Understanding Computer Game Culture

The Cultural Shaping of a New Medium

Contents[1]

Contents....3

Introduction....7

I. Culture and Technology....25
- 1. Computer Games as Interactive Text....29
- 2. Computer Games as New Media....44
- 3. Computer Games as Cultural Form....49

II. Computer Simulation....69
- 1. Mathematical Modeling....72
- 2. Modeling Thought....88
- 3. Modeling and Interpretation....98
- 4. Modeling and Culture....111

III. Virtual Ontology....123
- 1. Analyzing the Virtual....125
- 2. The Virtual as a Possible World....136
- 3. The Virtual as Mimesis....151

IV. Simulating a Self....173
- 2. Playing God....186
- 3. Point of View....203

V. The Purpose of Play....223
- 1. Playing as Coping with Reality....229
- 2. Gaming as Coping with Competition....238

Media Cited....255

Publications Cited....261

Appendix: Full List of Contents....269

[1] Full list of contents available in appendix.

"Saying it once and for all, man only plays, when he is man in every sense of the term, and he is only fully man when he is playing." Author's translation of Friedrich Schiller, *Über die ästhetische Erziehung des Menschen*, 15th letter, 1795.

"Machines are worshipped because they are beautiful, and valued because they confer power; they are hated because they are hideous, and loathed because they impose slavery." Bertrand Russell, *Sceptical Essays*, "Machines and the Emotions," 1928.

Introduction

In 1952, Alexander Douglas, a Ph.D. student at the University of Cambridge, England, programmed an interactive game of *Noughts and Crosses* (Am. Tic-tac-toe) as an experiment in human-computer interaction (see Douglas 1954). It was a single-player game in which the player used a telephone to dial the number of the square she wanted filled. In 1958, Willy Higinbotham, a scientist at the Brookhaven National Laboratory in New York programmed *Tennis for Two*, a rudimentary *Pong*-like game which was played on an oscilloscope, a technical device for visualizing changing electrical currents. Both Douglas and Higinbotham created working prototypes of their games and demonstrated them. The time was not ripe, however, and the interest in their work waned soon after. In the summer of 1961, however, a new mainframe computer called the Programmable Data Processor 1 (PDP-1) arrived at the computer lab of the Massachusetts Institute of Technology. Unlike its predecessors, it boasted a cathode-ray tube screen and was capable of handling the input of more than one user at a time. In order to demonstrate the visual and interactive capabilities of the newly arrived machine, Steve Russell, an engineering student, decided to write a program which would use graphics and respond to users' input in real-time. The result was *Space War* (1962), a two-player computer game in which two space ships fight one another moving around a gravity-emanating planet at the center of the screen. Each player can rotate her spaceship, thrust its engines and fire missiles to the other ship. Interestingly, *Space War* was among the first graphical computer applications. By way of comparison, the first digital computer-generated film was made in 1963 by Edvard Zajac at Bell Labs in order to simulate the motion of a communication satellite (Binkley 1993) and the first time computer graphics were publicly exhibited as art was by Georg Nees at the Studio Galerie at the University of Stuttgart in January 1965 (Candy & Edmonds 2002).

When comparing the evolution of computer games to that of film some half a century earlier, a number of parallels can be observed. A first element that they have in common is their technological origin. When Thomas Edison, inspired by Eadweard Muybridge's demonstration of moving image photography, filed his patent for motion picture recording and playback in 1887, he did not see his invention as a step toward a new form of representation, let alone art, but simply as a technological means for recording reality. It was only later when films grew longer and montage developed into a powerful grammatical tool that people began to see film as an artistic form. In a similar way, neither Alexander Douglas who developed *Noughts and Crosses* as an experiment in human-computer interaction, nor Steve Russell who created *Space War* as a demonstration program for the PDP, saw computer simulation as anything but a programming challenge. At best, they realized that it had potential as a form of entertainment, but as computers were large expensive hulks at the time, any commercial endeavor was bound to fail.

A second parallel between the development of film and that of computer games is that, at least in the USA,[2] they both went through a phase in which they were marketed as coin-operated attractions on fairs and in amusement halls. Edison's Kinetoscope, which appeared in 1894, was a peep-show-type

[2] In Paris, Louis and Auguste Lumière built the cinématographe, a device serving both as camera and as projector, and patented it in February 1894. They organized a private screening in March 1895 and a first paying show later that year. They would never build a peepshow or coin-operated version of their invention.

viewer. The spectator would insert her coin and then look through a small hole, as if it were a telescope, behind which a short sequence, usually no more than twenty seconds, of moving images would be projected. The Kinetoscope became a commercial success and different versions would be placed in parlors all across the United States: “a flotilla of picture peephole machines featuring films of flexing strongmen, highland dancers, cockfights, trapeze artists, contortionists, and trained bears” (Herz 1997: 46). As for computer games, the first commercial instance was *Computer Space* (1971), a simplified version of Steve Russell's *Space War* built into an arcade cabinet. Like Edison's Kinetoscope, it was fitted with a coin-operating slot and placed in public places like bars or amusement parks. *Computer Space* was not a large commercial success, however, probably because it intimidated potential players by its complexity. This did not discourage its creator, Nolan Bushnell, however, who started his own company and together with Alan Alcorn built a simpler, tennis-like game. *Pong* (1972) was an instant hit and Bushnell's company, Atari, would dominate the computer game industry for more than a decade.

HOME TOGETHER

In the second half of the 1970s, as computer equipment grew smaller and less expensive with the invention of microchips and cheaper production methods, computer games, like the moving image through television, migrated from the arcades to the living room, a shift which would not only change computer gaming from an economic and social point of view, but which would also have an impact on the technology and its content. Whilst Edison's Kinetoscope would play a short, fixed sequence, usually some 15 seconds of moving images for a coin, arcade computer games, like pinball, did not explicitly limit the playing time but allowed the player to continue until she made a fatal mistake. Hence they needed to be at the same time difficult enough so as to prevent advanced players from playing forever and easy enough for novice players to get started without having to go through pages of instructions and without being killed after only a few seconds of play. Moreover, for both categories there needed to be an incentive to play again and again so that another quarter would be inserted. Typically, arcade game developers solved these issues by making their games simple at the start, but after a minute or so strongly increasing difficulty, usually by raising speed and number of enemies. In this way the novice player would not be discouraged and get a good taste before being relentlessly slaughtered and the more advanced player would continue to be challenged even after several sessions.

All this changed, however, when the first so-called home entertainment or video computer systems – consoles we would call them today – appeared on the market. They were small special-purpose devices which had to be connected to a television set and were meant to be played in the living room. Initially, they would contain one read-only chip with a fixed number of games, usually variations of *Pong*. By the end of the 1970s, however, they could use pluggable cartridges allowing games to be sold separately. As computer games moved from bars and amusement parks to the home, their audience broadened significantly and their social function changed. Families, young and old, would sit together in front of the television and watch each other play. This may well have been one of the reasons for the success of the 'mostly harmless' platform game genre which largely shuns violence and emphasizes characterization and colorful graphics (see also chapter 4 on avatarial introjection). Even more important was that, with the migration, the commercial imperative of having to strip the player of a quarter every five minutes or so had disappeared. Initially, home systems would continue to draw upon the success of arcade classic genres such as space shooters and racing games. Gradually, however, they would shake loose their arcade heritage and begin to evolve their own forms.

Arcade computer games are indiscriminately action-based, cramming as much spectacle and excitement in as short a playing session as possible. Home computer games,[3] on the other hand, freed from the shackles of having to keep playing sessions under ten minutes, began to develop more epic proportions, and devote more attention to background story and character development. Furthermore, the release from arcade constraints permitted home computer

3 I use the term 'home computer game' here not to refer to games played on home computers such as the Spectrum or the Commodore, but to all games which could be played at home including those played on a video game system or console.

games to link up with the pre-arcade tradition of university mainframe computer gaming which likewise had not been faced with the economic restrictions of coin-operation. In mainframe gaming, student experimentation and computer science research had led to the development of a broad array of computer simulations and games. These included a strategy game: *Ham(m)urabi / Kingdom* {David Ahl 1970};[4] an evolution simulator: *Life* {John Conway 1970}; a cave-crawling role-playing game: *Hunt the Wumpus* {Gregory Yob 1972}; a primitive flight simulator: *Lunar Lander* {Jack Burness 1973}; and a text adventure, *Colossal Cave Adventure* {William Crowther & Donald Woods 1975}, which would have a tremendous influence on the development of computer games not so much in terms of technology, but as a cultural mediator between tabletop *Dungeons & Dragons* role-playing {Gary Gygax 1974} and computer gaming. In the course of the 1980s, all these genres would gradually be reintroduced into home gaming, eventually leading to the development of a renewed economic imperative for game designers: i.e. closure. Whereas arcade game designers had to eternally postpone closure so that players would return to play again and again, home computer game developers were forced to introduce endings to their games so that players would cease playing them and run to the supermarket to buy more.

A fourth and final parallel can be drawn between the role played by the American film industry in the building of the USA's cultural identity as a global superpower, and that of computer games in establishing the image of Japan as an economic heavyweight in the 1980s. Cinema, that is to say the concept and technology for public screening, was a French invention, but the Lumière brothers failed to turn it into a successful business. It was primarily the American filming industry, symbolized by Hollywood, that managed to develop film-making into a profitable commercial enterprise which came to dominate cinemas all over the world. Computer simulation, on the other hand, is an American invention, first technologically with Steve Russell's *Space War* and

[4] In this study, I use two types of brackets: round ( ) and curly {}. Round brackets refer to secondary, usually academic sources which can be found in the "Publications Cited" list where they are ordered by author. The curly brackets are used to refer to primary sources – literature, film, television series, toys, computer games and software – which can be found in the "Media Cited" list, where they are ordered by name (e.g. look for *Space War*, not Russell).

some ten years later commercially with Atari's *Pong*. In the course of the 1980s, however, the traditional American media industry, which had meanwhile absorbed Atari, failed to grasp the intricacies of the new form and by the second half of the 1980s, it was the Japanese game manufacturer Nintendo which came to dominate the global game market with their Entertainment System. In the mid-1990s, the Japanese electronics giant Sony took over the lead from Nintendo with the release of the first Playstation console. Since then, computer games have become one of the primary exporters of Japanese popular culture (see also chapter 4 on playing god).

THE PIED PIPER

Computer games will soon be celebrating their fiftieth birthday and they are growing more important both culturally and commercially.[5] Moreover, in educational circles, the interest in using computer games for training and learning is growing, particularly because of their automotivating power, the fact that they do not need external rewards to encourage performance. Combine that with the ability of the computer to effortlessly take into account myriads of variables in the game and you have an excellent training ground for today's increasingly complex world. Furthermore, computer simulation and games play an important, if not the most important, role as a driving force in technological innovation in the area of desktop computing. They are among the last desktop computer applications to require ever more powerful processors and graphical units, driving competition between technologists and developers. In turn, this produces better algorithms, new software libraries, industry standards and even programming languages. Despite their relative age, however, their educational potential and their role in technological innovation, computer simulation and games are still looked upon with suspicion and disdain, and are regularly treated with downright hostility by the general public, the press and the academic world. Fear of the unknown, particularly of new forms of representation is of

[5] There is a persistent myth that is regularly picked up by the media, saying that the gaming industry is now the largest in entertainment. Until today, this is not so however. Reports publishing these claims usually compare combined console and game sales with box office returns neglecting for example the DVD resale market and television rights.

course not new.[6] The attacks on computer games have been so fierce, however, that they merit a closer look.

A first wave of what could be called *ludophobia*, fear of computer games, rolled over the USA in the early 1980s when first the popular media and later the scientific community interpreted young children's devotion to computer game play as a sign of pending addiction. In 1982, the US Surgeon General C. Everett Koop announced that computer games were producing "aberrations in childhood behavior," and that children were becoming addicted to games "body and soul" (cited in Morris 2003). These claims turned out to be inspired by fear rather than scientific evidence, however, mistaking the self-motivating quality of computer game play for a form of addiction. The panic culminated in 1981 when computer games were banned in the Philippines, where arcade owners were given two weeks to destroy their machines.[7] Instead of looking at computer game play as a meaningful – in the sense of having purpose and sense – occupation, the majority of researchers in the 1980s failed to overcome their prejudices towards computer games as colossal time-wasters. "The zeal with which researchers tried to calculate how many hours children devote to playing video games, as if this held the key to the quality of their education, is curious, to say the least" (De Aguilera & Méndiz 2003: 7). In the aftermath of the addiction discussion, there were also concerns about the possible negative health effects of extensive playing. Often named hazards were obesity, far-sightedness

[6] Janet Murray notes in this context that man has always greeted powerful new representational technologies with suspicion, from the bardic lyre, to the printing press, to the secular theater, to the movie camera, to the television screen. "We hear versions of the same terror in the biblical injunction against worshiping graven images; in the Homeric depiction of the alluring Sirens' songs, drawing sailors to their death" (1997: 18). In most cases, the suspicion is motivated by a concern that the new form of representation will be used for the deception of mankind. The question then remains, however, whether we should attempt to ban the new form or help people understand it (see also chapter 2).

[7] A similar panic, and subsequent banning of pinball machines in New York in 1941 led to thousands of machines being smashed and dumped into the sea (Morris 2003).

and epilepsy.[8] The fiercest assault on computer games, however, occurred almost a decade later.

The trigger of this second wave of ludophobia was the commercial success of two violent computer games in 1992. The first was *Mortal Kombat* (John Tobias & Ed Boon), a conventional so-called beat 'em up game – a genre in which two or more warriors are pitted one against the other in a two- or pseudo-three-dimensional environment and which had been popularized by games such as *Double Dragon* {Yoshihisa Kishimoto 1986} and *Street Fighter* {Yoshiki Okamoto 1987}. *Mortal Kombat* was perceived as being different, however, because it did not have cartoony computer graphics like *Double Dragon* or *Street Fighter*, but used digitized photographic images. Moreover, it allowed the player to perform so-called 'finishing moves'. When her opponent was beaten, she could press a combination of keys and her avatar would carry out a spectacular but gruesome fatality such as tearing out the opponent's spine. The combination of photorealistic imaging and virtual bloodshed upset many parents and led to the formation of the Entertainment Software Rating Board (ESRB) in the USA. The second game that caused uproar in 1992 was *Wolfenstein 3D* {John Romero & John Carmack}, a highly successful – both technologically and commercially – first-person shooter which would play an important role in the popularization of the format. In the case of *Wolfenstein*, it was not so much the graphics, but the player's point of view – seeing directly through the eyes of the shooter – which caused concern. The idea was that the player, by performing violent actions in first-person perspective, would be inclined to also carry out those actions in real life.

In 1999, after the Columbine massacre, in which Eric Harris and Dylan Klebold, themselves students at the Columbine High School in Littleton,

---

8 Loftus & Loftus mention an amusing case in which computer game play is not linked with physical but with psychiatric illness. An article in the September 1982 issue of the Journal of the American Medical Association reported on a curious psychiatric disorder termed 'Space Invaders Obsession'. The victims of this illness were men about to be married who demonstrated a fourfold increase in the playing of *Space Invaders* in the weeks preceding the marriage. The authors of the study claimed that the principal goal of the game, i.e. defending a home base against aliens, acquired a special symbolic significance in the face of an impending marriage. It was also reported that, for whatever reason, game playing dropped dramatically following marriage (1983: 109).

entered their school building, blindly murdered thirteen students and staff, and wounded twenty-three others before killing themselves, the discussion regarding violent content in computer games strongly resurfaced. Not long after the tragedy, the media discovered that Eric and Dylan were habitual *Doom* {John Romero & John Carmack 1993} players and that Eric Harris had created a modification of the game, the so-called 'Harris-levels', presenting circumstances similar to those of the actual shooting (two shooters, multiple shotguns, unarmed opponents etc.). Soon, media and politicians began pointing towards computer games as the probable cause of the massacre. Their implicit claim was that Eric and Dylan had experienced the pleasure of killing harmless victims in computer simulation and then imitated this behavior in the real world. The question of why they programmed such a simulation in the first place was meanwhile happily ignored. Computer games, it was decided, was to be the scapegoat. In the months after the massacre, the hate campaign against the medium raged violently and eventually lead to senate hearings regarding the matter. Even academics indulged in what Sue Morris (2003) would describe as a 'moral panic'.[9] Indeed, the violent tone of some of the researchers' reports is peculiar, to say the least. All of a sudden, it was claimed that there was a consensus among experts regarding the effects of computer game play and that lay people (sic.) needed to get the message (Anderson & Bushman 2002). Playing violent computer games was at least as dangerous as unsafe sex (2001: 357), passive smoking and exposure to lead and asbestos (Anderson 2002: 115).

THE ARTFUL DODGER

At the other end of the spectrum, probably partly as a reaction against the negative depiction of computer games in media and press, a number of researchers and theorists made contrary claims. Whereas prophets of doom such as Koop and Anderson saw computer games as a waste of time or a source of perver-

[9] The term 'moral panic' was first used by Jock Young in 1971 to describe the pattern of events that followed public concern over marijuana smoking by middle-class youth in London. Media-fueled public pressure prompted to set up drug squads which led to an increase in the number of people arrested. This in turn validated and reinforced the initial concern. A large number of moral panics since World War II have been associated with the emergence of various forms of youth culture. Great concerns have been expressed at one time or other about jazz, pinball, movies, comic books, rock 'n' roll, 'snuff' movies and role-playing games (Morris 2003).

sion, these enthusiasts claim that they should be seen as a logical next step and a new and possibly superior art form. One of the first to take this position was Chris Crawford in his otherwise excellent plea for the appraisal of computer games: *The Art of Computer Game Design* (1984). Crawford, who was a successful game designer in the heyday of Atari, sees computer games as a poorly developed and generally misunderstood medium which holds great promise for both artists and public (1). As a reason for why computer games are not recognized as an art form, Crawford puts forward what he calls the 'timidity of the marketplace' prescribing 'feckless' computer games. "These machines are new; the public is unfamiliar with them and the manufacturers are hesitant to press the public too hard too fast. We therefore opt to build inhibited little games pathetically whispering some trivial emotion" (3). For Crawford, computer game art is a logical and consistent development from the history of representation. Initially, there were only static media such as painting and sculpture, which were conceived to represent a single moment in time, a snapshot in the middle of events. In the nineteenth century, dynamic media like film were added to the equation and for the first time it became possible for artists to represent the changing nature of the world. Computer simulation, then, goes one step further in that it not only allows a designer to represent change in terms of its results, but also in terms of its mechanics. It allows to create a framework in which the player is free to actively interfere and explore not just *what* it is that changes, but also *how* and *why* it does so, the web "of causes and effects by which all things are tied together. Thus, the highest and most complete form of representation is interactive representation" (1984: 9-10).[10]

Present-day defenders of computer games as an artistic form include Mark Wolf, who compares them to early silent black and white films and who predicts rapid improvement (2001a: 7), and Henry Jenkins, for whom they are *the* artform for the digital age. "Over the past three decades, computer games have progressed from the primitive two-paddles-and-a-ball *Pong* to the sophist-

[10] In a similar vein, Alain and Frédéric Le Diberder declared computer games the tenth art in *Qui a peur des jeux vidéo?* (Who is afraid of video games?, 1993). In France, the six traditional arts are considered to be architecture, sculpture, painting, music, engraving, and drawing. Photography is equally considered as sixth art. The seventh art is cinema, the eighth is television, the ninth comics and the graphic novel, and the tenth digital art.

ication of *Final Fantasy* [{Hironobu Sakaguchi 1987}], a participatory story with cinema-quality graphics that unfolds over nearly 100 hours of game play, or *Black and White* [{Peter Molyneux 2000}], an ambitious moral tale where the player's god-like choices between good and evil leave tangible marks on the landscape." Using Gilbert Seldes' concept of lively art (1957), Jenkins describes computer games as a logical successor to popular forms of entertainment such as film and comics. He notes that many of the reasons that are often given as to why computer games are not a form of art are the same as those used fifty years ago to reject cinema: i.e. its commercial motivations and technological origins, its appeal to violence and eroticism, and claims that there are no works of lasting value. Like Wolf, Jenkins believes that computer games will follow in film's footsteps and become an important artform in the not too distant future. He cites game designer Warren Specter, co-creator of *Deus Ex: Invisible War* {1999}, who sees computer games as only just emerging from infancy. "We're still making (and remaking!) *The Great Train Robbery* [{Edwin Porter 1903}] or *The Birth of a Nation* [{David Griffith 1915}] or, to be really generous, maybe we're at the beginning of what might be called our talkies period [*The Jazz Singer*, {Al Jolson 1927}]."

