

## **‘Translating Narrative into Code’ – Thoughts on a Technology-Centric Model of Digital Games as Programmable Media**

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### **The Story so Far – Current Notions of Game Analysis**

Even in a discipline as young as ‘game studies’, ignoring for a moment the increasingly popular further differentiation between ludologists and narratologists<sup>[1]</sup>, it has become impossible to account for every approach concerning methodology for the study of digital games. For precisely that reason it is important to be aware that the better part of academic literature is published and debated online. New techniques of archival storage, faster ‘reaction times’ and a far greater transience of the contributions shape the flow and crystallization of gaming theories. I will, thus, critically comment on a selection of texts and examples displaying current notions in game analysis.

A dominant approach, especially in European (or, even more precisely, German) game studies, is to take games as a focal point for culturally informed sociological or philosophical contemplation.

Often, the authors use a property of games or in-game narrative as a starting point. Klaus Bartels, for example, writes on the issue of perspective (the god-like perspective in isometric and 3D games like *Populous*) as a collective ‘Befindlichkeit’ (existential orientation) of our time (Bartels, 2001/02). Markus Rautzenberg uses his clever observation, that digital games often work with self-reproducing code, to contemplate the use of golems, homunculi and other ‘worldly’ manifestations of this idea in game narratives (without elaborating on the type of correlation, however) (Rautzenberg, 2002).

Another common denominator is the eagerness, to draw on established theoretical frameworks like film theory, narratology or gender studies, trying to fit digital games into their respective point of view or even employ them for their own goals. One early example is Roberta Sabbath’s ‘gendered’ reading of *Gabriel Knight*, the main argument holds that despite the invariably male protagonist, no objective representation of the female subject and body occurs. One finding to support this claim is the fact, that female characters in cut scenes are never only partially depicted (with the virtual camera eye signifying the ‘male gaze’), except for the face. While this is certainly an interesting approach, a more rewarding take on the problem would include the interactive elements characteristic of digital games<sup>[2]</sup> (Sabbath, 1997/98).

Greg M. Smith faces the same pitfall in his analysis of dialogue conventions in *Final Fantasy VII*, working with narratological terms by Seymour Chatman and Eugene Dorfman (kernels, narremes) (Smith, 2002).<sup>[3]</sup> His observations, e.g. on the use of reflector figures like Cloud providing information on the back story, knowingly bridge the gap towards film studies syntagmas and remind us of the (not at all abolished) notion of textuality in digital games. But again, I would argue, interactive media fundamentally re-inform the practice of reading towards 'text-processing' in a way only temporarily describable with film studies or narratological methodology. Rather, the main purpose of text in (especially early) digital games and literary adaptations like *Wonderland* is to conceal an underlying layer of code which is vital in understanding textuality within digital games. To understand this concept, the 'infinite' location [country lane] in the introduction of the text adventure *Wonderland* might serve as an example; it would translate into pseudo-code as follows:

```

on (south) { // expects input by the user

    if (location == [country lane]) {lane_segment += 1; //segments of the
compound location are stored in a variable

        if (lane_segment >=8) {goto [end_game(1)];} //the game ends with Alice
waking from her nightmare as a

                                //sort of interactemic 'deus ex
                                machina'

    }

}

on (north) {

    if (location == [country lane] && lane_segment >= 1) {lane_segment -= 1;}

    else {goto [river bank];} //leads to a new 'location object'; for further reference,
see final chapter

}

```

The final reading experience, however, is a continuous repetition of the line "The lane seems to extend endlessly both to the north and the south." which, in turn, serves to create the effect of a loss of orientation and an indistinguishable, featureless landscape.

