from an abstract perspective is independent of how it is used in relation to a model of story form. The decision of how to map story form onto network structure is a design and authorship issue. Graph theory provides a number of specific concepts for describing the form and properties of graphs based upon the nature of their links and the topology of link connections. Some of these are:

    - a *complete* graph is one in which every node is connected with every other node

    - a *multigraph* is a graph with multiple links between the same nodes

    - a *walk* is a series of links connecting one node to another via an arbitrary number of intermediate nodes (possibly none); a *path* is a walk having no recurring nodes; a *trail* is a walk having no recurring links; a *cycle* is a walk that returns to the starting node

    - a graph is *connected* if it has at least one node and there is a walk connecting every node within the graph

    - a *digraph* is a graph having directed links

    - the *degree* of a node is the number of links connecting to it; for a digraph this includes the *in-degree*, or number of links entering the node, and the *out-degree*, or number of links leaving the node

    - a *forest* is a graph that is *acyclic*, ie. has no cyclic nodes, while a *tree* is a directed acyclic graph, or an acyclic digraph

3. a *node substructure*, constituting what the nodes contain. Since a node can in principle contain any kind of interactive narrative structure, interactive narrative structures may be arbitrarily nested, using either the same or different structures within the content of what is a node at a higher level. For example, the nodal or dead-end structure described above could be modelled as a linear sequence of nodes in which each node represents a game level; the interactive story possibilities within each node could then be represented as smaller scale networks.

In addition to graph theory, it is also useful to look at classical or naive set theory as an additional source of concepts for describing interactive narrative structure. Some relevant concepts include:

- a *set* is defined as a well described collection of objects, referred to as *elements* or *members* of the set

- a *totally ordered set* is a linear *sequence*, having a specific ordering of its members

- a *partially ordered* set, or *poset*, is formally defined as a set that is reflexive, antisymmetric and transitive, but here can be regarded informally as a sequence that has branches that diverge and/or converge. Graphs can be used to illustrate the order of posets.

The earlier mentioned models of interactive narrative structures can now be described in these more specific terms:

- an exploratorium is a sequence having nodes that are sets of narrative components; if the accessibility of components within each node is to be modelled as a graph, then it is a *complete* graph, ie. every object within a node is connected to every other object within that node

- a parallel plot structure consists of parallel sequences with links between those sequences, constituting a digraph

- nodal, or dead-end, structures are connected graphs, and may be more specific depending upon their particular form

- modulated, or dynamic labyrinth, structures are also generic graphs, but with conditional access to subgraphs

- an open structure maybe either the same as an exploratorium, except that the high level structure is a branching graph rather than a sequence, or a complete graph

More importantly, the kinds of graph and set-theoretical concepts described above provide a language for specifying a much greater variety of interactive narrative models that any of the small number of specific models described here.

Some further points about these methods of specifying interactive narrative structure:

- while a graph model may be used, with node contents being recursively specified by graphs, this recursive decomposition stops with either graphs having nodes, or sets having members, corresponding with story components. In interactive 3D games those components are things such as plot points presented in cut scenes, associated state changes, level advances, items or benefits lost or gained, and specific game challenges including individual opponents to be killed, puzzles to be solved, quest goals to be achieved, and quest goals actually achieved. Interactive movies will have components such as video sequences and hypertexts will have text chunks, perhaps with static 2D graphics.

- terms from graph theory can provide more precise descriptions of interactive narrative patterns than terms like “parallel plot structure” or “dead-end structure”. However, the latter terms may be more meaningful in terms of how it feels as a player to move through those structures. Hence it may be useful to use both informal descriptions and more formal descriptions, where the informal descriptions address the mapping of narrative function onto the graph model and the more formal description is more precise in how the graph functions and is traversed.