Objectives

I reject both the ludophobic claim that computer games are a source of perversion and the ludophiliac one that they are a logical next step in the development of representation and art. Both of these perspectives are based on unmotivated bias and are intrinsically associated with the theoretical paradigm of technological determinism which has dominated technology and media studies since their inception. In a deterministic frame of thought, technological development is something that happens outside of human society and functions independently from cultural signification and understanding. It is a fixed process – there is only one possibility, neither its tracks nor its goals can be altered – and every now and again disruptive innovations appear which unilaterally change society and culture. Technological determinism denies the role of man in technological innovation. The question of where technology comes from and what guides its development is left open. Consequently, technologically deterministic studies tend to be motivated by either anxiety or by blind enthusiasm. Because technology is seen as something that evolves outside of human control, it is seen as a higher power and alternately regarded as a dangerous intruder or as an example of divine providence. My approach, however, is constructivist in nature. Constructivism or social shaping of technology (see also chapter 1, section 3) is an alternative paradigm which made its appearance as a reaction to the reductionism of technological determinism. It rejects the idea that technological development is something that happens independently from the society by which it is pursued and that its path is unchangeable. Technological innovation is seen as an inherently social and cultural process steered by human insight and desire. In this study, I analyze and describe computer games from the perspective that they are a response to human needs and wishes and the result of a fundamentally socio-cultural development process.

The main thesis of this study is that computer games are a cultural form and that they are very much a product of their day and age. They are not objects determined by the technology on which they run, but artifacts, human creations shaped by the meanings, understandings and preoccupations that make up the society in which they evolved. The main aim of this study is to describe a number of these ideas and situate them in their cultural context. Thereby I do not mean to provide a 'ready-made' framework for the analysis or interpretation of computer games, but wish to contribute to the development of a useful vocabulary and critical discourse. This study is not one of individual computer games. It is an inquiry into computer game culture, its codes, meanings and technology, what constitutes a computer game and why it was thus conceived. Hence not just computer games constitute my object of inquiry but also other forms of popular culture such as literature, film, television, tabletop games etc, when relevant. Special interest goes to the way in which meanings and ideas migrate between these cultural forms, leading to a first secondary claim which is that, in view of today's so-called 'media ecology', it is unuseful to study any cultural form in isolation as is still all too often done in present-day cultural research, usually due to institutional boundaries. Finally, I do not avoid technological matters and neither do I separate them from the discussion of cultural influences. This leads me to another secondary claim, which is that it is unuseful to make a radical distinction between cultural and technological shaping factors as they are more often than not inextricably linked (see for example chapter 4 on introjection). Technology is not a danger, not even an enemy to human culture; it is one of its primary creations.

METHOD

When looking at various research strategies, a distinction can be made between analysis, synthesis and meta-analysis. Analysis deals directly with the object of inquiry, describing its formal characteristics, analyzing its structure, developing categorizations etc. Synthesis operates one level higher, looking at various analytical frameworks, finding common grounds, resolving conflicts and overall working toward a common vocabulary and frame of reference. Meta- analysis, finally, functions as a control body for the two previous categories, a critical voice identifying and questioning in which areas research is required and how it should be carried out. When looking at how the three categories are distributed in various fields and disciplines, there are significant differences. Some are more directed toward analysis, others toward synthesis. When I began looking into computer game studies, the distribution of analytic, synthetic and meta-analytic research was highly uneven. Despite the relative youth of computer game studies at the time, there was already a remarkable body of analytical material available, if you managed to find it. What was also remarkable, however, was the variety of theoretical frameworks and different conceptualizations that were being used and the apparent lack of communication between their creators. Apart from analytical work, there was also a significant body of meta-analytic discussion on methodological issues, the large majority dealing with the question of whether narrative would be a useful category when analyzing computer games. What was lacking, however, was a common frame of reference, not necessarily one methodology, but a conceptual apparatus and a useful synthesis of previous research. This study should be seen as an attempt to help fill this synthetic gap in computer game studies and work toward a useful set of concepts and categories.

This book is the result of an extensive study of secondary literature combined with analytical work on relevant primary sources. These sources were often computer simulations and games, but at least as often literature, film or television series. The choice of material, both secondary and primary, has not been based on formal criteria, but on selection as I went. I have started by gathering as much material on computer games as was available and by then selecting a number of relevant problematics. From then on I have searched more precisely for material dealing with these topics. The main selection criteria have been clarity and explicative power and I have deliberately sought to cross disciplinary borders and work eclectically. For processing the material, I have used Michel Kabay's Computer-Aided Thematic Analysis (CATA), a qualitative heuristic technique which helps you to structure large quantities of diverse material. CATA uses the automated sorting capabilities of word processing or spreadsheet software for the organization of non-numerical qualitative information. The gist of the technique is to repeatedly classify, sort, reinterpret and reclassify notes. By continuously creating new categories, changing the configuration of the material and adding new ideas, relationships emerge that are otherwise not evident. By progressively refining categories, they become increasingly intuitive and better accorded to the material they are meant to describe. By leaving the iterative sorting to the computer, it becomes much easier to focus on the categories involved and to adapt them as you proceed. "Such flexibility encourages experimentation, which may lead to unexpected juxtapositions that encourage new ways of thinking" (Kabay 2003).

OVERVIEW

The first chapter deals with methodological issues. In it, I look at two approaches to computer game analysis, which I both discuss and eventually reject for various reasons, and I propose a third. In the first section, I look at the proposal to describe computer games as interactive texts. I explore the notion of interactivity, how it is used in human-computer engineering and marketing, and how a specific form of participation, i.e. introjection can help to describe the mechanism of being projected into the computer game world. I look at the ideas of hyper- and cybertext which are both problematic when applied to computer game analysis, the first because of its nodal structure, and the second due to its focus on programmatic rules and its disregard for the perceptions they evoke. And I look at the notion of ergodic literature, which is useful, but which suffers from formalistic reduction. In the second section, I evaluate media theory as a theoretical framework for computer game analysis. I look at Bolter and Grusin's remediation theory and Manovich's general theory of new media. I reject the fundamentals of both approaches on the basis that they are technologically deterministic. In the third and final section, I go deeper into the idea of determinism by looking at Postman's dystopian view on technological development. I reject his deterministic perspective and formulate a constructivist alternative which allows for the incorporation, not just of technological issues, but also social, cultural and ad hoc ones in the description of technological evolution. I sketch what a constructivist approach to computer game studies could look like. Finally, I formulate a hypothesis as to what computer games could tell us about the society in which they were shaped, what characteristics of the time in which we live are reflected in the computer game form.[11]

The second chapter deals with the principles underlying computer simulation. In the first section, I describe the foundations of mathematical modeling, the molding of real-world phenomena into mathematical structures and properties. I describe computer simulations and games as instances of dynamic computer modeling consisting of entities, states and events. Then I look at the technique's specificity and limitations as a form of representation of physical and behavioral phenomena. And I look at how and why events occur in a simulation and describe them as an emergent phenomenon, a result of the low-level interaction of dozens of entities and events rather than that of one top-down imposed structure. The second section is an excursion into the relation between mathematical modeling of reality and thought about that reality. I lay out Turing's imitation game for detecting artificial intelligence and I present Searle's re-

[11] From chapter two onward, the overall structure of this study is bottom-up, starting from the technological groundwork of computer simulation in the second chapter; over the imagining they generate, their virtual nature, in the third; the role of the simulated player in the fourth; to finish in the fifth with the question of why one desires to be cast in a simulated virtual environment so much.

futation in the form of his Chinese room argument which I confront both with top-down logical and bottom-up emergent A.I. The third section deals with the issue of the interpretation of computer simulation and games. My claim is that, despite their being dynamic and quantitative representations, they are very much susceptible to qualitative criticism. Then, to illustrate my point, I look at a number of strategy and simulation games which inevitably present a biased and culturally determined view on reality, and at a number of propagandistic games which blatantly promote political views or even advertise hate. In the fourth and final section, I go into the relation between mathematical modeling and our contemporary society and culture. I look at Turkle's claim that computing has moved its emphasis from calculation to simulation and point to the fallacy of placing too much emphasis on modeling as opposed to real-world analysis. Finally, I evaluate Baudrillard's view that our culture is slowly becoming a simulation in itself due to its unrestrained reliance on models and representations. I reject his analysis on the basis that we are a society in transition and that computer simulation is not a cause, but an effect, a human attempt to improve the understanding and representation of certain aspects of the world.

The third chapter is an exploration, no longer of simulation's organization in entities, states and events, but of the perceptions they evoke. In the first section, I inquire into the ontological nature of the virtual, first by looking into Pierre Lévy's philosophical account of the virtual as potential reality, and then by describing how online virtual environments are sometimes described as potentially real worlds. In particular, I deal with the phenomenon of real trading of virtual items whereby virtual in-game objects such as weapons or estate are sold for real money. In the second section, I evaluate the option of describing virtual environments as logically possible worlds. I sketch the basics of possible-worlds semantics, describe its merits when applied to the description of fiction, but arrive at a fundamental objection, i.e. that fictional worlds violate the logical laws of non-contradiction and excluded middle. I zoom in on the application of possible-worlds logic to the description of virtual environments and reject it on the basis of them being subject to contagion from the real. In the third and final section, I look at Kendall Walton's theory of representation as a game of make-believe. I describe its foundations which are derived from children's pretense play and see how they can be applied to how we deal with representations in general and virtual environments in particular. I criticize Walton's views on the relation between mimesis and truth and his attempt to analyze the difference between fiction and non-fiction as a binary opposition. I stick with his framework, however, and use his distinction between objective and subjective imagining to describe the difference between our dealing with traditional representations and introjective play. Finally, I return to the issue of virtual trading and reject the view that virtual economies constitute a possible reality on the basis that they are a form of mimesis, an imitation rather than logically identical to the real.

The fourth chapter, "Simulating a Self," deals with the structural role that is foreseen for the player of a computer game. In the first section, I present the concept of introjection (Lat. being cast into), which refers to the fact that the player of a computer game is projected into the virtual world where she is assigned a role by the system. I discuss the notion in relation to other concepts such as 'presence' and 'immersion' and point to its specificity. In the second section, I go deeper into the role that is designated to the player and I distinguish between two configurations: avatarial introjection, whereby the player assumes the role of a member of the virtual world and is tied to its restrictions, and transcendental introjection, whereby the player is given a unique status in the game-world, that of a transcendental deity. In the third and final section, I zoom in on the question of point of view in computer games. I begin my discussion by looking at Britta Neitzel's proposal to derive a conceptual apparatus from Gérard Genette's framework for the description of narrative focalization. Although intrinsically useful, I point to its limited applicability and its failure to explain computer simulation's specificity. For this reason, I present a more detailed, layered framework dealing with the construction of the virtual world, the role of the player's character in that world, and the role of the player in the character consecutively. In conclusion, I reflect upon my own analysis and point to a number of paths for future research.

In the fifth chapter, I finish my voyage from form to function, from machine to man by looking at the player's motivations, why he engages in such a trivial, seemingly purposeless activity such as playing. In the introduction, I look at Richard Bartle's classification of players into achievers, explorers, socializers and killers which is useful for analyzing the differences between players, but which does not explain the deeper purpose of why anyone would want to play in the first place. In the first section, I look at various perspectives on the concept and activity of play of which I keep the cognitivist notion of play as rehearsal and the psychoanalytical one of play as negotiation, the former claiming that play is a way of acquainting oneself with various activities and the latter describing it as a means of emotional coping with reality. In the second section, I move from the general notion of play, which includes motor and fantasy play to the idea of game play, i.e. competitive play constrained by a rule-based system. I begin my discussion by comparing the narratological concept of narrative conflict with that found in competitive games, i.e. ludic conflict. I point to a number of correspondences and to one major difference, i.e. the introjection of the player. I then continue with why a player would want to enter a rule-based environment and I will claim that it is due to the desire to gain control over her environment and over her own feelings of anxiety toward it by striving for perfection. In conclusion, I go back to the main claim of this work, i.e. that computer simulation and games are a cultural form, a human artifact answering to specific human needs and wishes, which I find in its being a way of coping with an increasingly competitive society.

I

Culture and Technology

> Technologies do not (...) evolve under the impetus of some necessary inner technological or scientific logic. They are not possessed of an inherent momentum. If they evolve or change, it is because they have been pressed into that shape.
>
> Wiebe Bijker & John Law, introduction to *Shaping Technology / Building Society*, 1992, 3.

Despite their relatively advanced age – depending on whether you identify Alexander Douglas' *Noughts and Crosses* (1952) or Steve Russell's *Space War* (1962) as a first, computer games have recently or will soon celebrate their fiftieth birthday – the study of computer games 'an sich' is a remarkably recent phenomenon. Early computer games were developed as experiments in graphical programming, human-computer interaction or artificial intelligence. They were run on large mainframe computing systems and hardly ever left university engineering or computer science laboratories. There they were experimented with by a whole generation of soon-to-be computer scientists and software engineers, many of whom would, in later years, play a major role in the development of information technology as we know it today. During the 1960s the cultural influence exerted by games such as *Space War* and later *Ham(m)urabi/Kingdom* {David Ahl 1970}, *Lunar Lander* {Jack Burness 1973} and *Colossal Cave Adventure* {William Crowther & Donald Woods 1975} is difficult to overestimate. In fact, the increasing popularity of spatial metaphors in computer programming during the 1970s and 1980s may well have been inspired by long nightly sessions of *Space War* or *Advent*. From the academic front, however, there was still little interest in the new form outside of computer science and engineering which were exclusively interested in technological issues, not cultural. During the 1970s, as arcade computer games grew in popularity and the gaming industry began to take shape, the situation would largely remain the same. Every now and again, computer games would pop up in popular press reports, but the academy remained mute on the subject, a rare exception being Howard Ball's 1978 article "Telegames Teach More Than You Think," an early study of computer games' educational potential.

In the 1980s, popular media began to show interest in the new form of entertainment as an increasing number of articles appeared on the subject. Initially, these reports were neutral in their description of the new pastime, a little amazed at its popularity at the most, describing how not just shy twelve year olds would populate the arcades, but also lawyers and accountants, "Gucci's and three-pieced suits stuffing quarters into *Asteroids* [{Lyle Rains & Ed Logg 1979}]." This changed in January 1982, however, when computer games made it to the cover of *Time* with a multi-page story titled "Games That Play People" (Skow 1982). All in all, the *Time* article was a fairly balanced review of the computer game phenomenon discussing its attractions, its fans, its industry and its economic potential. The eye-catcher of the piece, however, was one Steve Juraszek, a fair-haired, bright-eyed thirteen-year old who had recently set a world record by playing *Defender* {Eugene Jarvis 1980} for sixteen hours straight with one quarter while being fed pizza and cola by his friends. As it often goes, not the actual content of the article caught the public imagination, but the image of countless teenagers being glued to endless rows of flickering and bleeping machines. The subtitle of the story read that "[t]hose beeping video invaders [were] dazzling, fun, and even addictive." Many readers, however, would forget the first two observations, remembering only that computer games could be addictive. In the course of 1982, an avalanche of negative reports on worried parents, addicted gamers and possible health hazards would ensue, which would eventually lead to the American Surgeon General C. Everett Koop expressing his concern. At the end of 1982, the first so-called computer crash took place when Atari sales missed their predictions and Warner's stock plummeted. After that, the media storm subsided and the public attention waned.

In the same period, the first tentative examples of computer game studies began to appear, by which I mean the first studies which discuss computer games in and for themselves. In 1983, Geoffrey and Elizabeth Loftus' *Mind at Play: the Psychology of Video Games* (1983) was published, a psychological study, which, despite its sometimes narrow behaviorist focus, managed to provide insight into the basic mechanisms of player motivation. Although obviously inspired by the public concern regarding the possible addictiveness and health hazards of computer game play, Loftus and Loftus succeeded in sketching a clear and objective picture, and at several occasions they made interesting excursions into the deeper psychology of *Pacman* {Toru Iwatani, 1980} for example or into the possible educational benefits of computer game play. A second example, is *The Art of Computer Game Design* (1984) by previous Atari game designer Chris Crawford. Although not exactly an academic or even vaguely scientific work, it deserves to be included as Crawford successfully expressed some of his basic intuitions and experiences regarding the form. As discussed in the introduction, Crawford saw computer games as an undervalued and underused form with much greater potential. As such, his work can be seen as the beginning of computer game design theory. The third and by far the most interesting study of computer games from the 1980s is Sherry Turkle's *The Second Self: Computers and the Human Spirit* (1984). Although the book did not exclusively deal with computer games (in fact, only one chapter does), Turkle succeeded in describing a number of fundamental elements that determine the relationship between man and machine (see also chapter 5), whereby she took a firm stance against the ludophobes who saw computer games as a threat.

Around 1992, the second storm of ludophobia raged over the USA regarding the relation between violence in computer games and actual violent behavior by children. By the mid-1990s, however, this controversy (which would briefly resurface in 1997 after the Columbine tragedy) was overshadowed by the advent of the World-Wide Web which drew most media and academic attention. The Internet frenzy would last the entire second half of the 1990s until the dotcom crash around the turn of the millennium and would spawn such popular yet short-lived fields as cybersociology, cyberpsychology and Internet Studies. Also during this period, however, a renewed interest in digital narrativity lead to a new generation of seminal studies to be published, most notably Espen Aarseth's *Cybertext: Perspectives on Ergodic Literature* and Janet Murray's *Hamlet on the Holodeck*, both 1997. Aarseth's *Cybertext*, while not primarily a study of computer games but one of text-generators, introduced a previously unseen conceptual apparatus into (digital) literary studies which would play an important role in raising interest in dynamic, computerized fictional forms. Murray's *Hamlet on the Holodeck*, on the other hand, is a hypothetical inquiry into virtual reality's potential as a form of narrative representation, musing on the possibilities of full immersion and boundless interactivity. Although neither of these examples were actual 'game studies', they succeeded in drawing the necessary attention to the subject and thus paved the way for the discipline's founding.

In this chapter, I look at two lines of research each of which have proposed their own approach to computer game analysis and I put forward a third. First, I look at the research tradition of digital literature analysis which has proposed to analyze computer games as interactive texts. I sketch a brief history of the paradigm and look at its major conceptualizations: i.e. interactivity, participation, hypertext, cybertext and ergodics. While I value the contribution of several of these notions, most notably Murray's participation and Aarseth's ergodics, I do not employ them as a basis for my own discussion because I believe that they fail to grasp the specificity of computer simulation. The second research tradition I evaluate is that of new media studies, which proposes to look at computer games within the broader perspective of digital media and to understand them based on their technological and teleological underpinnings. Again, I accept some elements, but overall reject new media theory on the basis that it is severely technologically deterministic. In the third and final section, then, I propose my own approach to computer game analysis which is based on work by British and mainland European researchers who reject the deterministic view and instead see technology as a socio-cultural construction. I first look more closely at the deterministic frame of thought and identify its main weaknesses. Next, I formulate a constructivist alternative and see what this would mean when applied to computer game studies. Finally, I present a number of hypotheses regarding the extent to which computer games reflect the cultural context in which they developed, i.e. what they can tell us about the time in which they evolved.