Other perspectives derived from the game-literature analogy are the 'dual temporal logic' (going back to Seymour Chatman again), described by Jon-K Adams (Adams, 1996). Story-time (intradiegetic unfolding of time) and discourse-time (reading/viewing time) are, of course, only a vague set of coordinates for describing game-specific effects. Further differentiations (not mentioned by Adams) such as 'illusory story-time', the effect of time ticking by even in still shots through the 'iconic',

i.e. essential movement of the camera can be more readily adaptable to interactive media (Chatman, 1998).[\[4\]](#)

A morphology of game time in that manner could probably be more suitable for close-reading games than the take on time in digital games chosen by Jesper Juul in *First Person. New Media as Story, Performance, and Game* (Juul, 2004), using schemas for illustrating common-sense relationships of 'play time' and 'event time' like the observation that saving the game is a 'standard violation' of game time and that loading between levels pauses play time. Another example in which the conscious violation of game time has repercussions on the player's experience of space is *Elite*, a space trading simulation in which the approach for a landing at a space station takes about ten minutes in real time, giving an impression of the (literally) infinite vastness of the randomly generated virtual space.

A final piece of insight to be had by looking at the implicit textuality of digital games is Jon-K Adams's hint at the text type 'description' which is more adequate for games than the traditional novel, focusing on a sequence of places, not processes, which makes up the game narrative, organized not by causal coherence but by contiguity (Adams, 1996: 194). More precisely, the types of continuity best suited to 'explain' game narrative progression are space-time (day / night) and part-whole (tree / forest) relations, according to Greber and others (Greber, 1993).[\[5\]](#) An example for the practical utility of this concept (which Adams fails to give), might be the climactic narrative structure of prototypical games like *Doom3*, organized not in terms of plot coherence but in terms of spatial contiguity, the main guiding principle being the motif of descent, both in terms of spatial coherence of the levels and its Dantesque plot.

Another insightful comparison of text types is proposed by Henry Jenkins and Mary Fuller in their article on "Nintendo and New World Travel Writing", which concentrates on the exploration and mastery of topological conditions as a connector between digital games and travel literature (Jenkins, 1995).

As quoted by Ted Friedman in his analysis of *Civilization II* (Friedman, 1996), Jenkins takes up two concepts by Michel de Certeau, the linguistic renderings of 'maps' and 'tours'. Most games, as a result, conduct a transformation of a 'map' into a subjective, user-dependent 'tour' ("place becomes space"), consistent with Jenkins' term 'spatial storytelling'. Friedman doesn't concur with the application of this idea to strategy games like *Civilization*, because the increasingly exposed top-down map remains detached, in its abstracted form without offering any further associative access points.

Jon-K Adams further generalizes this point, claiming that the cognitive process in playing digital games consists mainly in unraveling the pattern of spatial interconnectedness of the places in the "game text" (own translation). It is quite apparent, that this concept requires more differentiation. Depending on the type of game (to avoid the problematic concept of genre which, especially applied to games, can lead to excessive typologization as evidenced e.g. in Mark J.P. Wolf's chapter on genre in *The Medium of the Videogame*, (Wolf, 2002)), the use of space differs considerably. Games like *Neuromancer* even exhibit a meta-concept of space, using a dual spatial representation of places like corporations etc. in 'real space' and

'virtual reality', and thus make the rethinking of space and its virtualization a key gameplay concept.

However, Adam's hint that the basic commands in early digital games were always directed at movement is still valid to a large degree today.

Departing from these theories I would argue that one important function of spatiality in games is its semiotic deep structure, its capacity to shape what I would call 'player experience'. A look at *Wonderland*, an early text/graphics adventure may serve to illustrate the point. In many comparable games, the discrete locations are organized on a rectangular grid. More sophisticated games like *Wonderland* use rectangular vs. diagonal grids to differentiate between man-made and 'natural' surroundings<sup>[6]</sup>. Another example is the common notion in 3D games to conceal level changes by placing the respective trigger in narrow, winding tunnels (since 3D engines generally do a visibility check before rendering all vertices, this procedure also helps to save computing time) that had a notable paradigmatic impact on player expectations and behavior.