- for framing narratives, branching structures can be used to allow game play decisions to have an impact on the high level story, perhaps enhancing the feeling of the narrative significance of performing game moves for the player. However, the higher the level of narrative structure, the more expensive it will be to produce any kinds of branches. This is a strong incentive *against* using *exclusive* branch patterns (ie. branches that are exclusive alternatives) in high level narrative models, unless

the underlying content is cheap to produce. Most graphically rich computer games that use a high level narrative framing for game play either 1. use inclusive branching, all players being intended to traverse all or most of the branches (eg. adventure games), or 2. use a highly linear framing narrative, so that once again all players access most of the same narrative material. Otherwise, if exclusive narrative branches are used, for any single player there is far more material in the game than that player will experience (without repeat playing through a whole game arc); this is generally regarded as an unnecessary and expensive redundancy of game content. This is why exclusive branching patterns are more commonly found in hypertexts, where the story content is relatively cheap to produce.

- the graph-based model of interactive narrative structure is a representation of causal dependencies between and among game actions and states. It is not *necessary* to use any such representation. If it is used, it can be used for textual/graphical representation of narrative structure during game design. Ideally this should be supported by tools that map those representations directly into game scripts for implementation, or game scripting languages should have the ability to directly express those graph structures and their associated features and constraints.

In stating that it is not necessary to use a graph-based model of narrative structure, there are many benefits in doing so. However, considering the example of games in which the player's moves map onto low level in-game player character actions, it becomes completely impractical to map out all of the possible story alternatives at a low level. The transition point is the boundary between higher level designed story patterns and lower-level designed potential for the emergence of story material. The boundary will not exist if either:

- the "game" is produced as a branching narrative structure over non-interactive story components. Game play will then be a matter of resolving the conditions required for progress within the branching narrative structure in the manner of a classical "point-and-click" hypertext or adventure game

- *no* predefined narrative structure is used, the designers focussing exclusively upon low level action generation; if story content is still of interest the designers in this case must design story potential into the system, with higher level story structures emerging as a consequence of player actions.

High level inclusive branching or sequential linear designs are often used for level design. This is not necessarily for the sake of creating a sense of story, other than the weak story of increasing character capacity through increasing levels of difficulty, or adding incidental interest to game play by thematic variation of game space topology, style and decoration in different levels (eg. the first level is the Town, then the Wilderness, the Underground Complex, the Caverns, then the Forest, the Castle, etc.). This is also very different from using *told* story material in the form of cut scenes to present a framing narrative context. Changing settings can reinforce changing narrative functions of game subspaces (the journey starts in the town, within the underground complex the hero must search within her soul, the villain lives in the castle, etc.) but are not in themselves intrinsically narrative.

# Object-Oriented Story Construction

Whether or not a high level narrative frame is imposed over game play, most game play in interactive 3D games occurs at a level where the very high number of possible combinations of actions, positions and interactions makes it completely inappropriate to map out branching interaction possibilities at the level of the design of game moves. Interactions and their consequences between paired types of actions can be specified, using, for example, payoff matrices. But in the simulation of a continuous game space where players can choose moves for interacting with other player characters or NPCs, the details of interaction are far too great to consider other than at the level of the pair-wise interactions of moves that are highly combinable in sequences. This amounts to the design of game characters encapsulating

interaction potential in their available potential moves, constituting a character- (and game object-) level object-oriented approach to interaction design.