1. COMPUTER GAMES AS INTERACTIVE TEXT

In July 1945, one month before a uranium-235 atomic bomb was dropped on Hiroshima, and a half year before John Presper Eckert and John William Mauchly presented the Electronic Numerical Integrator And Computer (ENIAC), the first general-purpose electronic computer, Vannevar Bush proposed a new method for information storage in an article in *The Atlantic Monthly* titled "As We May Think." Bush, who had been working as an engineer in the American War industry, realized that the modern world would be facing new technological challenges, urged not so much by the desire to win the next war as to prevent it. The solution he saw before him was a new, more efficient and more intuitive system for storing and searching information. Since the days of square-rigged ships (15th - 18th century), Bush claimed, the ways of handling and accessing information had not changed. Archives and libraries were expanding at such a rate that they were becoming uncontrollable and inaccessible. For Bush, these numerically, thematically or alphabetically ordered systems needed to be rethought and replaced by a structure closer to how humans deal with information cognitively. As an example of such a structure, Bush proposed the *Memex*, a proof of concept system of levers, motors and microfilm. At one point in his essay, he refers to computers, "the advanced arithmetical machines of the future," which he foresees to "perform 100 times present speeds, or more," but still he conceived of his *Memex* as a mechanic microfilm device operated by levers. "On deflecting one of these levers to the right [the user] runs through the book before him, each page in turn being projected at a speed which just allows a recognizing glance at each. If he deflects it further to the right, he steps through the book 10 pages at a time; still further at 100 pages at a time" (Ibid.). As opposed to traditional linear classifications, Bush puts forward associative indexing as a structuring system, creating what we would today call hyperlinks. "When the user is building a trail, he names it, inserts the name in his code book, and taps it out on his keyboard. Before him are the two items to be joined, projected onto adjacent viewing positions (...). The user taps a single key, and the items are permanently joined (...). Thereafter, at any time, when one of these items is in view, the other can be instantly recalled merely by tapping a button below the corresponding code space" (Ibid.). The *Memex* was never built, but Bush's ideas found many followers.

In 1965, Theodor Holm Nelson, one of Bush's admirers, wrote an article titled "A File Structure for the Complex, the Changing, and the Indeterminate" for the Association for Computing Machinery. In this groundbreaking text, he introduced the concept 'hypertext' from the Old Greek 'υπερ', meaning over, above, behind, beyond. In his writings, Nelson has always been vague as to the precise nature of the hypertext concept, but in *Literary Machines* (1981), he describes it as "non-sequential writing – text that branches and allows choices to the reader, best read at an interactive screen." In 1967, Nelson presented his plans for *Xanadu*, an international hypermedia system named after Samuel Taylor Coleridge's imaginary utopia in the poem "Kubla Khan" {1797}. Nelson's *Xanadu* was meant to become a system in which all contemporary knowledge and literature could be represented, and which would automatically calculate and charge the cost of copyright and retrieval by means of micro-payments. In 1979, Nelson founded the company Xanadu, which failed to produce a working prototype even after it was taken over by Autodesk, Inc in 1988. In 1992, the project came to a halt and in 1999 its source code was released. This lead to the scornful remark by some specialists that indeed it resembled poetry rather than programming code.

In this section, I look more closely at some of the theorizing on electronic literature and evaluate the possibility of describing computer games as interactive text. First, I look at the notion of 'interactivity' and formulate some criticism. Then, I move on to Janet Murray's idea of participatory media and propose a specific type of participation to describe what happens in computer game play, i.e. introjection, the casting of the player into the fictional world. Secondly, I evaluate textual analysis as a tool for the description of computer games. I present hyperfiction theory and its approach to the description of hypertext as an embodiment of poststructuralist theory. Then, I point to a number of theoretical problems when trying to apply hyperfiction theory to computer games, most notably the fact that hypertext is multi-linear whereas simulation is intrinsically non-linear. One solution to this problem is Espen Aarseth's proposal to look at computer games as algorithmically generated or cybertext. This is again not entirely satisfactory, however, as it still does not manage to do away with the idea of textuality and because it fails to grasp the most fundamental characteristic of computer games: their playfulness. Finally, I look at the promising ludology movement which builds on the cybertext tradition to create an analytical framework for computer game studies and express the hope that it will eventually transcend its structuralist roots.

INTERACTIVITY

In computer science and software engineering, the concept of interactivity is used to describe a process whereby the user can exert influence on a running computer program and thereby influence its course.[12] Interactive systems are

[12] The concept of interactivity is not exclusively tied to computer science. In psychology for example, it is used to refer to the condition of being able to act upon one's environment. Thereby it is often stressed that it is important for the cognitive development of an agent (man, animal) to maintain an interactive relationship with her environment. In 1963, Richard Held and Alan Hein described a now classic experiment in which two kittens from the same litter were placed in identical surroundings. Both kittens were exposed to identical visual experiences, but one was able to move freely while the other was restrained in a gondola chair. When they were not being tested, both kittens were left in total darkness. After ten days, the active kitten reacted normally to visual stimuli, while its restrained sibling behaved as if it was blind. A few days after the restrained kitten was released it started to develop normal visual skills.

opposed to batch computers which can only perform a number of predefined actions on preloaded data. An example of a batch process could be a request to order a number of files alphabetically, while its interactive equivalent would allow the user to order the files according to her wishes using an input device like a keyboard or a mouse. Interactive systems are studied in a subfield of engineering called human-computer interaction which attempts to describe and enhance the exchange of information between user and machine. Causal chains of events in a human-machine system are described as a closed information/control loop. The efferent or motor loop runs from human response to machine state (e.g. input through a keyboard), and the afferent or sensory loop from machine state to human senses (e.g. output on screen, printout). In order to describe the role that different apparatuses and interfaces play in the exchange of stimuli, the mappings from operator to computer and vice versa are described as two filters: an efferent and an afferent filter respectively (Sheridan 1992). Using this framework, it is possible to analyze speed and ease of operations using different computer interfaces. In web design for example, this type of analysis is often called usability testing. Possible parameters are the number of clicks required by the user to find a piece of information and the amount of time between them. The general aim is to improve the intuitiveness of the mapping between action and result. Important items of an interface should be easily found, intuitively accessed (e.g. by clicking), and should produce expected results.

Interactivity and usability testing are useful tools for analyzing menu-driven software interfaces or determining the accessibility of hyperlinked material. For analyzing stimulus-response intensive activities like playing computer games they are much less suited however. When using a word-processor or a photo editor, a user has a goal in mind, which she can formulate and which she tries to attain in the most efficient way possible. Similarly, a visitor of a web site is looking for a piece of information which she needs to find quickly and easily. As a researcher, you can describe how many feedback loops (menu-items selected, hyperlinks followed) are required and how long each of them takes, before the user reaches the desired state or goal. A number of discretely identifiable decisions lead to a possibly unknown, but determinable outcome. Menus can be altered, hyperlinks placed differently and the test can be repeated. When looking at computer game play, however, feedback loops are impossible to identify and artificially isolating units of interactivity from the broader semantic context is unworkable. Analyzing computer games in terms of action-reaction leads toward atomism, whereby macro-structure is relentlessly sacrificed for a meaningless formalistic description of micro-structure. Particularly in action games, where the player is constantly moving, pursuing several objectives at once or none at all, where she is acting on a continuously evolving environment, mouse-clicks and key taps become indistinguishable and function only to facilitate higher cognitive processes related to identification and conflict-resolution. Just as it is impossible to describe the Tour de France by counting the turning of the pedals, or a book by its average word-length, it is impossible to describe computer game play by looking at contextless causal chains of infinitesimal information/control loops. As with the words in a book or the frames in a film, it is what the stimulus-response chains evoke that is of importance: the suspense or disappointment they create, the meanings they generate.

PARTICIPATION

In *Hamlet on the Holodeck* (1997), an exploration of the possibilities of digital fiction and virtual reality theater, Janet Murray develops a conceptual apparatus for the analysis and description of various forms of digital narrative. Thereby her aim is not just to devise a framework of understanding, but to unveil a sort of technological essence of computing which could then be used to explain the present and guide the future course of digital storytelling. Whereas earlier studies, especially in hypertext fiction started from the notion of 'interactivity', for Murray, it is too vague and reductive (71). Instead she proposes four principal properties for digital environments which refer to their procedural, participatory, spatial and encyclopedic nature. Digital environments are *procedural* in that they are dependent on programming procedures which at any given moment generate their state and guide their course. Moreover, because they are procedural, state changes can be triggered by all sorts of events including the actions of a user. For Murray, this quality is best caught by the notion of *participation*.

The third component in Murray's framework is *spatiality*, which she associates with the fact that digital information tends to be structured in spatial rather than linear terms. One question to pose here is, however, to what extent this is a technical matter, spatiality being a familiar human metaphor which is used as a structuring device in many forms of representation, most notably natural language. The fourth property, finally, is referred to as the encyclopedic nature of digital environments, the fact that they are able to store an almost infinite amount of information. For Murray, the first two properties, procedures and participation, should be seen as a replacement for the vaguer notion of 'interactivity' and the remaining two (spatiality and encyclopedia) she describes as "making up much of what we mean when we say that cyberspace is immersive" (71).

Murray's idea of 'participation' is less restrictive than the human-computer engineering concept of 'interactivity'. Whereas the former focuses on the actual signal exchange between user and state machine, the latter allows for the inclusion of higher cognitive functions, treating the user as a creative contributor rather than a mindless goal-directed robot. In this way, 'participation' manages to overcome at least partly interactivity's atomism, clearing the way for the analysis of the relation between the user's decisions and narrative development. As for computer game analysis, however, participation alone is still not entirely satisfactory as a descriptive device, mainly because it fails to explain the intuitive difference between such forms as hyperfiction and digital cinema on the one hand, and computer gaming on the other. Both hypermedia and computer games are participatory (and interactive, if you like). What distinguishes them from one another, however, is the 'imaginary' position of the user. Whereas in hypermedia and interactive cinema the user takes an external position, deciding on fixed points how the story should continue, in computer games, she is given a role within the fictional environment itself. She steps through the looking glass and temporarily becomes both the girl sitting in front of the computer and the level 10 wizard who is on a quest to find a holy relic. Whereas the reader of hyperfiction or the spectator of digital cinema is like a distant onlooker, the player of a game temporarily assumes the identity of one of its entities. She projects her own self into the actions of her game persona, which can, for example, be observed in the fact that she refers to her wizard in the first person, as in "I am entering the cave now." In order to be able to refer to this type of participation, I will introduce the notion 'introjection' (Lat. throwing into) in chapter 4 to describe the mental movement of projecting oneself into the fictional environment and participate actively as one of its members.

Hypertext

When looking more closely at the idea of treating digital representation as 'text', we note that this perception has come a long way. As described earlier, Vannevar Bush was the first to plead for a type of multi-linear text in 1945, and it was Ted Nelson who termed it 'hypertext' twenty years later. It would take another twenty years, however, before the first functional hypertext systems became available: Apple's *Hypercard* {Bill Atkinson 1987} and Eastgate's *Storyspace* {Mark Bernstein 1987} being among the first. And it was only in 1990, with the publication of an early version of the *WorldWide Web,* that the advantages of organizing information in a hypertextual environment began to take root. Tim Berners-Lee, researcher at the Conseil Européen pour la Recherche Nucléaire (CERN) in Geneva created a simple yet ingenious system to streamline the information flow within his research group. Two principal requirements were that different media like text and images could be linked and that network users with different types of computers could access all available information. In 1990, the first operational prototype was available and in 1992, its underlying technology was released to the public. In 1993, *Mosaic* was released, the first browser capable of displaying colors and graphical elements and one year later its commercial descendant, Marc Andreessen's *Netscape Navigator* followed. The WorldWide Web succeeded in combining the solid and decentered nature of the Internet with the flexibility and simplicity of a markup-based hypertext system. It became a technology that would color the 1990s in more than one way, and became a symbol of the information society.

Meanwhile, in the late 1980s and early 1990s literary scholars developed an interest in hypertext as a tool for the creation of new types of literature, so-called 'hyperfiction'.[13] Theorists such as George Landow, Jay David Bolter, Michael Joyce and Stuart Moulthrop noted the correspondences between post-structuralist theory and the idea of hypertext linking. As Marie-Laure Ryan notes (2001: 6), the list of common features is indeed impressive. First of all, there is Roland Barthes and Julia Kristeva's notion of intertextuality, referring to the practice of integrating textual fragments by using citations, comments, allusion, imitation etc., all practices which are facilitated by a hypertextual writing environment. Secondly, hypertext linking shows reminiscence of Lévi-Strauss' notion of 'bricolage', whereby different techniques and materials grow together bottom-up into an organic whole rather than top-down from a predefined set of demarcations. Thirdly, hypertext is inherently fragmented, an idea that is recurrent in post-structuralist theory of the self (see for example Gaggi 1997). Finally, hypertext is seen as a materialization of, and a response to the cry for a new type of textuality that has resounded in literature and theory long before electronic hypertext existed. Often cited paper forefathers include Jorge Luis Borges' short story "El jardin de senderos que se bifurcan" {"The Garden of Forking Paths", 1941}; Raymond Queneau's *Cent Mille Milliards de Poèmes* {*A Hundred Thousand Billion Poems,* 1961}, a book consisting of strips of paper each containing one line that by shuffling can generate 10^{14} sonnets; and Julio Cortázar's *Rayuela* {*Hopscotch*, 1963}, a novel in codex form.

To some researchers, applying hypertext and hyperfiction theory to computer game analysis seemed consistent, and indeed there are a number of similarities between them. For example, while traditional narrative forms such as prose or analog media like film and television are typically fixed and linear, both hyperfiction and computer games break with that tradition in that they can change shape from one 'reading' to the next and hence, to a certain extent, do away with linearity. There is also a significant difference between them however. When looking at the relation between hyperfiction and storytelling, one can roughly distinguish between two types of 'hyperstories' which could be designated as single- and multi-story hyperfictions. As the name suggests, single-story hyperfictions present only one story line, but they allow the reader

[13] For a more extensive discussion, see Van Looy & Baetens 2003.

to roam through its representation. Examples of single-story hyperfictions include the canonized *Afternoon: A Story* {1990} by Michael Joyce and Stuart Moulthrop's *Victory Garden* {1991}. Again as the name suggests, multi-story hyperfictions mold several stories into one interactive text, meaning that the reader's decisions do not just influence which part of the story she reads about, but the course of the story itself. Examples of multi-story hyperfictions include *Addventure* {Allen S. Firstenberg 1994} and Philippa J. Burne's *24 hours with someone you know...* {1996} which both use an arborescent or tree-branching structure.[14] Computer games, however, are neither single- nor multi-story forms. They are simulations, partial models of reality which in real-time generate the events that take place in the virtual environment (see also chapter 2). Whereas hyperfiction permits the user to seek her way through a fixed set of static material, computer games are generated on the spot and are able to produce an almost infinite number of different story lines.

CYBERTEXT

In the 1960s, while hypertext was still in its conceptual phase, another type of digital text emerged, i.e. algorithm-generated text. In 1966, Joseph Weizenbaum wrote a small experimental program simulating a Rogerian psychotherapist and dubbed it *Eliza*. *Eliza* would analyze the user's textual input for syntactical or morphological hooks such as questions or personal pronouns and incorporate them in her generally meaningless, but in a therapeutic context, acceptable answers. *Eliza* sent a shock through academic circles, not in the least through Weizenbaum himself, who, in later publications, would warn against the substitution of human creative thought for mechanical rules in society. In 1975, William Crowther programmed a playful interactive machine-generated fiction known as *Advent(ure)*. One year later, Donald Woods discovered the game and added a number of fantasy elements, after which it became known as *Colossal*

[14] In order to limit the number of necessary nodes, in *24 hours with someone you know...* some branches merge at different points in the story. Thus some events may occur in exactly the same way in different branches of the structure, but are embedded in different parts of the story and are therefore "ontologically" different. For example, there could be a node in which character X is driven to hospital bleeding severely. In branch A this event occurs after X smashed a window out of frustration because his partner left, and in branch B it could occur after he was assaulted with a knife in the metro.

Cave. In 1977, Marc Blank and Dave Lebling created *Zork*, a witty text adventure inspired by *Colossal Cave*. It became a commercial hit (it is said to have sold more than a million copies) and spawned a whole series of so-called interactive fictions. This period is often referred to as the Infocom era. Also in 1977, James Meehan programmed one of the first story generators called *Tale-Spin*, which was able to generate a large number of stories from a limited set of textual elements. In 1978, finally, Roy Trubshaw and Richard Bartle created the first Multi-User Dungeon (MUD), a networked text-adventure-like environment in which several players could meet and act out scenarios.[15]

Espen Aarseth was one of the first researchers who set out to include both hypertext and algorithmic text into one systematic theory. Because the concept of 'hypertext' was so closely associated with multi-linear text consisting of a web of nodes and links, it was unsuitable for the description of text generated by algorithmic rules (1997: 75). For this reason, Aarseth coined the term *cybertext*, a neologism derived from Norbert Wiener's book *Cybernetics: Control and Communication in the Animal and the Machine* (1948). The concept of cybertext points to the mechanical organization of a dynamic text (1). Traditionally, text has been thought of as something that is separate from its carrier: the same string of signs can appear in a newspaper, on a computer screen or be sprayed on a wall as graffiti. Aarseth does not accept this separation however. He wants to be able to analyze poetry generators and text adventures as a whole, not just the text they send to the screen buffer. For this reason, he proposes to extend the notion of text to include its underlying generative rules and he makes a distinction between the text as it appears on the screen (scriptons) and the text as it is fixed in the rules of the machine (textons). A simple paper text could then be seen as a very simple cybertext, one in which all scriptons are identical to their textons. A text like Raymond Queneau's paper sonnet machine *Cent mille milliards de poèmes* {1961}, on the other hand, consists of 140 textons (slips of paper), but 100,000,000,000,000 scriptons (combined poems). Finally, in order to generate scriptons from underlying textons, many cybertexts require actions from the reader, such as textual input, element selection, puzzle resolution etc.

---

15 For a comprehensive history and analysis of interactive fiction, see Montfort 2003

Aarseth stresses, however, that this is not to be confused with interpretive action on the part of the reader which also plays a role when dealing with cybertexts, but not more or less than when reading linear or multi-linear texts and which does not change the configuration of the work itself (62).

All in all, algorithm-generated text has only been mildly successful however. One of its problems is that language, meaning-generation in particular, is not something that can easily be caught in or even imitated by finite logical or mathematical rules. In this area, machine-generated text has to turn to general artificial intelligence programming, but that has made only little fundamental progress since Weizenbaum's *Eliza* (1966). Visual representation, on the other hand, is less dependent on semiotic interpretation.[16] Whereas textual representation needs to 'see through' a situation in order to be able to describe it, visual representation can restrict itself to simulating its superficial results and that is much easier to translate into mathematical functions. If a programmer wanted to represent an object moving toward another object – say, a human figure toward a house – this is easily done using an algorithm redrawing the figure each time a few pixels closer to the house. If there were robbers in the bushes next to the road, their appearance on the screen could be triggered when the distance between the human figure and the bushes dropped below one hundred pixels for example. The player would notice the robbers, flee, and be chased across the screen. Representing this sequence of events in an exciting form in a cybertextual environment is much more difficult. First of all, the element of real-time would largely be lost. The player would not *see* the robbers appear, she would be told that they have appeared. Second, the excitement of direct action would be lost. The player would have no direct control over the puppet so she could only order it to flee and hope that it succeeds. Finally, if the text programmer wanted to make chase entertaining and unique, she would have to create a huge amount of text specifically for this single chase. The visual designer, on the other hand, could easily reuse the robbers and the house later in the game in a different context using different variables. Consequently, as

[16] There have been a few games such as *Rogue* {Michael Toy 1980}, that used text characters as graphic elements, using rows of characters to form walls and rooms (Wolf 2001b: 55). From the perspective of cybertext, these are simply graphical games since the characters depicted do not function as language and are therefore meaningless as text.

computers grew faster and better at displaying graphics, the paradigm of interactive fiction was gradually abandoned, and came to an end with the demise of Infocom in the mid-1980s.