Many theoreticians describe the overall interaction with digital games as a state of "cyborg consciousness", interpreting oneself as a "bodily extension" of the "feedback loop" dictated by the gameplay. Stripped of its body politics and gender connotations, this model overlaps considerably with what Mihaly Csikszentmihalyi described in his "flow theory" as a state of perfect balance between increasing skill requirements and personal competence (Csikszentmihalyi, 1992).<sup>[7]</sup> The immediate consequence of this idea would be that the player tries to understand and comply with the logic of the computer as a programmable device. Program code as a rule ecology, playing a crucial but occasionally overlook role in the production of digital games, in this context is revealed as inherently ludic. For instance, the quasi-ludic exploration and maximum variation of a technologically constrained program code frame becomes visible in Nick Montfort's observations on *Combat*; the game algorithmically defined core rules are recombined to form 27 game types in a process which could be characterized as 'ludus' according to Caillois. (Montfort, 2006) Lev Manovich describes this logic in his often-generalized *The Language of New Media* (Manovich, 2001) as a combined product of databases (storing originally unspecified data in a structured way) and algorithms (transforming these data)<sup>[8]</sup>. While Manovich's general take, using principles of new media design like modularity and transcoding as keys to new media analysis, is absolutely convincing and should be taken a step further for game analysis, his remarks on algorithms and databases are by himself conceived of as introductory and lacking for game analysis in the given form; they will, however, be a basis for the model sketched below.

Mimicking the logic of the computer, the player enters a unique identification relationship with the avatar in the game or, as Friedman notes more precisely, several 'game functions' which are not obligatorily tied to characters in the game narrative. Friedman describes the trance-like switching between game functions in *Sim City* (like the mayor, the city planner, the chief police officer etc.)

This process of identification can, in turn, be manipulated to create strong authenticity effects; e.g. the aforementioned *Neuromancer* lets the player process huge amounts of text in replicated BBS and other communication tool interfaces of

the early 1980s, mostly in hard-to-read black script on white background. Since the goal of the game is to obtain passwords, bank account numbers etc., the player identifies with the archetype of the hacker by mimicking its routine work; inversely, the game reveals the close connection between computer-mediated communication and ludic principles (Daisley, 1994).

One major flaw of some of the approaches sketched above is the lack of a comparative perspective, especially including older media frames. Many games like the *Monkey Island* tetralogy, for instance, reproduce media-specific imperfections like the omnipresent lens flare, parallax scrolling or even the shift of focus characteristic of cameras to reference cinematographical technologies which are equated with a unique quality of realism and authenticity[9].

A useful approach could be to consider borderline cases which blend narrative and systemic, i.e. gameplay devices, constrained by the contingencies of algorithmic expressibility. One such example is the D-Day sequence in *Medal of Honor* which has attained a similar iconic status as the Odessa Stairs sequence from *The Battleship Potemkin*. The difficulty of this level is so high that it is virtually impossible to survive it playing for the first time (which complicates the issue of identificational stance in a digital game) and the traversing of some areas is a pure game of chance. This does not make sense in terms of gameplay mechanics but creates a compelling narrative effect and effectively conveys the impression of singularity that the D-Day has in (at least American) popular discourse. The fact that the NPC allies sitting in the same landing craft like the avatar die immediately while disembarking is another gameplay violation that enhances the narrative effect.

The concept of a morphology of interactive constituents, complemented by a semiotic interpretation of their combinatorial potential has been briefly alluded to by Jan van Looy in his observations on *Head over Heels* (Van Looy, 2003). However, the results are not always convincing. For instance, van Looy notes that the breach in immersion by splitting the player's identification on two avatars leads to an interpretation of the game as signifying "friendship and love", supported by alleged "sexual connotations" elaborated later on; the superficiality of these conclusions suggests that a more coherent model is necessary for analyzing complex issues of signification through interactive design.

## **Towards an Object-Oriented Model of Game Analysis**

There certainly is no new theory which could 'replace' the existing corpus and cover all the contingencies of interactive media; instead, the approach proposed in this article tries to present an integrative model of thought that is based on program code as the common 'infrastructure' of digital games and breaks down some of the binaries imported by relying too heavily on one or the other discipline.