From a story perspective, this amounts to the adoption of object-oriented story construction methodologies (see [6]), in which game objects (including characters) encapsulate their own potential for the construction of interesting story material. What represents interesting story material depends upon the play experience preferences of the player. As noted above, game moves represent a performance repertoire of in-game player character performance primitives. Combat-oriented games, for example, provide player moves for actions such as moving the player character within the game world, exchanging, selecting and deselecting weapons, aiming and choosing opponents, and actually striking opponents (depending upon the game; for MMORPGs, where time delays exclude fine timing, the move is to initiate combat, with each blow typically being executed autonomously). Combat moves fit into a conception of interaction conforming strongly with the formal structure of a game. Combat moves are nevertheless performance moves that can also constitute player performance primitives for manifesting the lowest level of interactively selected detail in the game experience regarded as an unfolding story. Since the character encapsulates it's movement capacity, this is at least conceptually a variant of object-oriented story construction. For strongly combat-oriented games, however, a small number of types of moves are performed in very high density, that is, repeatedly at very short time intervals and for very long periods of time. This results in the game-intensive form of combat confrontations (each enemy defeated is one game bout won) dominating the player's experience of play. Performance of the game moves (in patterns or repetitive gameplay gestalts) consumes most or all of the player's attention, leaving little sense of higher level story or character development. This combat orientation means that levelling and increasing combat capability are the most relevant aspect of character development; any other elements of characterisation or story then fade into the background, and the details of higher level narrative contexts are frequently forgotten (as argued in more detail in Lindley, [17], [18]).

The solution to the difficulty of remembering a high level narrative context during highly repetitive game play may lie in good design of the methods by which the narrative context is presented, such as frequent use of cut scenes well integrated into an overall rhythmic pattern of game play. The problem of repetitive game play being more game-like than story-like is of a very different nature. This is, in fact, *not a problem for the gamist*, and the well designed narrative framing may not be a problem for the gamist/gamer who likes the occasional break (often designed as a reward for achievement in the game), resting for a while in the audience-oriented story role of the viewer of a cut scene. It is, however, a problem for players having the story orientations of performer and immersionist, since repetitive game play (typified by combat games) does not provide a sense of dramatically significant character or story development within the detailed interaction mechanics of play.

Object-oriented storytelling implemented at the character level can use linear or branching narrative (or narrative-like) structures to model character development over time *within* the control model of a character. This is a weaker sense of narrative than the use of a high level narrative form covering the interactions of many game characters and events. However, it is a way of structuring the development over time of the psyche, beliefs, affective states and behaviours of a character. This can be referred to as the creation of *inner narrative* models. This concept is closer to the concept of narrative developed by Louchart and Aylet [19], but provides a more specific advanced plan for character development. Progress along the inner narrative model can be a function of game world and character interactions, thus helping to shape the history of the game world in general but not necessarily leading to any specific overall and high level pattern of development (eg. narrative) at the world level.

A final point about object-oriented storytelling is that it can be applied at the world story level without being encapsulated within character models. An example of this is to use *plot controllers* that create specific transformations in the world and characters. A specific plot point is represented by a set of conditions marking its activation and a set of rules for transforming world and character states. An example may be a "falling in love" plot point controller, activated by a world action. This could, for example, be triggered by having a character look at a portrait of another character, triggering the plot controller which then

implements changes to the character control system, making it easier to move closer to the loved one and harder to move away. A set of plot controllers might or might not have internal dependencies, representing a plan for longer term story development. But an important aspect of this concept is that plot controllers are not necessarily activated but function loosely in the world to make interesting things happen under specific circumstances. This can also be used as a strategy for creating *inner narratives* from a more object-oriented perspective.

# Designing for Performative and Immersive Game Play

As seen above, game play framed by a high level narrative presented by cuts scenes, together with expository material found in in-game texts and NPC dialog, satisfies the *audience* orientation towards story. What then of the performer and the immersionist? RPGs are the game form most clearly directed towards performance. However, as discussed above, characterisation within an RPG game system is generally accomplished using class and race systems providing little beyond features having instrumental effects (eg. combat, movement and magic) for outlining characters, and this is done at the level of character types. Hence the in-game language of characterisation points directly at game mechanics designed for the gamist player, grounding character in repetitive game play rather than dramatic depth and development. Live-action and table-top RPGs benefit from their live performance contexts in giving players the space to imaginatively elaborate characters; indeed, over time, the mechanised rule sets of a campaign fall into the background while the ongoing imaginative improvisation of character and story form the essence of the play experience (see [20]). Character performance and character immersion are the great strengths of these game forms. Contemporary computer games mechanise game rule systems but do not provide the same scope for imaginative elaboration of character and story by players.