For cybertext theory, in order to circumvent the restriction to text-based interactive fiction, it would not be too difficult to extend its area of application to visual representation, a possibility still muffled in Aarseth's *Cybertext* (1997), but openly acknowledged in his contribution to the *Cyberspace Textuality* reader (1999). 'Text' would then come to refer to the underlying structure rather than the used sign type. The resulting schema (see below) shows an attractive symmetry between verbal and visual media. 'Linear text' in the verbal sense would refer to traditional print fiction while its visual counterpart could refer to linear media like cinema and television. 'Hypertext' could be used to refer to textual hyperfiction on the one hand and to hypermedia and interactive cinema on the other. 'Cybertext', finally, could refer to interactive fiction, story generators and Multi-User Dungeons in the verbal sphere, and to computer simulation and games in the visual. This would result in the following table:

	Verbal	**Visual**
Linear text	Most print fiction	Film, television
Hypertext (multi-linear)	Hyperfiction	Hypermedia, Interactive cinema
Cybertext (algorithm-generated)	Text adventures, poetry generators, Multi-User Dungeons	Computer games

Despite the attractive symmetry of the above classification, however, the use of cybertext theory for the analysis of computer games is not unproblematic. First of all, because the cybertext concept aims to include the program's underlying programmatic structure, its logical rules and textons, it is manifest that they be available to the person analyzing the work. This is only seldom the case however. The programming code of the large majority of commercial computer games is closed, unavailable for inspection. An alternative strategy would be to look at the computer game itself, play it more than once, compare sessions and then induce its underlying structure. This is a time-consuming operation, however, and in the case of modern, finely-grained simulations, it may well be unfeasible. Moreover, even if it were possible to derive all generative rules, it is unclear what it is that would be revealed about the gaming experience. While human-computer interaction theory was atomistic in that it aimed to describe the user experience by looking at human-computer signal exchange only, cybertext theory tends toward formalism in that it assumes that it is solely the underlying logic that is determinant for the gaming experience. It is not the logical rules in themselves that are of analytic interest, however, but the perceptions they generate (see also chapter 3). It is what the player imagines she is doing, that determines her actions and experience, not just the quantitative rules generating the simulation. Looking at the rules of football, for example, would explain very little about the pleasure and excitement the game can produce.

ERGODICS

A second notion introduced by Aarseth is that of 'ergodics', a term appropriated from physics and derived from the Greek words 'ergon' (work) and 'hodos' (path). It refers to the fact that some texts require non-trivial effort from the reader to traverse them (1) Ideally, for Aarseth, there would be two types of literature: narrative and ergodic. The reader or spectator of a fixed narrative work is powerless with respect to its unfolding. She may think what she will about the representation, but she cannot change it. She has the pleasure of interpretation, but she does not have that of influence. "The reader's pleasure is the pleasure of the voyeur. Safe, but impotent" (4). In an ergodic work, on the other hand, the reader/spectator/player is confronted with a number of obstacles that need to be overcome, to which Aarseth refers as 'aporias'. In traditional literary theory, the term 'aporia' refers to an insoluble contradiction or paradox in the semantic organization of a text. Aarseth, however, redefines it to become a formal figure, an obstruction that must be overcome by the actions of the player (1999: 38). When an aporia is solved, it is replaced by an epiphany: "a sudden, often unexpected solution to the impasse in the event space" (38). For Aarseth, epiphanies are more fundamental to the enjoyment of an ergodic than to that of a narrative work, because without their resolution, the rest of the work is not realized. Finally, the relationship between the narrative and the ergodic is dialectic, not dichotomous. Narrative elements can be found in ergodic works, and ergodic elements in narrative ones (34). In adventure games, for example, narrative elements (texts, cut scenes, explanations from characters) are alternated with ergodic puzzles or action sequences.

Compared to 'cybertext', the concept of 'ergodics' has aroused little academic interest. This may be due to the radical newness of the concept and to its somewhat awkward ring, evoking at the same time religious connotations and associations with 'gothic' literature. A second, more fundamental reason, however, has been the term's etymological origin. As described above, 'ergodic' is derived from the Old Greek 'ergon', meaning 'work'. Most of the 'texts' qualifying as ergodic literature are 'games', however, and are as such strongly associated with 'playfulness', a semantic category traditionally opposed to 'work'. For Aarseth, the ergodic element refers to "a type of discourse whose signs emerge as a path produced by a non-trivial element of work" (1999: 32). Yet, games are neither valued as 'discourse' – their primary attraction is one of participation, not of interpretation – nor as 'work', from which 'play' is meant to be a refuge. Finally, the second part of the compound, 'hodos' (path) is not unproblematic either in that it seems to refer to a reading path which is associated with the web-like structure of hypertext rather than with the algorithm-generated nature of cybertext.

Moreover, ergodic theory tends to be mechanistic when it comes to conceptual borders, denying the possibility of hybridization. As a starting point for his analysis, Aarseth takes Gerard Genette's discourse typology. For Genette, there are two levels of discourse: description (e.g. "the car was a BMW") and narration (e.g. "the car drove through the red light"), whereby the latter is dominant but reliant on the former. Aarseth accepts Genette's classification and proposes to add ergodics as a third category. Ergodic works such as adventure games could then contain description (graphics, descriptive passages), narrative elements (background story, pre-scripted scenes) and ergodic elements (labyrinths, puzzles, chases, fights). Unlike Genette, however, who sees his typology as fuzzy, conceptually vague, Aarseth attempts to make his categorization exclusive. "Compared to a non-textual game such as football, which has only action (ergodic elements), the computer game has both ergodics (action) and description (graphics, sound), but not narration, since the event space is not fixed before the time of play" (1999: 35). Apparently, in an attempt to establish a firm identity for 'ergodics', Aarseth opposes it strongly to narrative, describing both notions as mutually exclusive. Consequently, an ergodic element cannot be narrative and vice versa. In reality, this is not the case however. Ergodic elements such as action sequences and puzzles can play an important role in the narrative development of a game. Similarly, narrative elements give meaning to action and puzzling in games. Ergodics and narrative are not mutually exclusive features, but function as catalyzers to one another. They do not work against, but with one another in the evocation of imaginary happenings.

Since their inception, cybertext and ergodic theory have been striving toward disciplinary independence, criticizing "the recurrent practice of applying the theories of literary criticism to a new empirical field, seemingly without any reassessment of the terms and concepts involved" (Aarseth 1997: 14). Little by little, it has moved away from strictly textual analysis toward more general computer game studies. In 1999, Gonzalo Frasca proposed the term 'ludology' (from 'ludus', Lat. game) as a name for the previously non-existent academic discipline for studying games. Since then, ludology has played a invaluable role in the emancipation of computer games as a research object and has helped to overcome the pointless Manichean discussion of whether they are good or bad to society. More recently, the ludologist rhetoric has acquired a somewhat bitter tone, however, accusing disciplines such as literary and film studies to be organizing a gold rush on ludologist territory with little respect for local culture and history. Even if this were the truth, putting up defenses has not been a favorable move as it has plunged the discipline into another round of pointless dualist debate. Henry Jenkins, for example, accuses the ludology movement of being unduly polemical. "[T]hey are so busy trying to pull game designers out of their 'cinema envy' or define a field where no hypertext theorist dares to venture that they are prematurely dismissing the use value of narrative" (Jenkins 2004). Similarly, Stuart Moulthrop warns against closing the 'hermeneutic circle of simulation', a defense maneuver which he deems useful to an extent, but which at the same time "threatens to impose a hazardous solipsism" (Response by Moulthrop to Aarseth 2004a). In the third section, I present a cultural perspective on game analysis, which, I believe, does more due right to the form precisely through its inclusiveness and interdisciplinarity. But first, I look more closely at a second approach that has been proposed for the analysis of computer games, i.e. media theory.

2. COMPUTER GAMES AS NEW MEDIA

Roughly speaking, the concept of 'medium' (Lat. middle, between, means, way) conjoins three relatively distinct meanings: that of a social institution, an artistic mode and type of electronic apparatus. In its first meaning of *social institution*, 'the media' refers to companies, services, organizations and their employees working in public and commercial information production and dispersal: Hollywood, British Broadcasting Corporation, Sony Corporation, Madonna etc. In this sense, computer games are undeniably part of the media. In its second, older sense of *artistic mode*, 'medium' refers to a broad array of instruments and styles that are used for creative expression: paint, music, sonnet, novel, television show, film, music video, website etc. Also in this sense, computer games are decidedly a medium. They are a form of expression, arguably even of artistic creation. Finally, in its third meaning, the term 'medium' refers to the *electronic apparatus* of an information technology, strongly associated with the broadcasting of signals, a 'middle' or 'in between' people: the telegraph, telephone, radio, television, e-mail etc. In this section, I evaluate the claim that the digital computer in general and computer games in particular should be seen as a medium in the sense of apparatus. I look at two theories, Jay David Bolter and Richard Grusin's remediation theory and Lev Manovich's digital materialism, which I both reject on the basis that they are technologically deterministic and hence reductive, and I plead for a broader cultural perspective on computer simulation and games.

REMEDIATION

In *Remediation: Understanding New Media* (1999), Jay David Bolter and Richard Grusin set out to create an analytical framework for digital information technology and content. Their starting point is McLuhan's idea (1964) that the 'content' of a medium is always another medium, which they term *remediation*. The telegraph remediates print, which remediates writing, which remediates speech (45). Their argument is that “new media are doing exactly what their predecessors have done: presenting themselves as refashioned and improved versions of other media. Digital visual media can best be understood through the ways in which they honor, rival, and revise linear-perspective painting, photography, film, television and print” (14). Bolter and Grusin believe that there is a teleological factor at work in the evolution of media technology, that technological innovation is working toward a specific goal which is perfect mimesis.[17] In order to understand this evolution, they refer to two, partly opposed tendencies: hypermediacy and immediacy. *Hypermediacy* refers to new media's tendency to multiply channels, to saturate itself with sources of information. A web page, for example, contains text in different colors and sizes, hyperlinks, images, graphical elements, animation etc. For Bolter and Grusin, hypermedia design privileges “fragmentation, indeterminacy, and heterogeneity (...) emphasiz[ing] process or performance rather than the finished art object” (31). *Immediacy*, on the other hand, refers to new media's tendency to “erase or to render automatic the act of representation” (33). Through immediacy, technology attempts to erase itself, to become transparent so as to present the mediated environment as a unified visual space, seamlessly integrated in the actual. A useful example of this is the cinema theater where the viewer is submerged in imagery, sound and darkness, where the border between spectator and fictional world is made as inconspicuous as possible.

When trying to apply the remediation framework to concrete examples, however, it becomes clear that its theoretical foundations are problematic. If we say that hypertext remediates print, for example, what do we mean by that? Do we mean that it absorbs all qualities and techniques of the older medium and then adds its own? If we adopt this explanation, it is plainly wrong since many

[17] One of the more amusing teleological analyses that I have come across is one claiming that all technological innovation in media is driven by the pornographic industry, by the desire to reach perfect verisimilitude in the simulation of sexual intercourse with a fictional person. One often quoted example is the victory of the technologically inferior VHS video cassette format over Betamax because Sony would not license the latter to pornographic filmmakers.

characteristics of print (size, easy access, page numbers etc.) are not taken over. A second option is to take remediation as the negotiation and adoption of only certain qualities and techniques from the older medium. But why do we then speak of remediation and not simply influence or emulation? Moreover, how do we explain that some examples of works in other media have great influence and others have none whatsoever? And how do we describe influences from other cultural forms that are not media in the strict sense? Do computer games remediate pinball machines because they adopted the three lives paradigm? Do they remediate sports when they are practiced in teams scoring points? Do they remediate literature when they adopt techniques for generating identification, characterization and setting? Do racing games remediate driving a car? Etc. In a sense, Bolter and Grusin obscure two related but distinct phenomena. On the one hand, there is the cultural process of influence and negotiation and on the other, there is the competition between technologies, whereby newer media tend to be shaped so as to emulate older forms, speed up their acceptance, and permit them to steal away the older medium's audience and market. These two processes are not identical, however, the first being part of a cultural dynamic and the second induced by a commercial imperative.

LINGUA MEDIA

In 2001, Lev Manovich, a Russian theorist working in San Diego, USA, published *The Language of New Media*, a voluminous study of digital media. Using concepts and theoretical tools from engineering and the humanities, mostly computer science and visual studies, he devises a theory of what he calls 'new media', overall corresponding to computed or digital technology and content. Instead of imposing an a priori method or framework, Manovich designs his theory from the ground up, a method which he terms digital materialism (referring to Marx, and possibly his own Soviet Russian background). He aims to describe the nature of digital technology, to "scrutinize the principles of computer hardware and software and the operations involved in creating cultural objects on a computer to uncover a new cultural logic at work" (10). For Manovich, cinema was the technology that paved the way for new media in that it succeeded in making abstraction of the relation between carrier and content for the first time.[18] Film samples time twenty-four times per second, realizing a conceptual break from the continuous to the discrete. For new media, "All that remained was to take this already discrete representation and to quantify it" (50). Upon this numerical basis, various levels of structuring have been constructed so that the computer has become able to manipulate different types of information and representation creating what Manovich calls "a new medium – the meta-medium of the digital computer" (6).

Like Janet Murray (see above), Manovich identifies a number of fundamental principles of new media which he derives from computer scientific concepts (48). There are five in all: numerical representation, modularity, automation, variability and transcoding. *Numerical representation* refers to the discrete and quantifiable nature of digital representation. Analog media create a material image on, for example, magnetic carriers like tapes or discs. Digital media, on the other hand, contain a numerical description, a series of instructions and data which can be transcribed for various uses. *Modularity* refers to what Manovich calls "the fractal structure of new media" (30), the fact that media elements in a digital environment are always represented in similar modular structures, i.e. collections of discrete samples (pixels, polygons etc.). *Automation* refers to the fact that computer processes can be programmed and hence acquire a certain independence from their creator. New media can, to an extent, be made to act on their own and will do so in often unexpected ways. Manovich's fourth element, *variability*, is a variation on the previous, referring to the fact that digital media need not be fixed; they can exist in different versions and can be converted automatically from one version to another. *Transcoding*, finally, refers to the computer's ability to convert different types of media into digital data. For Manovich, transcoding is the most fundamental principle of new media and will change the way in which we create, receive and understand culture. Arguably, it is also his most problematic one, however, as he fails to see the technique within a broader perspective. The relation between new media and culture is not that of a technology ordaining the transcoding of all instances of human ex-

[18] Arguably, this is somewhat of a simplification as discrete symbolic notation exists at least since logographic writing systems from around 2000 BC in for example India, Crete, and China.

pression into its native form, but, inversely, that of a culture carefully but purposefully exploring the possibilities of new forms of representation.

Like the majority of media studies, Manovich's approach starts from a technologically deterministic viewpoint. He describes the creation of computer software as an interplay between its use and design on the one hand and the broader socio-cultural context on the other. As we work with software, its operations become part of the cognitive arsenal used to understand ourselves and the world. “[T]he design of software and the human-computer interface reflects a larger social logic, ideology, and imaginary of the contemporary society” (118). Manovich does not practice what he preaches however. His main strategy is to identify functional principles of computer hard- and software and use them to uncover a new 'cultural' logic at work in new media (10). Moreover, when discussing transcoding, he goes even further in that he foresees that the computerization of culture will gradually accomplish “similar transcoding in relation to *all* [my italics] cultural categories and concepts. That is, cultural categories and concepts are substituted, on the level of meaning and/or language, by new ones that derive from the computer’s ontology, epistemology and pragmatics. New media thus acts as a forerunner of this more general process of reconceptualization” (47). This is rather difficult to believe however. When looking at today's networked media, for example, there are digital newspapers, e-books, webcasts, animated cartoons, streaming movies, games etc. When looking at graphical user interfaces, there are desktops, windows, buttons, addresses, menus, documents, folders and so forth. These are all cultural categories used to address computing issues, not the other way around. Admittedly, they are shaped by the technology in which they are used, but in nature they are cultural. In a similar way, computer games are very much reflections of our cultural understanding of the world: cars are driven, doors opened, criminals caught etc. Computer games are human experiences shaped according to technological constraints, not technology shaping human experience. Undeniably, like every form of representation, computing imposes constraints on its own development. Claiming that it determines its own form and function, however, is naive and incorrect. We are not witnessing the digitization of culture, but the cultural development of digital technology into a powerful means of human expression.

One final argument that must be put forward against Manovich's new media theory is that it is trying to do too much. In one go, he speaks about special effects in films, digital animation, websites, computer games and virtual reality relying on a handful of technological principles. Cultural production is a much too complex phenomenon to be reduced to a few linear variables however. Moreover, by referring to *new* media, Manovich tends to drive a wedge between older technologies and techniques on one side and digital representation on the other. The majority of 'new media' show more similarities with their analog forefathers than with one another however: webcasts with radio, streaming with television, computer games with board games and sports etc. As Espen Aarseth observes (1997: 19), media are far from neutral, inconsequential carriers of information, but the essentialist idea of a 'computer medium' as a singular structure of well-defined properties of communication is untenable. Computer technology can sustain different types of media with highly distinctive characteristics. This pluralism avoids the trap of technological determinism and allows to "see the technology as an ongoing process of, rather than a cause of, human expression." There is not one medium of the computer game. "Games are, at best, a somewhat definable cultural genre" (Aarseth 2004a, see also 2001b).

3. COMPUTER GAMES AS CULTURAL FORM

In *Culture and Society* (1958), Raymond Williams pleads that culture be accepted as ordinary – by which he means basic, close to daily life – rather than high and exalted. Every culture has its own shape, its own purposes and its own meanings which are expressed in institutions, arts and learning. Creating and maintaining a society is a matter of finding common meanings and directions, its development an active debate and amendment lead by experience, contact and discovery. Two elements work together in this process: one traditional, consisting of known meanings and forms; and one creative, the active pursuit of new meanings and directions. 'Culture' conjoins these two aspects, which at the same time function in society as a whole and in each individual member. In *Television: Technology and Cultural Form* (1974), Williams further elaborates on his views and develops a theory on the relation between culture and technology. Whereas most research at the time dealt with the influence information technology has on society, Williams takes a firm stance against this one-way perspective by stating that media are not so much determined by technological factors as they are a cultural form, a human development brought forth by social change and cultural insight. In Williams' view, technology does not function external to the development of meanings and practices in a society, and neither is it dictating them. It is a factor within and at the same time a result of the continuous debate and amendment which leads a culture in a certain direction.

Also in 1958, Roger Caillois publishes *Les jeux et les hommes*, in which he analyzes the anthropological phenomenon of 'play' in the broadest sense – referring to children's play, but also to games of chance, sports, dance, rite etc. Whereas Johan Huizinga in *Homo Ludens* some twenty years earlier provocatively claimed that culture as a whole is a product of the human desire to play – in that it is simultaneously liberty, invention, fantasy, and discipline – Caillois takes a more moderate point of view (58). To him, it is clear that any attempt to define culture by referring solely to the principle of play would be a "rash and probably fallacious undertaking" (66). What he does accept, however, is that games can serve as a cultural indicator, as an object of study used to better understand a culture's underlying semantic patterns and provide indications as to the preferences, weaknesses, and strengths of a given society at a particular stage in its evolution (83). He postulates a reciprocal relationship between a society and the games it likes to play, an affinity between the latter's rules and the common characteristics and deficiencies of the members of different social groups. The games played in a given culture reflect its "tendencies, tastes, and ways of thought that are prevalent, while, at the same time, in educating and training the players in these very virtues or eccentricities, they subtly confirm them in their habits and preferences" (82). Games are a mirror of society: they reflect hidden fears, desires and preoccupations, and at the same time, being a cultural reflection, they play a significant role in the generation and confirmation of cultural meanings and practices.