Henry Jenkins seminal article "Game Design as Narrative Architecture" soberly unmaskes the polemics of the narratologists vs. ludologists debate and the somewhat normative stance some analysts like Janet Murray take towards the future development of game narrative.[10] Starting from the observation of dominant travel

themes in (early) digital games, Jenkins opens an interesting spectrum of cultural analogies like the fact that Japanese wall scrolls, one of the aesthetic role models for games like *Super Mario Bros. 3*, use spatial organization to map temporal relationships like the change of seasons depicted next to each other. The example of *American McGee's Alice*, in which the twisted retelling of the plot is achieved by a reconfiguration of the setting, the wonderland, again hints at yet another 'reading' of digital games, this time in terms of program code. An analysis of the 'recoding' or 'transcoding' of the wonderland theme could be a worthwhile complementary task.

The semantic space of (program) architecture turns out to be a useful frame; concepts like Jenkins' micro narratives, rather ornaments than supporting pillars of the filmic narrative structure so to speak, could be translated into game studies vocabulary as micro interactemes which do not refer exclusively to minigames as such but to interactemic devices which are not vital to the completion of the game but may (re-)inform the 'reading' of the overall game mechanics[11].

Jenkins case for 'embedded narrative', e.g. applicable to the multiple temporality of a detective film, is yet another step in the direction of a kind of neo-structural approach such as the one sketched below. The recourse to Russian formalism might be unpopular in contemporary literary criticism; concepts like Propp's 'narrative functions' or Greimas' grammar of narrative[12], however, can be an interesting complement to an excessively poststructuralist analysis, if informed by a sound understanding of the limits of the approach.

Against the background of these preliminary thoughts, a potential alternative Conceptual paradigm could be based on the nomenclature and the structure of object-oriented programming (OOP) and could tentatively be labeled 'object-oriented narrative' (OON) construction.

OOP is well documented, often with reference to a particular programming language like C++. Its central characteristic is the definition of 'objects' belonging to different 'classes', which are autonomous in so far as they have their own methods (functions) and are not governed by a central script. A simple example taken from game design practice would be a particle algorithm for complex visual effects like a fountain, where each drop of water is an individual 'object' with a short (sine curve) behavior script and some instance variables like its size and trajectory[13]. It has, also in digital game programming, gradually substituted other paradigms like procedural programming for various reasons.

The most visible proponents of 'object-oriented programming' as a concept in game studies discourse are Mirjam Eladhari and Craig Lindley from the Trans-Reality Game Lab in Stockholm. Their use of OOP principles focuses mostly on narrative design in digital games and has a production focus, i.e. is aimed at minimizing causal dependencies and, thus, the likelihood of 'dead ends' in nonlinear plot construction. (Eladhari, 2003: 35ff.) For this purpose, design concepts like 'structured development' (36) and programming concepts like normalization (37) which in the case of rule system amounts to minimizing functional coupling in a narrative 'grid'. This notion of narrative is usually visualized in tree diagrams (50) which, I would argue, as a ready-made tool simultaneously shape the theoretical imaginary and act as focal points for game theorization. All in all, this approach is very much geared towards applicability and, therefore, only peripherally overlaps with the model I

propose; it reaffirms the neo-structuralist notion of narrative prevalent in digital game production encapsulated in tools like the tree diagrams by refining it instead of reading it as an indicator of the technologically-driven formal repertoire of digital games.

Coming back to the original idea of OOP principles as models of narrative forms, more complex game could thus be deconstructed into 'objects' adhering to freely selectable and arbitrarily divisible classes like environments, NPCs, quests, props, cultural references and syntagms[14]. The ideal level of fragmentation has to be determined independently for each analysis. Eventually, objects can be subsumed under 'object classes', which are defined as groups of objects sharing the same implementation of object methods. One application would be the typologization of characters according to their function for the game mechanics (object provider/ vendor, information provider, enemy, assistant, reflector, task provider, atmospheric catalyst, gameplay tutor etc.).