Providing support for performative and immersive story orientations in computer games is therefore the major ongoing challenge for game technology development in support of immersionist and performer game play. Beyond audience-oriented narrative techniques, game play oriented towards dramatic content requires a more object-oriented approach in which the player character encapsulates character and story development potential, and the specific narratives that emerge over time are a function of the players' history in a game world.

Role-playing systems based upon classes and races provide some initial mechanisms for this. These systems provide accessible, if shallow, characterisation for players who are not skilled in role-playing. Class and race systems are also very general, functioning for new characters who appear anywhere within a game world, with no personal history and no preformed personality. Deeper, richer and more interesting characters require more specific characterisation. This amounts to having a history with its consequences, being associated with specific places and within a complex social structure. This kind of history can develop over time within a massively multiplayer on-line role-playing game (MMORPG), but a new character enters the world like a baby with no family. It really is not a character at all, but a bunch of instrumental capacities. A player who stays within the world for a long time can develop their character into a deeper character having a history and a social network. But the history of such a character is written within a world of endlessly duplicated monsters and objects that respawn or are generically substituted when killed or taken. The character's history of actions leaves few permanent traces. And the social networks developed over time are defined primarily by players using free text chat facilities, so these identities do not form a game world identity so much as an in-player-group identity. So the markers of character are either generic or exist within relatively closed social networks of small player subgroups. Skilled players may manage to perform and/or immerse within the scope of freedoms allowed by the game system. An ongoing challenge is to provide system support extending effective realisation of these story orientations for less skilled players, and integrating the uniqueness of well developed characters more effectively into the ongoing history and fabric of the game world.

# Emergent Narrative

There is nothing intrinsic to the forms of immersive and performative game play described here that renders them incompatible with the use of predefined high level linear or interactive narrative frames. The player who does not also like audience-oriented story content may not like such framing any more than the pure gamer or socialiser. For the player who strongly prefers immersive and performative play to the exclusion of audience-oriented story material, systems based only upon character- and game-object level object-oriented story construction provide a solution. However, the question that then arises is: how is it possible to create an experience over time that has the properties of a well-structured narrative?

A central issue here is that of what constitutes a well-structured narrative. For many immersive and performative players the answer may be: a narrative involving a complex and multidimensional character going through both deep and varied emotional experiences and evolving relationships in a (virtual) life of unfolding complexity and interest. Then an object-oriented construction system is a preferred solution. But the answer from highly conventional narrative writing would be: the three-act restorative structure. This leads to a problem for the latter kind of narrativist: how to develop an object-oriented story construction system that in operation results in the formation of a specific high level narrative structure, such as the three-act restorative structure (or Aristotelean dramatic arc, etc.), without defining the plot in advance? This is (essentially) the problem of *emergent narrative*.

*Emergent computing* generally refers to computational processes in which the execution of a large number of very simple rules or processes results in the collective generation of interesting higher level patterns or structures. Emergent narrative in the strong sense is concerned with the emergence of well-defined high level narrative forms from the interaction of smaller scale elements (eg. game characters) in a system that does not contain any representation of that high level form. An example of a system that uses an Aristotelean arch of dramatic tension rising to a climax and then declining is the *Façade* interactive drama system. In this case parameters on story elements indicate a cumulative drama value, providing a basis for dynamic element selection without prespecifying a specific plot ([22]).

If the target narrative form is not so specific, the concept of narrative emergence is correspondingly weakened. For example, the retrospective narrativisation of a character's experience, in which the experience is internally transformed into a story (considered by Louchart and Aylet, [19]) must count as a weak sense of emergent narrative. Perhaps an even weaker sense is the process of the player constructing told stories about their play experiences to relate to others after the event. The general Emergent Narrative Theory of Louchart and Aylet [19] is based upon no high level structural form, but instead uses the term narrative to refer to what here has been described as object-oriented story construction. However, the use of the term narrative in this way loses the stronger meaning of specific high level narrative forms in the way generally associated with the concept of emergence in computing.