In his classification, Caillois distinguishes between four types of games (some examples are my own): games driven by (a) *competition* (agôn), e.g. football, racing, chess; (b) *chance* (alea), e.g. dice, poker, lottery; (c) *pretense* (mimicry), e.g. playing family, carnival, theater; and (d) *vertigo* (ilinx), e.g. dancing, roller-coasting, benji-jumping (12). These categories are not mutually exclusive. For example, the board game *Monopoly* {Charles Darrow 1935} is based on chance (throwing dice), but it also incorporates elements of action and competition (building houses, making sure someone else cannot buy all streets of the same color), and pretense when exchanging cards or negotiating sales. As for computer games, it can be argued that all four types of play are present in some way. Most computer game genres such as sports, racing, platform, shooting etc. are action-based. Other genres such as card and puzzle games, virtual gambling etc. are based on chance. The degree to which pretense is a factor in computer games is a rather complex and contested matter which is dealt with more extensively in the third chapter on simulating a self. For the moment, suffice it to say that in most action, strategy and simulation games, the player assumes an in-game identity through which she directs her actions within the virtual world (introjection). Hence, within the game, she pretends to be her game character or avatar. When looking for elements of vertigo, finally, it can be argued that there are none as the computer game player's body remains stationary.[19] This is only true in case of an unimaginative and literal transposition of the notion however. Most action games, particularly since real-time three-dimensional graphics have appeared on the scene, place much emphasis on engaging and highly immersive special-effects provoking emotions and excitement akin to actual vertigo.

For Caillois, the presence and popularity of certain types of play in a culture forms an indication as to the meanings and values this culture supports. A cultural preference for games of chance (alea), for example, indicates a strong awareness of the limitations of the human will and of man's inability to realize his desires and fantasies all by himself. This type of society places a strong em-

[19] Some computer game technologies require the player to move her body, which is registered by the computer as input and used in the virtual gaming environment. A well-known example is Konami's *Dance Dance Revolution* {1998} in which the player has to perform pre-choreographed series of movements on a platform with colored squares and arrows that indicate the movements to make. In 2003, Sony launched the Eye Toy, a camera and microphone that registers the player's sound and movement which are used in the game on screen. Typical Eye Toy games involve dancing, singing or simple actions like catching virtual objects.

phasis on the individual's dependence on her environment, on powers she cannot control, and it is more inclined towards religious submission and acceptance of destiny (18). Cultures which favor games of action and competition (agôn), on the other hand, believe in man's will to succeed. These societies place more emphasis on personal responsibility and success, both of which are seen as a vindication and confirmation of cultural values. An individual growing up within an agôn-centered culture, although he may not be consciously aware, is imbued with an urge to respond to the pressure to compete, to prevail over other competitors and be successful both in play and in everyday life. Further in the book Caillois gives the example of a classification of cultures based on the type of games they play. Primitive Australian, American and African societies, for example, which Caillois refers to as 'dionysian' are societies ruled by masks and possession, i.e. by pretense (mimicry) and vertigo (ilinx). Societies closer to our own such as that of the Incas, Assyrians, Chinese or Romans are more orderly, more rationally organized according to systems of thought featuring offices, careers, codes, with fixed and hierarchical privileges in which competition (agôn) and chance (alea) prevail (87).

The main thesis of this study is that computer simulation and games are a cultural form and that, as such, they can tell us something about the culture in which we are living. In this section, I further elaborate on this claim and present a number of issues which will be further developed in later chapters. To begin with, I look at Neil Postman's dystopian view on the relation between culture and technology in the history of humanity. I comment upon this theory and debunk it on the basis that it presupposes a strict separation between culture and technology and subscribes to a deterministic view on development. Next, I present an alternative, constructivist perspective on the development of technology which is grounded on the observation that technology develops within society and depends upon its structures and ways of understanding. Third, I remain within the same argumentation, but zoom in from technology at large to information technology, confront Marshall McLuhan's deterministic view on media evolution with more constructivist analyses such as that of Raymond Williams and Brian Winston, and give examples of what a constructivist analysis of computer simulation and games could look like. Finally, I tread on more hypothetical grounds and pose the question whether there are not more fundamental correspondences between computer games and contemporary western society than just the form of play. My argument is that computer games as real-time state-machine simulations reflect our present-day obsession with control over the 'now'.

TECHNOLOGY GIVETH AND TECHNOLOGY TAKETH AWAY

In *Technopoly: The Surrender of Culture to Technology* (1992), Neil Postman proposes a history of mankind in terms of the relation between culture and technology. Within this history he distinguishes between three phases in technological development: tool-use, technocracy and technopoly. *Tool-using cultures* are characterized by the fact that they produce tools for two reasons: to solve specific and urgent problems of physical life: e.g. water power, windmills, the heavy wheeled plow etc.; or to serve the symbolic world of art, politics, myth, ritual, and religion: e.g. castles, cathedrals, books etc. (23). In these cultures, technology is produced to serve the dignity and integrity of the culture in which it is used, and culture operates independently from technology basing itself on humanistic principle. In a *technocracy*, however, Postman's second stage, this is no longer so. In the Middle Ages a number of inventions emerged which tipped the power-balance. As examples, Postman puts forward the mechanical clock, which changed the human conception of time; the printing press with movable type, which reduced the importance of the oral tradition; and the telescope, which challenged fundamental propositions of Judeo-Christian theology (28-29). Whereas in tool-using cultures, technology was still subjected to cultural principle, in a technocracy, it is beginning to define its own, independent role as a way of ameliorating the standard of living. Technological development moves from the periphery to the center of cultural life, increasingly subjecting the social and symbolic spheres to its requirements (28). In Postman's view, the majority of modern nations – most of Europe, Japan, Canada, Australia etc. – are technocracies.

The third and final stage in Postman's history is that of *technopoly* – a phase which, until now, has only been entered by one nation, i.e. the USA. In a technopoly, human culture is definitively subordinated to the technological imperative (48); all systems of thought which present themselves as an alternative to the strictly rational pursuit for growth and efficiency are eliminated just as the World State eliminated all alternatives to itself in Aldous Huxley's *Brave New World* {1932}. “It does not make them illegal. It does not make them immoral. It does not even make them unpopular. It makes them invisible and therefore irrelevant” (Postman 1992: 48).[20] During the second half of the nineteenth and the twentieth century, science and technology began to make progress at an ever increasing pace and traditional systems of thought came under siege. Karl Marx subjected free will to historical dialectics (1867); Friedrich Nietzsche declared God dead (1885); Sigmund Freud claimed our conscious self to be only a thin layer on top of the larger subconscious (1899); Albert Einstein showed that even certainties like space and time are relative (1905); and John Watson analyzed human behavior in terms of stimulus - response (1913). Amidst this conceptual debris, Postman finds man looking for something to hold on to, something to believe in, and the only certainties left are science and technology in themselves. “Whatever else may be denied or compromised, it is clear that airplanes do fly, antibiotics do cure, radios do speak, and (...) computers do calculate and never make mistakes” (55). Technopoly is the final stage in the gradual submission of culture to technology. Technology is deified: culture takes its orders, seeks its authorization and finds its satisfactions in technology.

RESISTANCE IS FUTILE

Postman's theory is problematic in several respects however. A first weakness is the implicit belief that culture and technology are separate entities, that there is, on the one hand, human cultural development in literature, art, ethics, religion etc. and on the other, functioning from and within a different realm, technological development in mechanics, electronics, computing, engineering, chemistry etc. Within this opposition, for Postman, technological development is the neg-

[20] Arguably, Huxley's World State would do all of these things however. Giving birth to children, for example, is made illegal, immoral and unpopular through automated conditioning during sleep, and invisible by keeping 'savages' who still give birth to their children in reserves far away from the majority of World State citizens.

atively marked term. Whereas culture is seen as a product of man, something created by and for him in order to find his way in life, technology is described as something alien to human culture, something that comes from outside only to force its will upon society. This differentiation, which is related to the historical opposition between subject and object, mind and body, is not realistic however. First of all, culture is technical: it relies on technology for its creation, not just in terms of production and distribution, but also within its very structural layout consisting of complex systems of codes, conventions and techniques. Art, literature, religion etc are elaborate structures of understanding and are as such rational constructions as are material technologies. Secondly, as is my main claim in this study, technology is also cultural, a product constrained by reality, but inherently a human creation only made possible by human understanding, effort and desire.

Furthermore, because he makes a strict separation between the cultural and the technological sphere, Postman is forced to posit the latter as an autonomous agent of transformation, a power which functions outside of society and which responds only to its own inner laws. This makes Postman's theory technologically deterministic. Technology is treated as a given, something of which the form and function cannot be questioned. Only its impact on society can be measured, the effects it has on the way man conducts his life. Technological determinism is related to the religious idea of predestination. There is only one direction into which technology can develop and that path is fixed. Whichever decision scientists make, the course of science is determined. Moreover, inevitably, at the end of that course lies a final judgment, a verdict of the higher power which speaks to man through technology. This will either result in his salvation, a return to paradise or in damnation, everlasting hardship. Technology is either the right path or the wrong one. Either way, there is no escape. Man is impotent and only at the very end of the road he will know his destination. For this reason deterministic theories tend to be either utopian, seeing technology as a force of liberation, empowerment or both (cf. the Internet hype of the late 1990s) or gravely dystopian, viewing technology as a 'malin génie', an evil genius feeding upon human invention and creativity in order to become stronger and eventually subordinate man to its will. Technology is seen as something that must either be renounced or believed in, as if it were a religious revelation. Needless to say that I do not base my research on the deterministic paradigm. In the next subsection, I deal with an alternative, i.e. a constructivist view on technological development.

Somewhat paradoxically, Postman's response to technopoly is heroic personal resistance. He summons those who still can, to become “loving resistance fighters” (182), and to spread opposition through education (185). What he fails to do, however, is offer a theoretical alternative to his own three-step evolution towards cultural self-annihilation. Man should resist the technological and economic imperative, but there is no way that he can escape from it. Because technology is something that develops outside the grasp of culture, its course is unalterable and one can only declare war against it and fight it till the bitter end. This line of thought is based on false premises, however, and guided by fear instead of rational understanding. Technology is a product of and for mankind and if at one point it fails to conform to this role, this is because man elevated it to a higher position. If indeed the economic imperative in the USA is becoming too poignant and technopoly is looming, this is not due to higher logic, but to social development. If American society is being organized so rationally that there is no more room for human intuition and culture, as Postman claims, this is not because of some inner technological law, but because man has pushed society in this direction believing it would benefit him. Economy is a human creation, a conglomerate of systems working together in order to solve a human problem, i.e. scarcity. If, at one point, this system derails and begins causing problems in itself, it is unhelpful either to uncritically accept this fact or blindly resist it. Rather, it would be the time to debunk the myth that technological development is predestined and begin altering its course.

A CONSTRUCTIVIST ALTERNATIVE

Since the 1980s, a constructivist alternative to technological determinism has been gaining ground in the United Kingdom and Europe. Various schools such as 'Social Shaping of Technology' (MacKenzie & Wajcman 1985) and 'Social Construction Of Technology' (Pinch & Bijker 1987) challenge the privileged status often granted to technological development in social discourse. Instead of treating technology as a given, constructivist researchers analyze the various factors at work in its construction, revealing that technology is not so much a predestined path determined by objective reality as a social process constrained by it. Constructivist research rejects the post-enlightenment, deterministic tradition which does not problematize technological change, but limits the scope of inquiry to monitoring the social adjustments it entails (Williams & Edge 1996: 866). It demonstrates that technology does not develop according to an inner technical logic, but is instead a social product, patterned by the conditions of its production and use. Technological development is a continuous process of variation and selection following multiple directions rather than one fixed path. Every stage in the creation and implementation of new technologies involves a set of choices between technical options (Pinch & Bijker 1987: 28). Apart from narrowly technical considerations, a range of social factors influence which options are selected and shape the content of the technology and its social implications (Williams & Edge 1996: 866). Technology never emerges from or into a vacuum. It develops the way it does because of its specific historical context, and it succeeds or fails in large part due to that same context (Williams 2003). Constructivism pushes to go beyond seeing technology as a reflection of a single rationale like the economic or technological imperative and gives credit to technological development by recognizing it as the complex cultural dynamic it presents.

Constructivist studies restore the notion of intention. There are 'choices' (sometimes conscious, sometimes not) inherent in the design of individual artifacts and systems, and in the direction and trajectory of innovation programs. Technology does not emerge from the unfolding of a predetermined logic or a single determinant. It is a 'garden of forking paths' where different routes are available, potentially leading to different technological and cultural outcomes (Williams & Edge 1996: 866). Innovation is a contradictory and uncertain process which cannot be reduced to a rational/technical process of problem-solving. It involves economic processes and building alliances of interests among supplier firms, technologists, potential users, funding bodies and so forth with the necessary resources and technical expertise developing visions of as yet un-realized technologies (873). The constructivist paradigm is at its best when aimed at specific fields or artifacts. Whereas deterministic theories are readily available when a broad, generalizing explanation is required, the constructivist framework is a powerful descriptive device which analyzes the impact of various contextual factors on the development of concrete artifacts. To sum up, constructivist research describes the ways in which social, institutional, economic and cultural factors shape the direction and rate of innovation, the form of a technology, and the outcomes of technological change for different groups in society (868).

Technological constructivism is united by an insistence that the black box of technology should be opened to allow social, economic and cultural patterns embedded in both the content of technologies and the processes of innovation to be exposed and analyzed (866). It stresses the negotiability of technology, highlighting how particular groups and forces shape technologies to meet their ends. This, in turn, raises questions about irreversibility, the extent to which technological choices may be foreclosed (867). Constructivism sets out to integrate natural and social science concerns, describing the relationship between scientific excellence, technological innovation and economic and social well-being. It aims to emancipate science and technology and dismantle their privileging as inevitable or standing outside or above society (867). Thus it aims to broaden the political agenda by making proposals regarding the promotion and management of technological change (865). "No more mere tinkering at the margins of technology policy, seeking to grapple with its products but leaving unaltered the direction and goals of innovation" (868-869). Technology is neither an opponent to be fought nor a deity to be worshiped: it is a human creation which should be made to reflect human interest both in the short and the long term, helping man to live in harmony with his environment, not be a cause of disruption.[21]

[21] An example of an international political agenda that is based on technological constructivist thought is the Kyoto protocol. Negotiations between more than 160 nations to reduce greenhouse gas emissions started in 1992 on the Framework Convention on Climate Change and were agreed upon in Japan in 1997. An example of a concrete policy relating to energy saving is the European Union energy labeling scheme. Since 1995, refrigerators and freezers and later washing machines, dryers and dish washers have to carry an energy label giving information about their performance and physical characteristics. The appliance's relative energy efficiency

MEDIA DETERMINISM

In 1964, Marshall McLuhan introduced the concept of 'media' and gave birth to the academic field of 'media studies' in his visionary work *Understanding Media*. As a reaction to the literary-historical scholarship that dominated Toronto's graduate English department at the time (Theall 1971), McLuhan, himself a schooled literary scholar, proclaimed the precedence of technology over its content in his famous aphorism 'the medium is the message' (7). In a period when information was increasingly being produced and received in visual, rather than written form, his theory filled an important gap legitimating the work of a fast-growing group of advertisers, media directors, communication researchers and avant-garde artists. McLuhan succeeded in catching the optimism and spiritual vibe of the 1960s and translate it into vague yet suggestive theory. To him, media are extensions of the human senses: radio allows you to hear distant sound, television to see far-away events. As such, they are bionic prostheses for boosting human perception. But it does not stop there. For McLuhan, many if not all technologies are fit to qualify as a medium: a shovel as an extension to the hand, a car as one to the feet etc. Telecommunications, for example, are seen as an extension to but also as an externalization of the human nervous system, turning the world into one large organism, a 'global village'. McLuhan sees technology as a way of extending man's abilities on the material and, as would become increasingly clear later in his career, on the spiritual plane. In his work, media acquire a divine status. Electric light, the "purest medium of all" (1997: 8), devoid of message, is identified as a godly light, technology as a force leading humanity to salvation.

In later years, McLuhan develops a more systematic basis for his media theory, which he terms the 'tetrad', and which consists of four laws framed as questions. "What does it (the medium or technology) extend?"; "What does it make obsolete?"; "What is retrieved?"; and "What does the technology reverse into if it is over-extended?" (McLuhan & Powers 1989). When fitting the invention of the automotive car into this framework, for example, one interpretation

is indicated using a color scheme and a letter mark from A to G. By introducing this obligation, the constraints against which engineers develop their prototypes are altered and consumers are enabled to take the new variable into consideration when deciding which technology to buy.

could be that it has extended the human ability to move from one place to another, say the feet; that it has made the horse and carriage obsolete; that speed, endurance and ease of maintenance have been retrieved; and that, when overextended, it could reverse into something we can no longer live without, making us unfit to organize our lives without it. Interesting enough, but where does man, as the inventor and creator of technology fit into this picture? In all four laws of the tetrad, the subject is technology. Every once in a while, a new technology introduces itself to mankind, shows them how it can extend their abilities, takes away their previous extensions, and makes them dependent on it. This is a fallacy however. Technology does not appear out of the blue. It is the result, usually of decades of cultural, social and technological developments in a certain direction guided by human needs and desires. Technology is not an autonomous agent; it is cultural form.

MEDIA CONSTRUCTIVISM

In *Television: Technology and Cultural Form*, Raymond Williams reacts against the McLuhan doctrine. He notes that media theorists invariably see technology as an autonomous agent in society and that they either defend a deterministic or a symptomatic view on technological development. Like determinism, the symptomatic paradigm places technological development outside the socio-cultural sphere, although it does assign a minor, post factum, evaluative role to it. After a technology has been developed, it is introduced to the public, by whom it is evaluated and if it responds to a latent cultural or psychological inadequacy, it will be successful and the inadequacy will be alleviated (12). Despite it being more accurate as to the role of society in the development of technology, Williams rejects symptomatism on the basis that it fails to recognize the constructed nature of the technological artifact, the fact that it is a human creation brought forth as a response to human needs and wishes. For him, the debate between determinism and symptomatism is sterile as both positions, albeit in a different way, have abstracted technology from society. New technologies are claimed to be invented in a vacuum and then introduced into an alien and unsuspecting society. Williams rejects this abstraction and calls for the restoration of human intention in the process of research and development so that technology can be described as a response to known social needs, purposes and practices (14).

In 1986, an even more violent attack on McLuhanism was staged by the historian Brian Winston and published with the difficult to misunderstand title *Misunderstanding Media.* In this extensive study of the socio-cultural factors involved in the invention and marketing of the telephone, television, computer and satellite, Winston rejects the idea of an 'information revolution' and replaces it with 'information evolution'. The blurb on the cover is clear enough: “[Winston] argues that the information revolution is an illusion, a rhetorical gambit, an expression of profound historical ignorance, and a movement dedicated to purveying misunderstanding and disseminating disinformation.” Winston charges against what he calls a “profound tendency to historical amnesia,” which is often accompanied by the assertion that “the pace of change is now so fast as to be uncontrollable or that 'nobody could predict' this or that development” (15). By minutely analyzing the historical context in which various technologies appeared, Winston describes how, for example, the possibilities of using electricity for signaling developed virtually hand-in-hand with the growth of scientific knowledge on the subject. Similarly, the development of photography has continuously reflected the understanding of the effects light has on various substances, an item which has been on the scientific agenda since the Middle Ages. Winston also notes that many inventions such as the telegraph, television and transistors have been thought of before they were actualized, from which He concludes that technological development is not so much an autonomous force as a response to human needs. Scientists and technologists depend on fundamental understanding of both general and scientific matters for their work. They are exponents of both the general culture and the scientific tradition in which they were educated.

Constructivist Game Studies

In this study, I employ a constructivist framework for the description of computer simulation and games whereby I take into account not just technological factors but also elements from the socio-historical and cultural context of their development. Whilst I accept technological limitations as constraints in the development process, I do not see them as determining factors. I reject Janet Murray and Lev Manovich's idea that the shaping of digital artifacts can be analyzed by looking at a strict number of technological principles such as discreteness or interactivity. As I argue in the next chapter, it is correct that computer simulation is a form of discrete, mathematical modeling and as such favors the representation of elements of reality whose structure resembles its underlying technology most closely: spatial simulation and conflict rather than associative narrative development for example. This does not mean, however, that computer simulation and games are determined by technology. On the lowest level, computer processing consists of machine code changing the state of endless arrays of bits and bytes, but with each abstraction layer constructed on top of this binary core (programming languages, object definitions, scripting, graphical interfaces, physical reality engines etc.) computer simulation moves further away from its machine nature into the realm of human representation. As I will show in the next chapter, the basic characteristics of computing are never too far away when analyzing a simulation – just like one can see the lines on a painting and the letters in a book. The truly distinguishing characteristics of the form, however, can only be attributed to cultural factors.