The semantic field of OON can be elaborated at will: for instance, an object type can have multiple instances and reproduce independently. In digital games, these interactemic topoi are intricately interwoven with the narrative layer. Games often randomly generate new environments from a repertoire of characters, landscape tiles and props. This is to presuppose, however, that there is an underlying silent consensus that any environment is sufficiently re-creatable from a limited, given recombination of 'objects'. The parameters of this often invisible code schema, i.e. the choice of components and their probability distribution etc., can yield interesting results for cultural analysis, e.g. considering the (Western) construction of 'Easternness' in games like *Throne of Darkness* through random environment generation. Some games in this category like *Frontier: Elite II* even generate subplots using random specifications (or, to stay in the OOP metaphor, prototypes), which lead to 'emergent narratives' in the line of Jenkins' terminology that are only at first glance random.

The technique described above is an example of a recursive narrative/interactemic algorithm, every subplot being an object that can converge with others both spatially and logically[15]. This principle is made explicit (like many other aspects of virtuality) in *The Matrix Reloaded* and the corresponding game adaptation *Enter the Matrix*, e.g. as the Agent Smith character reproduces himself and transfers his properties (e.g. the capacity for assimilating other entities) via 'inheritance' (like in OOP) to all instances. Thereby, the group of 'Agent Smith instances' is created as an independent macro interacteme with its specific functional, semantic and associative parameters that is more than merely the sum of its parts[16].

Apart from recursivity leading to patterns such as the aforementioned loops, there are other models to be drawn from recourse to programming theory and nonlinear narrative in digital games.

A common type is the *symmetrical interactivity structure*. Thereby, a narrative process is subdivided at key positions into multiple branching out threads that are horizontally permissive. The symmetrical layout of the interactivity sphere often corresponds to spatial symmetry that is often tentatively concealed in contemporary games. The map from *Might & Magic IV* is an example of point symmetry while the

castle of Lord British from *Ultima Underworld II* is constructed in nearly perfect horizontal and vertical axis symmetry according to space and functionality[17]. Celia Pearce applies the terminological dualism of symmetry and asymmetry to the relation of initial set-ups in two-party or multi-party game (Pearce, 2002). It could thus be said that chess, as a result, would be a virtually complete symmetrical game (apart from the fact that the white side always begins), while current strategy games like *Age of Empires II* consciously utilize asymmetrical, i.e. uneven starting conditions. A possible explanation is the fact that the emotional reward gained from a victory out of an emergency situation is greater[18]. This pattern is particularly intriguing since plot in digital games is often constructed along those lines which results in a projection of those patterns into collective “player experience”[19].

Another fundamental pattern is the *hierarchical interactive structure* that emanates from the linear development of an object, often the avatar itself. The usual composition in this case is a sequence of functionally similar/ identical subplots, in the course of which the level of difficulty and other parameters such as the density of interactive links successively increase. A current example of this structure, often blended with elements of symmetry, can be seen in the *Gothic* RPG games. The plot in these games is tied directly to the development of the main character that passes through various career phases depending on the selected character class. Temporarily, also multiple paths can be treaded. At the same time, the diverse settlements in the virtual territory, each linked with one career option, are distributed in spatial symmetry.

A criterion for this approach is the *action and movement repertoire* of the avatar or group of protagonists in the game; in the context of a visualization of the interactivity sphere, the field of action (or multiple, overlapping fields of action) of the characters is a viable sorting category. One example of this model is the variable extension of the characters’ movement repertoire in games like the literary/film adaptation *Lord of the Rings: The Two Towers*, which creates a different identification potential of the protagonist depending on the choice of ‘moves’.