# Conclusion

This paper has presented a framework interrelating models of game and story form with player preferences for play style and story orientation. Games are regarded in terms of three levels of temporal design, from simulation at the lowest time scale, through the design of game moves above the simulation level, to the structures of specific narrative patterns at the highest level. High level narrative patterns can be designed as a priori linear or non-linear structures, narrative can be approached as an emergent phenomenon, or a game may omit any strong narrative form. Games having no high level narrative design may nevertheless support performative and immersive game play, this being a matter of detailed design of the game mechanics within an object-oriented paradigm of play-time story construction. At a general level this framework can be applied to table-top and live action role-playing games, as well as to computer games; the nature of the experience can be very different, but the same methods of structuring game mechanics in relation to player styles are still applicable.

# References


[1] Aarseth E. J. 1997. *Cybertext: Perspectives on Ergodic Literature*. The Johns Hopkins University Press.

[2] Bartle R. A. 1996. "Hearts, Clubs, Diamonds and Spades: Players Who Suit MUDs". http://www.mud.co.uk/richard/hcds.htm.

[3] Bartle R. A. 2004. *Designing Virtual Worlds*. New Riders Publishing.

[4] Chatman S. 1978. *Story and Discourse.* Cornell University Press.

[5] Dancyger K. and J. Rush. 1995. *Alternative Scriptwriting*. Second Edition, Focal Press.

[6] Eladhari M. 2002. *Objektorienterat berättande i berättelsedrivna datorspel* ("Object Oriented Story Construction in Story Driven Computer Games"). Masters Thesis. University of Stockholm. http://zerogame.interactiveinstitute.se/papers.htm.

[7] Eladhari M. 2004. "Interactive Narrative". Unpublished lecture notes from the course *Introduction to Game Analysis and Design*. Gotland University, Sweden.

[8] Eladhari M. and C. A. Lindley. 2004. "Story construction and expressive agents in virtual game worlds". *Other Players Conference*. Centre for Computer Game Research, IT University, Copenhagen, Denmark, 6-8 December.

[9] Frasca G. 1999. "LUDOLOGY MEETS NARRATOLOGY: Similitude and differences between (video)games and narrative". http://www.ludology.org/articles/ludology.htm.

[10] Frasca G. 2001. *Videogames of the Oppressed: Videogames as a Means for Critical Thinking and Debate*. Masters Thesis. Georgia Institute of Technology.

[11] Juul J. 2001. *A Clash between Game and Narrative*. Translation of Master's Thesis written in 1999.

[12] Juul J. 2003. "The Game, The Player, The World: Looking for a Heart of Gameness". *Proceedings, Level Up Digital Games Research Conference*: 30- 45. Copier M. and Raessens J. eds.. 4 – 6 November 2003, Utrecht.

[13] Kim J. 1998. "The Threefold Model FAQ". http://www.darkshire.net/~jhkim/rpg/theory/threefold/faq_v1.html.

[14] Klabbers J. H. G. 2003. "The Gaming Landscape: A Taxonomy for Classifying Games and Simulations". *Proceedings, Level Up Digital Games Research Conference*: 54 – 67. Copier M. and Raessens J. Eds.. 4 – 6 November 2003, Utrecht, Netherlands.

[15] Kücklich J. 2001. "Literary Theory and Computer Games". *Proceedings of the First Conference on Computational Semiotics for Games and New Media (COSIGN)*. Amsterdam. 10-12 September 2001.

[16] Lindley C. A. 2001. "A Video Annotation Methodology for Interactive Video Sequence Generation". *Digital Content Creation*. Earnshaw R. and Vince J. (eds). Springer, ISBN 1-85233-379-0.