A second group of elements that I take into account in my analysis are socio-historical. Thereby both the context in which computer games are produced and that in which they are received or 'consumed' can be of significance. For example, Steve Russell's *Space War* (1962), the mainframe game usually appointed as the first computer game, was developed at the height of the Space Race between the USA and the Soviet Union at the Massachusetts Institute of Technology, one of America's main research facilities not just for computing, but also space research. Hence it should not come as a surprise that *Space War* was set in outer space, using algorithms devised for simulating various physical phenomena relevant to space faring. *Space War*'s influence on computer simulation and games is difficult to overestimate. Not only did it introduce the space flight theme, but it also played a major role in the introduction of the more general spatial metaphor into computing, an idea which, decades later, would lead to the conception of ideas such as cyberspace, virtual reality, but also the graphical desktop and the 'information highway'. Furthermore, the actual 'ludic' layout of *Space War* lends itself to analysis against its historical context. The game presents two spaceships, one lean and mean on the left (Needle or Pencil) and one large but somewhat unwieldy looking on the right (Wedge). In the middle of the screen, there is a small planet (sometimes referred to as a sun) which attracts the spaceships who are to battle one another by turning, thrusting their engines and shooting their missiles. Several observers have suggested that Needle is actually the American space effort and Wedge that of the Soviets, their shape metaphorically representing their land sizes. The planet in the middle is our own and the game as a whole a symbolical representation of the anxiety towards what the space race could turn out to be.

An example of social context at the other end of the chain, i.e. that of reception by the market place playing a role in the shaping of early computer games is the fact that, initially, they were placed in bars and amusement halls where they were influenced by the existing form of the already popular pinball machine. Nolan Bushnell, the man behind the first commercially successful arcade game *Pong* {1972} and the founder of Atari, was an electrical engineering student when he took a summer job at a carnival. He had seen *Space War* at college and decided to build a cheaper version which could be fitted in an arcade cabinet. *Computer Space* {1971}, a *Space War* clone, was not a commercial success probably due to its complexity, but its successor *Pong* became the father of a now multi-billion dollar industry. Early arcade game machines were placed in cafés and shopping malls next to pinball machines which had existed since the 1930s {Raymond Maloney 1931}. As could be expected, the newly arrived computer games were built in such a way that they resembled the established form. They were meant to appeal to the same public, function in the same social context and collect comparable returns. Thus arcade game machines were fitted with the same quarter slots as pinball machines, inherited their reward system using points and high scores, their three-ball paradigm which became three lives and the possibility to gain extra ones by playing special levels or collecting valuable items. Thus early computer games did not have the epic proportions which they would require a decade later after the development of home computing, and, significantly, it was not due to technical restrictions but to the social and commercial context in which they were meant to operate.

Cultural Context

The main focus of this study is on the cultural factors which have influenced the shaping of computer simulation and games, however, the formal and functional relations maintained by their technology and content with other cultural forms and practices. When looking at action computer game genres, for example, obvious relations include various real-world action sports and games of skill in which agility and dexterity determine how successful the contestant is. When zooming in on specific genres such as racing and shooting games, there are also other relations that deserve mentioning. Racing games, for example, refer to the sometimes seemingly endless chasing scenes in popular action movies and can be seen as being announced by them. Similarly, shooting games resemble shootouts in Westerns, for example, presenting the player with large numbers of thugs with highly inadequate shooting skills and the remarkable feature of dropping dead on the spot after taking one bullet. The space ship theme was inspired by the actual Space Race against the Soviets. Later versions would incorporate various themes from popular science fiction such as alien attack and robot or more generally machine insurrection. A final influence, whose importance is difficult to overestimate is Japanese popular culture. Since the demise of Atari in the 1980s, the computer game industry has been dominated by Japanese corporations such as Nintendo, Sega and later Sony. One important tradition they brought to the table was martial arts, which was already a popular theme in Japanese action films and which would prosper in the so-called beat-em-up computer game genre. Finally, it was also Japanese influence, via Nintendo's *Donkey Kong* {Shigeru Miyamoto 1981} and offspring which would introduce the first computer game characters, heavily stylized after manga and anime examples into the platform genre (see also chapter 4 on avatarial introjection).

Computer game genres such as text- action- and point 'n' click adventures are heavily influenced by the Western narrative tradition. They introduce characters, usually through a background story, a narrative conflict between the player-character and a dark force and propose an exit strategy, a way of lifting the conflict. Then the player is urged to step into the identity role prepared for him (see also chapter 4 on introjection) and resolve the main narrative conflict by engaging in a number of episodic subplots. Computer role-playing games on the other hand have their own cultural heritage in card and live role-playing games in which people would gather, take on the role of a mage, a rogue or a warrior and set out on a quest lead by the dungeon master and his rule-book, a quest of which the outcome would be determined by collecting valuables, learning skills and magic and long rounds of dice-throwing. The most important predecessor to computer role-playing was Gary Gygax's *Dungeons and Dragons* {1974}, whose quantitative approach to almost every aspect of the fictional universe would have enormous influence on computer gaming. (I go deeper into this in the next chapter when discussing mathematical modeling.) The origins of strategy games, finally, can be traced over board games like *Monopoly* and *Risk* {Albert Lamorisse 1957} to war games (Kriegspiele) as they were played by Prussian officers in the nineteenth century.

To conclude this discussion of the constructivist approach to game studies, I propose to illustrate it by way of a short exemplary analysis of a typical element of the computer game form, i.e. the existence of separations between playing subsessions usually referred to as rounds or levels. Of course computer games were not the first form to use rounds. Several sports, most notably boxing, are organized in stages. Why the technique was actually introduced in computer games is difficult to ascertain, but the best explanation is probably the technological. Early computing systems had only very limited computing power and memory and could therefore interpret only a limited set of instructions in one go. Hence when all computer-controlled entities were killed by the player, the game designer was forced to present a new, even greater challenge. Because of the technological limitations which he faced, the easiest solution was to simply reintroduce, sometimes in slightly altered form, the same game but at greater speed and therefore higher difficulty. This renewal would be preceded by a short break while the system would be reinitializing and then round or level two would start. Later, computer systems would not have such severe technological restrictions anymore. Level design would remain popular, however, largely because of the social function it acquired. Even more than points and high scores, levels were a clear indication of skill, a sign which could not only be used to set personal goals, but also to communicate past achievements. "I got to level eight yesterday." This, like film montage,[22] level design, which was initially a technological drawback became a cultural code and eventually a convention.

MIRROR, MIRROR, ON THE WALL

To conclude this chapter, I will consider the possibility of going one step further in the analysis of computer simulation and games as a cultural form. That is, I would like to look at them as not just a typical product of their day and age, but also as a more fundamental 'sign o' the times', something bearing within its very structure the interests and preoccupations of the culture in which they developed. Tentatively, I start my discussion with the observation that the 20th century has been characterized by an important shift in our conception of time. While the 19th Century was still firmly tied to the historicist perspective, in the 20th, inspired by the system of industrial production, the cultural focus moved from past to present. In 1916, Saussure proclaimed the prevalence of the synchronic over the diachronic perspective. Language and culture were to be studied as a system functioning in the now, not as a result of yesteryear's changes. In structuralist terms, cultural interest shifted from the syntagmatic axis of concatenation to the paradigmatic axis of choice. Cultural expression was no longer to be seen as a product of tradition but as a sign deriving its meaning from its relation to other signs within a system of choice. In this way, it can be said that, increasingly, the way twentieth century man saw reality became determined by analysis of the different elements constituting the present rather than by narration of the past. As Jos de Mul observes (2002: 19), Western culture has been evolving towards a post-historical conception of time, no longer seeing it as a diachronic continuum, but more as a succession of synchronic 'nows'. As a

[22] Due to the limited length of film strips, early film makers were forced to 'cut up' their film in different scenes. Gradually, however, cuts were more and more being used within one scene to add weight and meaning to certain events and images. Cutting thus evolved from a technological constraint into a basic cinematographic technique: montage (cf. Manovich 2001: 144).

state machine, the computer can be seen as an exteriorization of this interpretation and computer modeling as its connate form of representation.

Furthermore, it can be argued that, concomitantly, Western society has been organizing itself by issuing rules in the present in order to control the future rather than by guaranteeing continuity with the past. Politically, judicially, socially, and economically, Western society has placed more and more emphasis on rational 'rule-government', on systemic organization of society. Whilst since the Enlightenment, society had been increasingly organized appealing to human judgment, the Second World War has made it clear that that would not be enough. Human society would be needing a powerful system of rules to fall back on in case human judgment would ever be clouded again, a structure not so much replacing man as helping him to keep control over himself and his fellow citizen. Computer simulation can be seen as a reflection of this view on reality and man's role within. As I further develop in the next chapter, computer simulation is a quantitative, rule-based system of behavioral modeling. Unlike traditional, fixed, time-based narrative forms, it is a dynamic, spatially organized system of entities, each with their own set of quantitatively defined variables constantly regenerating and at all times controlling an endless succession of virtual 'nows'. As a player, you are offered an active role within this system. You are urged to introject (cf. chapter 4) yourself into its fictional environment. At the same time, however, your role is reduced to that of a firmly entrenched, quantitatively defined entity. Within the simulated physical environment you can do anything your role allows you to, but there is no outside that role. There is no escape from the system of rules as it is constitutive of your very being there. In other words, you are free to push any button you like, but there is no way that you can add a new one.

A third and final typical element of twentieth century Western society that one can see reflected in computer games is its growing emphasis, not just on rule-based arbitration, but on the organization of competition between individuals and organizations so as to increase efficiency and productivity. An interesting parallel can thereby be drawn between the market principle and computer simulation. Both are quantitative models consisting of abstracted, discrete entities whose relations to one another are defined solely on the basis of quantification. As such, both are an interpretation of reality, not in words or drawings, but in numbers and abstracted signs functioning within one large system of relative value. Moreover, both systems, because of their numerical and quantitative but also their reductive nature – their being based on exact rules and linked with clear goals – allow for the organization of competition whereby every contestant has, at least theoretically, an equal chance of winning. By abstracting reality away from the play dynamics, man is no longer impeded by his prudence and anxiety. There is no ethical responsibility in a game as there is none intrinsically for a for-profit corporation: the only goal is to realize growth, to become more efficient so as to outclass your opponents. Both the game's rules and its goals are defined by the system, delivering man from all responsibilities except the ones imposed by the game. As I argue in the third chapter on virtuality, rule-based modeling is very much an interpretation in itself, however, an interesting technique which can have its uses in society, but which should not be mistaken for that which it is abstracted from, i.e. reality itself.

II

Computer Simulation

"Only in mathematics will we find truth."

Doctor Who, episode 88, Robert Holmes, 1975

Much has been written on the 'nature' of the shift from analog to digital media creation and preservation, but only few authors have succeeded in describing the transition in such clear, illustrative terms as Timothy Binkley in "Refiguring Culture" (1993) and "The Vitality of Digital Creation" (1997). Art, in the sense of creative expression, is typically associated with the imprinting of timeless form in material substance, "legacies enshrined in material objects with more staying power than mortal flesh" (1993). Artistic creation enables man to imitate god and produce artifacts which exist independently from their creator. With the invention of the printing press (Laurens Coster early 15th C./Johann Gutenberg 1450s); and later technologies such as photography (Nicéphore Niépce 1825/William Talbot 1835/Louis Daguerre 1839); recorded sound: gramophone (Thomas Edison 1877) / phonograph (Charles Cros 1877); film:

kinetoscope (Thomas Edison 1891) / cinématographe (Lumière Brothers 1894); radio (Guglielmo Marconi 1896/Nikola Tesla 1897); and television (Philo Farnsworth 1927/Vladimir Zworykin 1929), art became mechanically reproducible and lost its so-called aura of authenticity and uniqueness (cf. Walter Benjamin *The Work of Art in the Age of Its Technological Reproducibility* [1938]). Copies of an original could be made mechanically by reading and imprinting the available information into different material substances, producing an analog (not an identical copy, hence these technologies would later be called analog media). Analog carriers copy information by transcribing it, by translating its image from one physical material onto another. When a picture is transcribed into an analog video signal, for example, a particular amount of light is matched to a particular amount of current. Subsequently, when recording this analog video signal onto tape, the changing magnitude of the electric current is transcribed into similar changes in the magnitude of a magnetic field.

Whereas analog media record impressions and make imprints in different material carriers, digital technologies take measurements and store numerical entities.[23] When a digital video system, for example, converts light into magnetism, it strips the structure of the physical event away from its underlying substance and turns the incoming signal into a pure abstraction, a file of numbers unattached to any intrinsic material alliance. Digital media convert, rather than transcribe the information they preserve. Whilst analog media record information in the material disposition of concrete objects, digital technology stores it as formal relationships in abstract structures. Copying information from one digital carrier to another does not take place by transcription, by making imprints of imprints, but by reading and inscribing the same numerical data each time anew. Thus, each digital copy, even if it is many generations away from the original, is still its identical twin. "Once converted from percepts into concepts, from material into numbers, information is freed from the infinite regress of transcription" (1997: 111). The first sign type to make the move from analog to digital was text, which came with the first 'killer-application' for the home com-

[23] Amy Divila notes that the move toward a digital ontology of measurement is not exclusively a technological matter, but could also be observed in other cultural manifestations such as conceptual art, "an art practice which suggested that the art had traversed from object to idea, from a tangible thing to a 'system of thought'" (2002).

puter next to computer games: text-processing. Later, rudimentary forms of images and music were introduced, and in the course of the 1990s the moving image migrated. As computers and algorithms grew more powerful, by the turn of the millennium, the initially crude forms of digital media had surpassed their analog predecessors qualitatively in most areas, turning the computer from a dull number-crunching calculator into an almost universal media player.

Once digitized, converted from material representation into abstract structures and data, information becomes manipulable: it can be analyzed and modified virtually. A digital photograph for example can be loaded into the computer's memory and then manipulated using manual tools or automatic filters. When changing the color balance of a photograph, for example, the computer applies a mathematical algorithm to every element (pixel) in the file and then redraws the result on screen. Computer simulation and games are an extreme application of the manipulability of digital information. They consist of large numbers of predefined data-structures (think photographs) and an algorithmic framework (think filters) determining how the entities of the simulation should interact and how the game should evolve from one state to the next. In this chapter, I go deeper into the ontological foundations of computer simulation and describe how it can be seen as a response to the cultural desire for a more quantified and dynamic framework for understanding and representing reality.

In the first section, I deal with the technological principles underlying mathematical modeling, the way in which dynamic structures of quantified data are used to represent reality. I define computer simulation as an approximative model set in motion. I describe its internal structure as consisting of entities, states and events. I evaluate its specificity and limitations as a form of representation. And I identify the course of events in a computer simulation as an emergent phenomenon, a structure developing from the myriad of individual interactions of its components rather than from a fixed structure. The second section is a brief excursion into the field of artificial intelligence. I introduce Turing's imitation game, I evaluate Searle's refutation and I look at the systems approach, which in turn defies Searle's argument. The third section looks at the interpretation process when dealing with computer simulation. My claim is that, despite it being a dynamic, changeable form, it is no more and no less than a form of representation and is therefore liable to interpretation. To illustrate this point I demonstrate how strategy and simulation games are inevitably the product of a specific, culturally determined world-view and look at propagandistic games advertising a political viewpoint. In the fourth and final section, I investigate how the idea of using measurement for representing reality accords with the society and culture in which we live. I look at Turkle's claim that computing has gone through a transformation from calculation to simulation and evaluate the dangers of placing too much emphasis on modeling and quantification by evaluating Baudrillard's claim that our society and culture are slowly turning into simulations themselves due to their reliance on modeling and representation as opposed to actual reality. I reject this point of view, however, by pointing to the fact that a society in transformation is likely to develop new ways of representing the world and that they should be seen as an opportunity, not as a problem.

1. MATHEMATICAL MODELING

The word 'model' comes from Italian 'modello' (diminutive of 'modo': form, shape) meaning 'smaller version' or 'smaller form of' as in 'model airplane'. A model of something is at the same time an autonomous object, e.g. a toy or an ornament, and a sign referring to its larger, real-world counterpart. It is an artifact which, by having recognizable characteristics evokes a mental representation of something else. This effect is achieved by imitating certain traits from the original such as its proportions and physical abilities (e.g. a Matchbox car {Lesney Toys 1952} having the proportions of, say, a Ferrari and small wheels so that it can drive somewhat like the real thing). Modeling an object involves taking its measurements and recreating its proportions in another form. The same model can be drawn on paper, built in wood or simulated by a computer. There are several advantages to creating a computer model over a paper or a fixed material representation such as cost-effectiveness and manipulability. The most important advantage, however, is the fact that it allows for cheap dynamic modeling or simulation: the detailed imitation – not just of geometrical shape and color – but also of an object's behavior in various circumstances. Because of its ability to calculate myriads of variables in real-time, the computer is the ideal tool for the generation and maintenance of mathematical models.

The complexity of a computer model can vary depending on the object or system that is represented and the behavioral aspects it is required to imitate. If we wanted to describe the constant movement of an object through time, for example, a simple equation like [distance = speed * time] would suffice. Real-world systems, however, tend to be much more complex. In that case, the behavior must be estimated with an approximative mathematical model (cf. Smith 1999: 2-3). When building a computer simulation, a designer selects a number of parameters which she believes are relevant in determining a system's behavior, translates them into mathematical functions, programs them into a model and runs it. When the behavior of the model is insufficiently similar to that of the real-world system, the designer will start again and incorporate more parameters or implement them in higher detail. If the similarity is sufficient for the purpose of the simulation, the model is retained. Many complex real-world phenomena are impossible to reduce to a finite number of parameters. Hence, like every other form of representation, simulations are approximations. First of all, they are selective in their representation of relevant factors from the real-world because of its complexity, due to practical or technological restrictions or because of the nature of the simulation which may be, for example, to entertain rather than to imitate in detail as is the case for computer games. Secondly, the selected parameters are abstractions, interpretations of phenomena of possibly ultimately ungraspable complexity usually in terms of linearly measured variables. And thirdly, simulation is always an imitation of the results of the process, not of the process itself, it is a representation of the surface, not of its actual mechanics. The relation between a model and its actual counterpart is one of resemblance, not of identity.

DEFINITION

A computer simulation is an implementation of a model over time,[24] a representation of a system's behavior set in motion. In a scientific context, simulations are used for research into and optimization of complex systemic processes. When designing a simulation, assumptions are made about various relevant parameters of a system, from which algorithmic descriptions of relations between entities are derived and from which a virtual model is developed. This model is then set in motion and observed through various interfaces so that it can be evaluated by comparing the feedback from the model to the behavior of the real system. When the resemblance between the two is unsatisfactory, algorithms can be refined and variables added until the model behaves sufficiently similar to the original. Once this geometrical model is established, its variables can be altered and the simulation can be run again. In the strictest sense, from this moment on, it is no longer a simulation of a real system, but of one that exists only within the computer. Formula One engineers, for example may create a model of their latest design. They program it, evaluate it, and refine it until it behaves almost like the real car. Once this is done, they can start experimenting with the simulation, change the shape of the tail, lower it, bend it or remove it entirely and watch their virtual prototype leave the race track and blow to pieces. Computer models allow for better understanding of the behavior of complex systems and predict their movements. They are not copies of their real-world counterparts, however, and will almost certainly return distorted results when presented with situations outside the realm of their intended application.