The relationship of code-based interactivity structure and game thus is not unlike the relation of screenplay and film. This thesis is backed by the observation by Spinuzzi, that also program code is not interpreted directly by the computer but like our language, a convenient construct to be compiled into binary format before being interpretable by the computer (Spinuzzi, 2002: chapter 4). Spinuzzi analyzes how programmers understand code and establishes a reception psychological link between language and code on the basis of linguistic theories like “hermeneutic guessing”. [20] An abstract hint at the importance of the code level as one of seven layers of game analysis is found in Lars Konzack (Konzack, 2002). Although he concedes, that often this layer has to be deduced indirectly from the ‘functionality’, Konzack understands code only in the literal sense and consequently does not attach much importance to it. More important to him are the traditional criteria like resources, space, time, goals, obstacles and rewards that are common tools in contemporary game research. Konzack also relates the transfer of approaches like film semiotics only to culturally preformed signifiers within in then game (as elaborated in chapter 5, “meaning”). Contrary to that, I would argue, that both macro and micro models of interactivity like the ones sketched above and their representation in the collective player experience constitute signifiers in themselves,

which have become sufficiently differentiated and established to be describable. The result is an alphabetization of interactive forms which is, like its often claimed counterpart 'visual culture', still not widely recognized since both seeing and interacting are conceived of as 'natural' acts, e.g. compared to the artificial/synthetic act of reading.

The theoretical frame outlined above leaves plenty of room to be fleshed out. Other parameters of OOP like polymorphism and encapsulation allow for a finer descriptive grid. Current software techniques like the reuse of code, the outsourcing of game physics into dedicated periphery and the mimicking of natural phenomena using shader, multi-layer texturing etc. lend themselves to semiotic reasoning which will shed more light both on digital game analysis and on our projections onto interactive media. If we literally deconstruct 'nature' using ontologically different technological tools<sup>[21]</sup>, a kind of cultural studies 'reverse engineering' of these techniques might tell us a lot about ourselves. This might portray interactive media not only as a myth in the way in which they are discussed in contemporary popular (and academic) discourse but also as a mirror of their makers.

## **Gameology**

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[1] The binarism implied here is already circumscribed in terms of 'schools of thought' by Justin Hall. Since binarisms are commonplace as a tool for orientation in well-established disciplines, this might be interpreted as a technique to inscribe oneself into established scholarly developments. 29 Aug. 2005 <<http://www.hypertextkitchen.com/Features/Hall2.html>>

[2] The only concession to nonlinearity Sabbath makes is the hint at the two possible endings, which might inform the (re)interpretation of the characters playing the game a second time. A common gameplay criterion for gender constellations in games would be the modification of character parameters in traditional RPGs, awarding e.g. female characters a 'charisma' bonus compensating for their 'strength' deficiency compared to male characters. Current games generally avoid this feature for reasons of political correctness.

[3] Smith also notes the tendency to use neologisms for micro-narrative techniques. Following this tradition, I will henceforth use the terms 'interactemic/interactesis' as opposed to 'diegetic/diegesis' to refer to the systemic, gameplay layer of digital games.

[4] The incessant movement of film at 24/25 frames per second, used also by Michel Chion for his approach towards filmic sound design in *AudioVision – Sound on Screen*, could be replaced by the necessity to interact in digital games, leading to 'narrative loops'. This rather trivial pattern has already been mimicked in films like David Cronenberg's *eXistenZ* but can serve as a first theoretical vantage point.

[5] Other types of contiguity, e.g. cultural or logical contiguity, are of minor importance at least for the current state of digital games. The two categories mentioned here are, in my opinion, often indivisible like in the example for space-time contiguity given by Greber herself (mountain ↔ peak, p. 375f).

[6] The best example of a constructed and confined location is the [palace] that represents the sphere of techne; natural locations [woods] or naturally evolved places [underground passage] use diagonals metonymically to signify a natural defiance of regularity. A mixed form is the [walled garden], a natural phenomenon framed by human intervention, which is depicted by diagonals forming a diamond, i.e. a standard pattern.