[17] Lindley C. A. 2003. "Game Taxonomies: A High Level Framework for Game Analysis and Design". *Gamasutra* feature article. 3 October 2003. http://www.gamasutra.com/features/20031003/lindley_01.shtml.

[18] Lindley C. A. 2004. "Ludic Engagement and Immersion as a Generic Paradigm for Human-Computer Interaction Design". *Proceedings of the 3rd International Conference on*

*Entertainment Computing*. Technical University Eindhoven, Netherlands. LNCS, Springer-Verlag.

[19] Louchart S. and R. Aylett. 2003. "The Emergent Narrative Theoretical Investigation". *Proceedings, Narrative in Interactive Learning Environments (NILE-04)*. Edinburgh, Scotland. http://www.victec.org/docs/Nile04.doc.

[20] Mackay D. 2001. *The Fantasy Role-Playing Game: A New Performing Art*. McFarland & Company, Inc., Publishers.

[21] Mateas M. 2001. "Expressive AI: A hybrid art and science practice". *Leonardo, Journal of the International Society for Arts, Sciences, and Technology*, 34 (2), . 147-153. Available on-line at: http://www-2.cs.cmu.edu/~michaelm/publications/Leonardo2001.pdf.

[22] Mateas M. and A. Stern. 2004. *Interactivestory.net*. http://www.quvu.net/interactivestory.net/.

[23] Meadows M. S. 2003. *Pause and Effect, the art of interactive narrative*. New Riders.

[24] Murray J. H. 1997. *Hamlet on the Holodeck: The Future of Narrative in Cyberspace.* Baltimore & London: MIT Press.

[25] Murtaugh M. 1996. *The Automatist Storytelling System*. Masters Thesis, MIT Media Lab, http://ic.www.media.mit.edu/groups/ic/icPeople/murtaugh/thesis/index.html.

[26] Nack F. and A. Parkes. 1997. "The Application of Video Semantics and Theme Representation in Automated Video Editing". *Multimedia Tools and Applications*. Zhang, H. ed.. 4(1): 57 - 83.

[27] Nack F. 1996. *AUTEUR: The Application of Video Semantics and Theme Representation for Automated Film Editing*. Ph.D. Thesis. Lancaster University, UK.

[28] Nelson T. H. 1982. *Literary Machines*. Mindful Press.

[29] Pohjola M. 2004. "Autonomous Identities: Immersion as a Tool for Exploring, Empowering and Emancipating Identities". in Montola M. and Stenros J. (eds.). *Beyond Role and Play: tools, toys and theory for harnessing the imagination*. Ropecon ry, Helsinki, 81-96.

[30] Propp, V. 1968. *Morphology of the Folktale*. American Folklore Society and Indiana University.

[31] Rimmon-Kenan S. 1983. *Narrative Fiction: Contemporay Poetics*, 2nd edition. Routledge: London and New York, 2002.

[32] Rollings A. & E. Adams. 2003. *Andrew Rollings and Ernest Adams on Game Design*. Indianapolis: New Riders.

[33] Ryan M.-L. 2001. "Beyond Myth and Metaphor – The case of Narrative in Digital Media". *Game Studies* 1( 1), July 2001. http://www.gamestudies.org/0101/ryan/.

[34] Stam R., Burgoyne R., and S. Flitterman-Lewis. 1992. *New Vocabularies in Film Semiotics: Structuralism, Post-Structuralism and Beyond*. Routledge.

[35] Vogler C. 1998. *The Writer's Journey: Mythic Structure for Storytellers and* Screenwritiers. 2nd edition. Pan Books.

[36] Wardrip-Fruin N. and P. Harrigan Eds.. 2004. *First Person: New Media as Story, Performance, and Game*. The MIT Press.

[37] Yee N. 2002. "Facets: 5 Motivation Factors for Why People Play MMORPG's".

http://www.nickyee.com/facets/home.html.

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