Today, systems as diverse as factories, communication networks, traffic, space flight, economy and social interaction are being computer-modeled. For each of these, a simulation of the system has proved to be more cost-effective, safer, faster, or otherwise more practical than experimenting with a real system (Smith 1999: 2-3). Apart from that, simulations are increasingly being used for training when live training is too dangerous or costly, e.g. in the case of dis-

[24] Ironically, time itself, or rather its registration, can be described as a simulation based on an ontology of measurement as clocks are fundamentally quantitative models of our planetary system (cf. Weizenbaum 1976: 24).

aster- or military combat training. The form under which computer simulation is best-known, however, is interactive entertainment: i.e. computer games. Purists may say that computer games are not simulations of real-world processes, but neither are the majority of experimental or training simulations. Most of today's computer games use simulation techniques to generate participatory worlds, whereby, as in scientific or other types of simulation, there is at least a minimal resemblance between the model and reality. What differentiates a computer game from a scientific simulation is its goal. Whereas scientific simulations aim to imitate reality as closely as possible, game simulations have no such restrictions and allow their programmers to create worlds restricted only by their imagination and the available computing power.

MECHANICS

Every computer simulation can be said to consist of entities, states and events (based on Smith 1999: 11). *Entities* are its basic constituents. A useful aid in understanding the functioning of a simulation is to think of it as a game of chess. The pieces would be the entities of the simulation, i.e. the elements that have a value and a meaning within the game system. This value is determined independently from the physical shape of the pieces. You can play chess using beautifully carved marble pieces or you can play it with seashells. The game itself would register no difference. It is the entity's role and position within the game that determines its value, not its shape or size. The *state* of a simulation consists of the collection of all its variables' values at a specific point in time. In chess, it would be the sum of the positions of all pieces at a specific point in the game (after one move and before the next). It is the game state which determines the power relations between the entities in the game and their possible next moves. *Events*, finally, are actions that change the state of the system. In chess, the only possible event within the system is the movement of one of the pieces (or several in the case of a rocade). Players may scratch their head, go to the toilet, or fall asleep for all that matters, the game of chess only records moves, and moves are the only events that change the state of the game. Events are the key items that make transformations in the model and drive it through its operations. Different simulations implement different possible events, which can be actions performed by the user (as in chess) or events scheduled by the system (e.g. the arrival of an airplane in a simulation of an airport). The latter are typically managed by queues (lists, stacks) in the model. These queues identify which events are ready to be processed, which are waiting until a specified time, and which must be triggered by specific conditions. There are several types of queues. The most common are first-in-first-out (fifo, e.g. trains in a railway station), last-in-first-out (lifo, e.g. job turnover in a company), ordered (e.g. predefined sequence of events), and random (12).

There are two types of simulation based on the way in which they change from one state to the next: discrete event and continuous simulations. In a *discrete event* (or event-stepped) simulation, state variables change only at distinct points in time (3). Most logic-test and fault-tree simulations are of this type. In discrete event simulation, the system manages a queue of events sorted by the order in which they are to occur. The simulation reads the queue and triggers new events sequentially. A discrete event simulation is not meant to run in real time, but is built to access the statistical data generated by the system to discover logic defects in its design or to improve efficiency. My chess example would be a discrete event simulation since it only changes states when one of the two players makes a move. Games of chess can be played by email or post over a period of days, weeks or months. The system does not take into account or even register the intervals between moves (unless a timer subsystem is added for limiting playing time). Every move in the game is a discrete event changing the power relations between pieces and therefore the global system state.

In a *continuous* (or time-stepped) simulation, variables change according to time. A continuous simulation uses differential equations, which are periodically solved (usually many times per second), and whose results are then used to change the state and output of the simulation. The majority of computer games function in real-time and are therefore continuous simulations.[25] Originally, continuous simulations were implemented on analog computers where the dif-

[25] Turn-based strategy games such as *Civilization* {Sid Meier 1991}, for example, are not however. They are discrete state simulations only changing state when the human player or the computer makes a move.

ferential equations were represented directly by various electrical components. By the late 1980s, however, most 'analog' simulations were run on digital computers emulating the behavior of analog equipment. A digital computer is a discrete state machine, but it can simulate continuity by changing states at very short, regular intervals. In practice, most simulations and games use both discrete and continuous variables, but usually one of the two structures is predominant (3). If we look at *Pacman*, for example, it would probably be classified as a continuous simulation: ghosts and Pac move independently and continuously, changing the state of the system at regular intervals. When Pac-Man eats a blinking pellet, however, a discrete event is triggered, causing the hunters to become the hunted for a predefined period of time.

APPLICATION

Roughly speaking, computer simulation is used for modeling two types of phenomena: physical and behavioral. Most scientific and industrial simulations model complex physical phenomena such as traffic flow, aerodynamics, factory throughput etc. These simulations are attempts at identifying the relevant entities, states and events in a physical process and create a model as granular, that is, as close to physical reality as possible. For example, we could try to build a simulation so as to determine the best position for a number of highway exits.[26] We could program a virtual highway, add the desired exits, moving vehicles, let the simulation run and collect statistics. We could do this a number of times with different parameters, compare throughput and determine which position would be best for the exits. We would not be sure of whether our exits were optimally implemented however. A real-world highway does not consist of uniform vehicles, moving at a constant speed over smooth, straight asphalt in optimal weather conditions. There are cars, trucks and buses driving at various distances. Highways climb and descend and are curved when they approach towns or cities (which is where exits are usually needed). There is night and day, different weather conditions etc. To take these extra factors into account, we could extend our physical simulation: make it more granular and precise. But

[26] Please note that my descriptions are not meant to be a realistic account of the creation of a simulation, but to explain its basic principles.

even then we would not be sure whether we have identified the ideal positions for the exits. A simulation is an artifact meant to raise consciousness regarding a specific phenomenon (cf. Turkle 1995: 72). It is not the thing itself, however, and neither will it ever be.[27]

A second reason why our simulation does not reflect real circumstances is that real-world actors do not continually behave in the optimal way. Cars and trucks are not inanimate objects, but vehicles driven by humans who each react in their own specific way to environmental stimuli. When representing these 'second order' phenomena, simulations use what is called *behavioral modeling*. As the use of simulation has extended beyond the modeling of complex physical phenomena, the need for a way to represent human and group behavior has been growing. To accommodate this need, simulation developers have turned toward artificial intelligence techniques. Although influenced by physical simulation, these techniques are ontologically remote from the above highway example. In the next section, I go deeper into the mechanics of artificial intelligence, but for the moment it suffices to note that it does not model the functioning of the brain itself, but rather (a tiny part of) its output. Most behavioral models are based on stochastic simulation, whereby the probability of a certain behavior is calculated rather than its actual cause. To return to our highway exit program, we could measure the number of accidents caused by cars attempting to overtake trucks, for example and then simulate what would happen if trucks were advised to take another route. Note that we do not know whether these accidents are caused by cars overtaking trucks, however, or even that they would occur at all. They could be caused by a myriad of other factors such as blinding by the sun, bad road surface or UFO sightings for all that matters. Stochastic modeling ignores all these factors and only registers the numbers. Hence it is highly dependent on the researcher's interpretation of a situation.

[27] In an article titled "Playing to win" in *The Economist Technology Quarterly* of 4 December 2004 (18-19), the question is raised whether training simulations can be a faithful representation of real-world situations and whether skills translate as easily from the virtual to the real as vice versa. A case in point is that of Dwight Freeney, a professional football player who also won the (virtual) 2004 *Madden* {Electronic Arts Tiburon, 2003} Bowl, a computer football tournament. At one point Freeney played himself (all players in *Madden* have individualized characteristics modeled after the real person). His comment on his virtual counterpart was careful yet brief. "It is not the total Dwight Freeney, but there are some similarities."

For the representation of statistical rather than deterministic interpretations of events, stochastic models use random number generators. These special-purpose programmatic functions can be instructed to return a random number within a certain range. These numbers can then be related to various events within the simulation which are only triggered when they equal specific values. For example, if we knew that, when it is raining, one car in a million that is overtaking a truck, would cause an accident, we could let the computer generate a random number between one and a million every time a car overtakes a truck. When the generated number is, say 'three', we could make the car cause an accident. There are two important remarks to be made about this example. First, within the simulation there is no intrinsic reason why the particular car number three would cause an accident. There is no modeled stress, road surface or alien invasion. There is only an author of the simulation who has observed a certain behavior in reality and imposes it top-down on the simulation. Secondly, and at first sight contradictorily to the previous, algorithms generating random numbers are not random. They are deterministic and merely provide the impression of randomness by using the time and date from the computer's internal clock and performing a series of calculations on them. Hence the generated number is no more than a calculated derivative of the time that the system is running. Thus our car number three neither causes an accident because of bad driving nor because of some divine intervention. It crashes because the person running the program decided to fire it up at a certain moment in time, a factor which is entirely external to the simulation's virtual ontology. Stochastic modeling is used to simulate phenomena as diverse as weather patterns, viral replication, the movement of a flock of birds or a school of fish being chased a predator, stock markets and human behavior.

DESIGN

Visually, the first instance of our highway exit simulation would probably have been a simple two-dimensional model using a birds-eye perspective. The highways could be represented by two-dimensional coordinates drawing a long thin band on the screen. Vehicles could be simple rectangular blocks determined by their coordinates, moving across the highway and every tenth vehicle or so could be programmed to try to leave the highway via our freshly implemented exit. When the lines between the coordinates of different vehicles would cross, this could be interpreted by the system as a collision and the animation of a road accident could be triggered. If we wanted to include height differences in our simulation, we could try to stick to our two-dimensional design and represent hills by causing the vehicles to slow down on certain strips of the highway (as if they were driving up-hill). This would not be sufficient, however, as it would be impossible to implement the driver's viewpoint. When you drive up a hill, you do not see what is behind the top. If we wanted to include this factor, we would have to move to a three-dimensional design, in which our highway could go up and down, and our vehicles are not just flat squares, but three-dimensional objects with a certain height and a driver point of view. This type of modeling is usually referred to as (3D-)*geometrical*, literally meaning 'measuring the world' in Old Greek.[28] Again, it is important to note that a three-dimensional model is not a duplicate of reality. Geometrically modeled cars, for example, do not consist of atoms. They do not stretch and shrink with temperature variations unless we program them to. And the engine parts do not make noise unless we trigger the playback of a sound file.

The virtual objects in a three-dimensional geometrical simulation consist of *polygons* (from Old Greek poly, for 'many', and gonos, for 'angle'). Polygons are defined by Cartesian coordinates (x,y,z axes). Think of a transparent three-dimensional cube defined by eight angles or vertices. These vertices are then connected by straight lines in the order that the coordinates are stored, drawing the edges and sides of the polygon. In the case of our cube we would have eight times three ordered coordinates connected by 12 edges surrounding six square planes. The sides of the polygon constitute the boundary of what is called the polygonal region. Where two planes of an object meet, a line is drawn, but the planes themselves have no actual surface. This method of programming virtual objects creates a skeleton also known as a *wireframe*. Once the object's shape is

[28] The idea of geometrical modeling can be traced back to Plato. In the *Timaeus* (360 BC), Plato's eponymous speaker reasons that the entire universe is made up of simple geometrical shapes that can be represented by the first four numbers: one is a point, two is a line, three is a triangle and four is the simplest non-spherical solid, a triangular pyramid (Poole 2000: 126).

determined and implemented, the planes can be filled out. In the early days of three-dimensional simulation, computers could barely keep up with continuously calculating the different positions of all vertices so that the planes of the polygons were usually filled in just one color. As processors grew more powerful and hardware acceleration became more common, however, the desire for graphical realism drove designers to more sophisticated techniques for filling out planes. One such technique is *texture mapping*, whereby a two dimensional graphic (sometimes called a skin) is drawn and then virtually wrapped around the polygon as you would wrap up a present.

If we return to the highway example and we wanted to create a three-dimensional model of a car, we would first analyze its shape and identify the separately moving parts. We only need a simplified version of a car so we would probably only distinguish the body of the car, wheels, doors, trunk and wipers. Next, as described above, we would look at each part separately, describe its geometrical shape in coordinates, create a wireframe and assemble our virtual car. The next step, would be to think about animating it. One popular technique for animating objects is *inverse kinematics*. First, the hierarchical relations between the different parts of the object are described. For our car, this is simple since we want the different parts simply to remain together when moving. If we wanted to animate a waving arm through the window, however, we would have a much more complex relationship. Then we would have to divide hand and arm, and break the arm into two separately moving parts. Next, we would determine the relations between the objects (hand, arm1, arm2, car),[29] their hierarchy and geometrical relations. Then, in the case of inverse kinematics, we would order the child object (hand) to move sideways and the two subsequent parent objects (arm below elbow and arm above) to follow. Another method which is becoming more and more popular is *motion capture*. In this case, actors are hired and asked to act out the different movements wearing a

---

[29] Again, I want to stress that these are simplified descriptions. Complex game objects like the cars in *Gran Turismo 4* {Kazunori Yamauchi 2004} for PlayStation 2 consist of ten to twenty-thousand polygons. Increasingly, computer game and console manufacturers are using the number of polygons calculated per second as a measure of visual realism (which is of course a simplification since polygons can differ in complexity and other factors like design, texturing and shading).

suit of sensors, transmitting series of coordinates to a central computer. These coordinates are then mapped onto the skeleton of the game character and translated into fluid, realistic motion. To conclude, I would like to stress once again that even realistic three-dimensional simulation is no more than a simplified representation. Our simulated car, for example, does not move because it has wheels or an engine. It moves because it is defined within the system as an object with certain qualities, one of which is moving across a highway. For the simulation, a car is only an animated moving polygonal area. If we changed its shape into that of an office building, we would have office buildings moving down the highway. Or if we programmed the cars to flap their doors as wings and define flying as one of the properties of the object 'car', they would fly.

EMERGENT PLAY

Complex behavioral simulations such as computer games do not consist of one top-down structured set of procedures and subprocedures which are executed sequentially. Rather, a number of object types are created (e.g. highway, car, truck), to which properties are attributed (e.g. shape, possible position, ability to move, distance to be kept from other objects etc.). Then, within the simulation, a number of instances of these types are generated: sometimes directly by the author (e.g. position of highway and exits), or according to a predefined algorithm (e.g. number of cars and trucks according to time of day, weather etc.). All these different objects have their own set of variables which change state constantly according to their own internal structure and design, but also according to the behavior of other objects in their vicinity. When an instance of an object car observes that the object truck in front is slowing down to leave the highway, it may likewise slow down and adjust its own state according to the other vehicles. Hence, the global state of the simulation is not so much the result of one centralized analytical structure, but rather of the sum of the behaviors of all its objects. As mentioned previously, simulations are often built precisely to map behavior that is impossible to describe in one structured analytical model because of the high number of parameters or their complexity. As such, a simulation is built to analyze a certain behavior that is impossible to explain from any of its parameters or separate parts alone. This type of structured behavior of a complex system that is impossible to reduce to the behavior of any of its separate parts is usually referred to as *emergent behavior*.[30]

Emergence (from Latin emergere: to come forth, come up, extricate oneself) refers to the development of properties, behavior patterns or structures in a complex system due to the interactions of its elements over time. An ant colony, for example, emerges from a large number of rule-based actions carried out by the separate ants. Emergent phenomena are unexpected, nontrivial results of relatively simple interactions of relatively simple components. The question of whether our highway exits are placed correctly does not depend on just the geography, just the number or type of vehicles, or just the weather; it depends on the interplay between all these and other factors. It is the emergent dance of interactions between different entities within the simulation that determines what would be the best location for the exits and the more parameters that are taken into account, the more granular the simulation is, the more reliable the obtained results will be. A second implicit requirement for a behavior to classify as emergent is that it must display a certain structure, an unexpected pattern as if the system as a whole were guided by a higher level of intelligence. A classical example of emergent behavior in nature is the movement of a flock of birds or a school of fish. Each individual bird or fish only reacts to the behavior of its neighbor, yet the flock or school as a whole moves as if according to a predefined choreography. Emergent structures are the bottom-up, decentered, adaptive structure par excellence. With every move the entire system is regenerated, taking into account different environmental factors. Its stability is assured by its complexity, not by any single crucial part. When one or a few fish in the school are eaten by an orca, the rest continues its evasive moves disregarding. Finally, system redundancy is low because of the simplicity of the individual behaviors of its parts. All these qualities can be said to have contributed, for example, to the success of market economies, which rely on emergence, as opposed to plan economies which are top-down centralized and therefore tend to create a high level of redundancy.

[30] For a more general description of emergence, see Steven Johnson's book on the subject (2001).

The concept of emergence is used to describe properties, behaviors and structures. In physics, for example, emergence is used to describe *properties* which occur at a macroscopic, but not at a microscopic level, despite the fact that the macroscopic system is only an ensemble of microscopic entities. One example is temperature. Individual particles can have energy, momentum, and velocity, but not temperature. Temperature only emerges when considering an ensemble of particles large enough for the laws of thermodynamics to apply. Another example is color. Elementary particles like protons or electrons have no color. It is only when they are arranged in atoms that they absorb and reflect specific wavelengths of light and display a color. Other examples of emergent physical phenomena include friction, viscosity, elasticity etc. In biology, the concept of *emergent behavior* is used to describe the structured behavior of large groups of organisms. Examples include the behavior of flocks of birds, schools of fish, but the most fascinating is the organization of ant colonies. Each colony sends out members to find food, clean up waste material, dispose of dead corpses, and drive away invaders. Yet, there is no centralized leadership organizing these tasks or giving assignments to the individual members of the group. Ants 'decide' what functions they need to carry out by interacting with one another and by sensing the pheromones secreted by other members. Each ant is an autonomous unit that reacts depending on its local environment and a number of genetically encoded rules. Interestingly, researchers have discovered changes in the behavior of ant colonies over time, showing what could classify as learning behavior. For example, a colony can learn about the geography around the ant hill. *Emergent structures*, finally, are best described as a result of emergent behavior. Typical examples are the design of naturally grown cities, the shape of galaxies, and the long-term behavior of the stock market. Significantly, these structures are not created by any single event or rule. There is no higher intelligence commanding the system to form a pattern, but instead it is the interactions of its parts with their immediate surroundings which produces the complex process that leads to order.

Emergent Narrative

Computer games are simulations consisting of virtual entities interacting on the basis of rules. Every object is defined by variables determining what it can and cannot do within the virtual environment. In a racing game, for example, you have a number of different types of cars, each with their stronger and weaker points. Advantages and disadvantages are distributed according to a paper-scissors-rock pattern. One type of car has the highest top-speed, but the other accelerates faster, and a third has better road-holding. All these cars are programmed to perform certain actions: accelerate, change gears, slow down, turn etc. Apart from these physical properties, each car is given certain behavioral traits. All cars in the race are programmed to finish the race as fast as possible, but their strategies may vary. One may drive offensively, trying to overtake at every possibility (using more gas, going faster through tires etc.). Another may drive defensively, waiting for the perfect opportunity to overtake. A third may be programmed to drive maliciously and block the cars behind him (with the risk of causing an accident or being disqualified) etc. The behavior of at least one car is linked with the input of the player. Each possible action by the object is mapped onto a number of clicks and/or key-presses by the player (e.g. joystick up/accelerate, click/change gear). Significantly, in computer games there is no all-encompassing script or scenario.[31] All entities (including those controlled by the player) perform a high number of relatively simple actions on the basis of environmental factors within the virtual world (slow down when approaching curve, overtake opponent on straight strip). Hence computer game play is often described as an emergent phenomenon (e.g. Aarseth 1997: 29; Juul 2005). There is no 'author' determining the course of action in a top-down imposed script. Rather, it is the myriad of different actions and decisions made by players and system that determine both the course and the outcome of events.