[7] A concise account of the ascriptions of the state of game playing can be found in: Friedman, Ted. "The Semiotics of Sim City." 29 Aug. 2005  
<[http://www.firstmonday.org/issues/issue4\\_4/friedman/](http://www.firstmonday.org/issues/issue4_4/friedman/)>

[8] Especially relevant are the chapters 'The Database Logic' and 'Data and Algorithm'.

[9] This depth-of-field effect is a standard shader technique in current game engines like the Unreal 2X technology, the product of which is a kind of 'outsourcing' of (visual) reality, decomposable into a limited but growing set of factors. Cf. <http://www.unrealtechnology.com/flash/technology/ue2x.shtml>

[10] In some bibliographical references, the article is dated 2004 (e.g. <http://wiki.arch.ethz.ch/twiki/bin/view/Gamearch/WebHome>) while the original version might be considerably older. This might be one further hint at the specificity of an academic discourse conducted intensively through online publications.

[11] Minigames often are incorporated into games with an epic storyline like the *Final Fantasy series* or *GTA: San Andreas*, either as an intertextual reference or as an 'interlude' which does not obstruct the game's progress but eventually unlocks a rewarding cut scene (like the Blitzball tournament in *Final Fantasy X*). An example of the latter would be the increasingly popular quick-time events that are e.g. used in *God of War* as an attempt to match virtual and 'real' action. To open a heavy gate or chest lid, the player has to press a button at a forced rate for some time, causing his physical exertion to match the action on screen.

[12] Greimas's idea that his model of narrative grammar and actant constellations could generate all thinkable stories is an argument not unlike the Aleph, derived from a short story by Jorge Luis Borges, which Marie-Laure Ryan identifies as one of the dominant mythologies of digital games (Ryan, 2001).

[13] A good introductory read is (Abelson, 1996).

[14] I use the term syntagm according to Christian Metz, who tries to give an overview of cinematographic syntax by describing eight syntagmas and their implementation in montage and cutting. Interactemic syntagmas must be larger units explaining the choice and distribution of micro interactemes, e.g. the gradual reduction of the player's freedom of movement and action before climatic events like

boss fights. As an example, consider the design of the E1M8 level from *Doom*, leading to the first confrontation with the Hell Knights (relevant GIF can be provided).

[15] Tasks in *Frontier* can take place on the same planet which, in terms of narrativized game experience ('tour') may lead to predilections for a specific region and, consequently a feeling of 'home', or result in conflicting goals, leading to mutual logical exclusions and/or 'moral' dilemmas for the game protagonist.

[16] Since Agent Smith was constructed as an absolute, indivisible force within the virtual world in the prequel *The Matrix*, the simple multiplication of this 'icon' effectuates a potentiation of the threatening effect and simultaneously a weakening of the original signifier.

[17] Axis symmetrie is also a crucial issue in stochastic game theory, since it can be used to simplify complex probability spaces; cf. (Binmore, 1993: 255f.)

[18] This indicates the existence of a meta narrative that goes beyond the scope of a single game [German: Partie], which develops during the progression of a campaign in games like *Command & Conquer*.

[19] E.g. the plot structure in *Neverwinter Nights*, the liberation of the town of Neverwinter from a mysterious plague, is not guided by the moral trials and betterments of the protagonists or the gradual spread of the disease but through the spatial segmentation of the town into four axis symmetrical parts and the respective subplots. The regions can be accessed in any order, whereby the micro narratives and micro interactemes contained within weave an emergent net of interrelations and possible associative combinations.

[20] Spinuzzi goes as far as designating programming as "another form of writing, another form of human communication", although the basal difference is that programmers theoretically have the opportunity to 'understand' others' code 'completely', i.e. as a mimetic effigy of the idea in the head of the author/sender. (Spinuzzi, 2002: chapter. 21f.)

[21] Having physics computation on a separate chip like the new AGEIA prototypes is an new ontological category and fundamentally changes the 'reading' of the code using that technology and, thus, the structure of the games using it.