Emergent play refers to the fact that in each instance of game play, from a limited number of possible actions defined by the system rules a higher structure emerges. Both computer simulation and games are meant to be repeated and varied, allowing the user/player to learn from variation. The system is

[31] In most computer games, there is a global scenario, but it functions more as a goal within the game, determining the order of the action rather than the action itself.

pushed to its limits producing variation after variation of related situations and the player is invited to experiment with different strategies. Thereby, it is often the case that both system and player behave in ways unforeseen by designers and programmers. A straightforward example is a chess program which plays better than all of its programmers combined, and which may win from Grandmasters, they could not have dreamed of competing with (cf. Aarseth 1997: 27). Similarly, players in complex virtual worlds can behave in ways unforeseen in the design of the simulation. In *Quake*, for example, players discovered that it was possible to jump unnaturally high by launching a rocket downward when jumping. Following the laws of action/reaction the players body was thrust upward at the launch (Kücklich 2004). Sometimes, players push the limits of the simulation so far that its artificiality is exposed. At one point in *Deus Ex*, for example, a first-person action adventure, the player is provided with attachable bombs ('LAMS') to blow her way past a number of obstacles. Players discovered that they could climb the walls of buildings using these bombs. They would attach a bomb, jump on it, attach one higher etc. In this way, players reached places they were never meant to explore (Aarseth 2004b: 371).

Sometimes, game designers are forced to break physical laws so as to keep game play interesting. In the multi-player version of *Return to Castle Wolfenstein* {John Romero & John Carmack 2001}, for example, players who are revived by a medic are programmed to be invulnerable for a brief moment in time so that they can seek cover safely and avoid being shot again and again. Aarseth reports, however, that this 'quirk' in the physical simulation was quickly discovered to be exploitable to jump over walls. Players would commit suicide next to the wall and make sure that they are revived next to an exploding grenade. The power of the explosion would then catapult them over the wall and permit them to attack the defenders from behind (2003: 3-4). Finally, whereas the above examples consist of isolated instances of game play, in persistent worlds in which thousands of players take part in games which last months if not years (see also next chapter), emergent behavior can have even more profound consequences. Will Wright, the designer of games like *SimCity* {1989} and *SimAnt* {1991} reports about how surprised he was about the directions in which his *Sims Online* {2002} evolved. Particularly, the sexual dynamics between players (several instances of prostitution have been recorded, some in which minors were involved, see Manjoo 2003) and the development of power structures within the virtual world were unexpected. Wright observes, for example, that, although the game was designed so that characters could not hurt or inhibit one another, quickly a kind of organized crime developed. Players found ways to annoy others and used these to wield their 'mob power' and go after what they called 'the griefers', people who played the game in a (from their point of view) inferior way (Wright 2005).

For some researchers such as Espen Aarseth (2001b, 2003, 2004a, 2004b) and Jesper Juul (1998, 2001, 2005), emergent structures are not just radically different from traditional storytelling, but also incompatible with the very notion of narrative. Like with 'ergodics', Aarseth opposes the idea of emergence to that of narrative development. “Simulation is the hermeneutic other of narratives; the alternative mode of discourse, bottom-up and emergent where stories are top-down and preplanned” (Aarseth 2004a). I tend to take a more moderate point of view however. Aarseth and Juul are correct in saying that simulation is fundamentally different from traditional storytelling. In a novel or a film, an author presents one fixed sequence of events, whereas in a simulation not only the sequence is not fixed, but the very nature of every event is explorable and alterable within the limits of its representation. It is not because there is a difference, however, that they are opposites. It is not because events are dynamically generated that the player of a computer game can not experience his adventures in a virtual world as a meaningful emergent narrative. Moreover, a simulation is an approximation, a representation of a set of qualities selected by its designers in order to have a certain effect. Hence, although the events occurring in a game are in themselves emergent, they are neither spontaneous nor objective. They are an anticipated effect of what could be called the simulation's 'intelligent design'. Computer games are representational systems built with a certain purpose in mind. They are authorial in that they represent some elements and not others, and structure them to achieve certain results and not others. Cut scenes and background stories are only the most blatant examples of authorial meddling in simulated representation. The true authorial hand is below the surface, in the simulation's mechanics (see also section 3).

2. MODELING THOUGHT

In 1946, just after the Second World War, John Presper Eckert and John William Mauchly presented the Electronic Numerical Integrator And Computer (ENIAC), the first general-purpose electronic computer. For the first time in history, a machine was able to perform complex logical operations and calculations, not just independently from man, but in many cases more efficiently than him. For the first time, a machine was able to take over complex logical and mathematical tasks which, until then, had been restricted to the realm of human thought. Hence, the step toward positing the computer as a thinking machine was only small and quickly the idea of developing machine 'intelligence' gained influence, a system that could not only make calculations, but also make decisions about real-world problems. The research discipline of artificial intelligence was born. A.I. research is often subdivided into weak and strong A.I. Weak A.I. is the moderate branch aiming to develop computer-based systems that can grasp and solve problems within a limited domain. A weakly artificially intelligent machine is able to make decisions independently, but only in a restricted number of cases. Weak A.I. systems are used in machines from cars to space shuttles.[32] Strong artificial intelligence research, on the other hand, aims to create computer-based systems that can make decisions, not just in strictly defined areas, but which can reason and solve general, unexpected problems, i.e. machines that have a mind (which is how John Searle originally defined strong A.I.). In the coming subsections, I tackle the theoretical possibility of such strong artificial intelligence using the framework of simulation and emergence that I have sketched in the previous section. First, I briefly present Alan Turing's famous test and John Searle's equally famous Chinese Room counter-argument. Next, I consider the possibility of emergent A.I., and analyze it against Hubert Dreyfus's critique of the possibility of machine intelligence.

[32] It should be noted that, strictly speaking, weak artificial intelligence is not restricted to digital computing. Thermostats in refrigerators or automatic gears in cars can be considered weak A.I. on the basis that they make decisions (turn off cooling, change gear) within a limited real-world domain.

THE IMITATION GAME

Already during the Second World War, Alan Turing, a British mathematician, saw a great future for machine intelligence, and he wanted to devise a test against which to measure the progress of the field. In 1950, he proposed what he called the 'imitation game', but which came to be known as the Turing test. The imitation game is a test in which a person (the interrogator) is separated in a room where she only has a computer displaying what we would today call a chat box. Via this computer she can send and receive text messages from two other 'chatters', which she only knows by the names of x and y. The interrogator knows, however, that one of the two is a machine and the other a person. The aim of the game for the interrogator is to correctly determine who is the machine and who is the person after five minutes of questioning. The aim for the (programmers of) the machine is to try to make the interrogator conclude that the other person is the machine, and the object of the other person is to help the interrogator to correctly identify the machine. Turing believed that by the turn of the millennium, computers would have grown so powerful that an interrogator would at least three times out of ten wrongly identify man and machine. Turing also believed that, around the year 2000, "general educated opinion" would have changed so much that we would speak of thinking machines without expecting to be contradicted. There is little doubt that he would have been disappointed by the achievements of today's computers in the imitation game. Every year, there is a Loebner Prize Competition in which computer programmers submit their creations to a limited Turing Test. They never come near the standard that Turing envisaged, however, as the success rate of the interrogator is still one hundred percent (Oppy & Dowe 2003).

Over the years, Turing's claims have unleashed both storms of protest and fits of enthusiasm. After the appearance of *Eliza* (Weizenbaum 1966), the realization of Turing's dream of creating a thinking machine suddenly felt dangerously/wonderfully close. As Weizenbaum reports: when chatting with *Eliza*, people started attributing intelligence and even an identity to what was basically only a rudimentary behavioral simulation. Blind enthusiasm led people to see understanding where there was none. Even schooled psychiatrists considered the possibility to fill the therapeutic needs of the people by *Eliza*-like machines. This enthusiastic outcry led Weizenbaum to write his plea for the revaluation of the uniqueness of human intelligence *Computer Power and Human Reason: From Judgement to Calculation* (1976). In defense of Turing, some thinkers put forward that he never meant for the imitation game to be both a logically necessary and sufficient condition for the attribution of intelligence. Indeed, when we look at the initial formulation of the game, Turing believed that the passing of the test would only provide probabilistic support for the hypothesis of intelligence (Oppy & Dowe 2003). On the other hand, it is not just Turing's words that are interpreted, but also the implicit message within the setup of the test itself. Fact is that the (human) interrogator has to choose between a person and a machine, which is the more 'human'. Moreover, the connection between interrogator and participants is very limited, suggesting that humans are nothing more to one another than distant exchangers of abstract symbols, and that being able to give acceptable answers over a chatline is sufficient to be classified as an intelligent human being. Arguably, Turing's predictions were not so much an overestimation of machine intelligence as an underestimation of human complexity. Turing was correct in prophesying a great future for logic machines in the second half of the twentieth century (which was not obvious in 1950). What he failed to see, however, was the distance lying between logic and human thought.

THE CHINESE ROOM

The best known argument against Turing's hypothesis that a machine passing his test is intelligent (in the Latin sense of 'understanding') is the Chinese room argument. This argument was first pronounced in 1980 by John Searle, a language philosopher of the American pragmatist school and it triggered a discussion between himself and the artificial intelligence research community, which still continues today. The gist of Searle's argument is that even if we created very sophisticated information processors which would be able to pass the Turing test, they would not be intelligent in the human sense of the term. They would not possess a mind or display so-called intentionality (know what they are thinking *about*). They would only be able to shuffle abstract signs without understanding them. To illustrate his claim, Searle proposes to imagine a situation in which a person simulates the operation of an artificially intelligent computer, which he calls the 'Chinese Room Experiment'. In the experiment, a man (Searle proposes himself) who does not know Chinese is locked in a room with a book containing a story in Chinese. The man does not know the story in the book, and neither is he able to read it. During the experiment, he is passed slips of paper containing questions about the story, again in Chinese so he does not understand the questions either. However, clever programmers have given him a set of rules for determining which signs he should copy from the book as an 'answer' to which slips of paper, which are then passed back. The rules merely consist of logical operators and references to the signs. “If sign x is followed by sign y, then return sign u.” Searle, proposes to imagine that the person in the Chinese room becomes extremely proficient at applying the rules and returning the slips of paper at the same rate a Chinese person would answer to questions about the story in the book. Even then, however, even when all questions are correctly answered within the appropriate timespan, the man in the room does not understand Chinese and neither does he know the story in the book. Hence, for Searle, it is theoretically impossible to create an information processor that is intelligent in the human sense of the term.

When Searle published his argument, the strong A.I. research community replied with more than a dozen attempts to refute him. The most common argument for denying the validity of the Chinese Room argument was what Searle himself termed 'the systems reply'. Essentially, it says that, although it is true that the man in the room does not understand the story, there is no reason to believe that the room as a whole does not understand it. Systems are more than the sum of their parts, and it may be that the person in the room does not understand, like a processor in a computer does not know what is displayed on the screen, but the system as a whole shows understanding. One could make an analogy with the human brain, which consists of different interacting parts, whereby one single part probably cannot understand, but the brain as a whole can. Similarly if we regard the Chinese room as a brain consisting of the man, the book and the rules, none of the three parts would 'understand' the story, but the room/brain as a whole would. Searle's response is simple. If the room as a whole understands, as the systems reply people argue, then make the room part of the man. Imagine that the man is able to internalize the entire system. He learns all the signs in the story book and all the logical rules by heart and processes the questions entirely in his head. Now, Searle claims, the whole room, the whole system that is believed to be understanding is in the head of the man, yet everyone will agree that he still does not understand (cf. Turkle 1984: 266). This is where the Chinese Room discussion ends (or should have ended) and Searle is right when he claims that a system that does no more than shuffling signs, that is a processor of information which carries no reference to the objects it describes, strictly speaking does not know what it is talking about and therefore does not understand. Hence, Searle is right in claiming that the Turing test is no solid basis for identifying intelligence. In their answers, however, the systems reply people are not referring to the system which Searle has in mind, but to a form of intelligence which emerges from the interaction of a complex system with reality: a form of emergent intelligence.

EMERGENT INTELLIGENCE

One of the oldest objections against the possibility of creating a thinking machine was formulated in Ada Lovelace's memoir (1843) when discussing Charles Babbage's *Analytical Engine* {1833-1842}, the first design for a universal (mechanical) computer. She observed that the Analytical Engine had no pretensions to originate anything, that it could do only what we can order it to do (Oppy & Dowe 2003). A computer is in itself a dumb machine, which, on a basic level, is merely able to switch circuits and nothing more. It is only when it is programmed, when its circuits are made to behave according to certain patterns, that it can be made to speak and these patterns are fixed by the programmer. But what would happen if we were able to make the circuits in a computer respond to patterns of input more or less independently? What would happen if we were able to teach a computer to learn from the evolution of phenomena and change its own setup? In other words, what would happen if we could make a form of emergent intelligence? Traditional artificial intelligence is concerned with the manipulation of symbols and natural language through top-down rules created by a programmer. There, the idea is that man is a logical being that can be caught within logico-mathematical structures, if we only make them sufficiently granular. Emotions, creativity, play can all in some way be reduced to one logical framework that is man, and that can be programmed to run on a computer. Emergent intelligence, on the other hand, has a much narrower scope and a fundamentally different methodology. Whereas traditional A.I. subsumed that the world, including man, must intrinsically be logical and therefore programmable, emergent A.I. takes the opposite perspective and lets structure come forth from a possibly endlessly complex reality to form interpretable patterns. Whereas in traditional strong A.I. programming is used to impose top-down rules on the interpretation of reality, in emergent A.I. it is used to create a sort of heuristic basis for interpreting and interacting with external stimuli.

One experimental technique for the creation of emergent intelligence is neural networking: a software architecture which tries to imitate the working of a brain's neural system. Neural networks are simulations of the behavior of high numbers of interconnected neurons, usually running on top of conventional digital computing systems. Whereas the underlying computer functions top-down logically, the simulated collection of neurons can be made to interact with different phenomena and, when programmed with a certain goal, they can devise a strategy for meaningful interaction. Neural networks simulate the brain's capacity to distill patterns and learn from trial and error by analyzing and interpreting the data which are subjected to it. Each neuron within the network receives various inputs from neighboring neurons and sends an output back on the basis of different weighting factors. In itself, each simulated neuron is a relatively simple entity functioning according to logical rules. The neural network as a whole, however, can display a wide variety of gradually differing 'interpretations' of phenomena and produce not top-down imposed but bottom-up emergent strategies for interaction. A neural network 'learns' when it is able to experiment, when it is presented with examples and given feedback on its analysis and strategy. This feedback allows the network to adjust its different weighting factors to bring its final output closer to the desired result. It could even be argued that in this way it displays a form of intentionality, not just processing symbolic representations, but actual information about the world. Present-day neural networks are not intelligent in the sense that Turing wanted his machine to be intelligent, but are used to analyze very specific situations and data involving pattern recognition, machine learning and prediction of the behavior of complex systems. They are used for tasks such as as voice and handwriting recognition, economic data analysis, gaming A.I. and for mimicking human decision-making, e.g. for filtering email.

If we return to the Chinese room discussion with an emergent A.I. system in mind, rather than a top-down structured information processor, the situation is different. Although the basis of the emergent system is logical, its functioning is more complex. First of all, there is no longer the objection that it functions separate from reality, i.e. its decisions are not made on the basis of preprogrammed rules, but are able to incorporate feedback from the phenomenon it is confronted with. Its reactions are not based on arbitrary rules but on the feedback it receives and stores in the weighting factors of its neurons. Like the human brain, which is partly hardwired through its genetic structures (which could be described as being 'programmed' by many thousands of years of evolution), and partly defined by culture, this emergent intelligence could be partly hardcoded and partly left to emerge from observations.[33] Secondly, internally, this emergent system would no longer be a natural language processor applying grammatical rules to linguistic structures, but rather a continuous system of evaluation of various linguistic strategies. One could even imagine complex neural systems to display a form of creativity or even an emotional preference for certain strategies, based on past experience. In this way, the fallacy of seeing (human) intelligence as a top-down logical system can be avoided. Although fundamentally based on binary logic, the simulation on top would not necessarily behave logically, but according to patterns observed in the data it is fed. When we more specifically look at Searle's analogy between the Chinese room and the Turing test, we see that it no longer applies. In an emergent Chinese room there would not be one Searle, but thousands, possibly millions of him,

[33] Of course the analogy with the human brain is limited, since the basic structures of most emergent systems do not change, do not permute like the human brain from one generation to the next. Neural networks are programmed to change the interrelations of its neurons according to feedback, but not their being a neural network itself.

and there would not be any logical rule-book, but complex interpretive interaction and decision-making on the basis of input from neighboring Searles and adjusting weighting factors. Searle would be right in saying that the people in the room still would not understand either the story or the Chinese language, but that would be beside the point. The weighting system as a whole (operated by thousands of Searles) would be able to devise intelligent strategies for discussing the story in Chinese and could therefore be said to understand it. Think of a Mexican wave in which each person does nothing but raise their arms when their neighbor just has, yet a complex visual pattern emerges. Just like no one in the public controls the wave, no one in the Chinese room would understand Chinese, but the room would.

DEUS EX MACHINA

Like top-down rule-based processing, emergent intelligence still faces several practical and theoretical problems however. The above description is only a thought experiment whereby a number of fundamental objections are temporarily put aside. The main objection against the possibility of emergent strong A.I. is that, even as an emergent structure, system A.I. would still be subject to the limitations of simulation. As described in the previous section, a simulation is a surface representation, a process mimicking the behavior of a phenomenon, not its duplication. The similarity between a simulation and an original is only skin-deep. If we were to make a computer simulation of the sound of a Stradivarius violin, for example, we could (again theoretically) create an emergent simulation listening to a Stradivarius playing dozens of pieces and make it interiorize the instrument's behavior. Let's imagine that, when finished, our emergent system is able to reproduce the sound of a Stradivarius. Even then, it would not be one however. The simulated Stradivarius will, because of its very design, always remain only an approximation of a real one. It can learn to imitate the Stradivarius sound in dozens of pieces. When confronted with an unknown piece, however, there is no guarantee that it will react as the real violin would. A simulation is an imitation of a limited set of qualities, not a copy of the original artifact.

In a similar way, emergent strong artificial intelligence will always remain an imitation and not a duplication of human intelligence, and, like the Stradivarius example, it will always be subject to its 'ontological' limitations. Hubert Dreyfus was one of the first philosophers to point out the inherent limitations of the artificial intelligence dream in *What Computers Can't Do* (1972), 20 years later republished as *What Computers "Still" Can't Do*. Dreyfus' arguments against strong A.I. are based on the phenomenological tradition, especially the work of Martin Heidegger. He stresses the fact that our understanding of the world, like our being, is highly context-bound and that our behavior cannot be reduced to objective, logical rules. From this position, Dreyfus criticizes the cognitivist view of human understanding on which strong A.I. is based, and which presupposes a rational, to a large extent logical, context-free cognition and understanding. More precisely, he focuses on what he considers the four primary (unproved) assumptions of strong A.I. research, one biological, one psychological, one epistemological and one ontological assumption. According to Dreyfus, strong A.I. makes the implicit (a) *biological assumption* that the brain is analogous to computer hardware and the mind to software. While this presupposition applies to early top-down conceptions of A.I., it is less true of the emergent type. As I have described above, early artificial intelligence research (of the top-down information processing type) presupposed that the human mind was a processor of logical rules and its thinking similar to applying those rules to binary data. Dreyfus correctly argues that there is no conclusive biological or empirical evidence for this assumption, so it must be false. Emergent systems, however, do not make this assumption. Emergent A.I. uses computer hardware and software only to make a simulation of a real-world phenomenon, e.g. a neural network. Logical rules are being processed by the computer only to generate large collections of data used to base interaction on. Thus, Dreyfus's biological assumption applies only partly since one can accept that, through its being a simulation, emergent A.I. may be able to partly overcome the dissimilarity between computer hardware and the human brain.

The (b) *psychological assumption* consists of the fact that strong A.I. researchers believe that the mind works by performing discrete computations based on algorithmic rules on discrete representations in the form of signs and language.

Again, this criticism primarily applies to the earlier, non-emergent type of A.I. For Dreyfus this psychological assumption rests on two others: one epistemological and one ontological assumption. The (c) *epistemological assumption* refers to the belief that all activity can be formalized logically and mathematically as predictive rules or laws. Dreyfus contests this assumption, based on the observation that human beings are highly context-bound creatures, which do not behave according to universal laws governing in- and output. In other words, for every context, specific rules would have to be created and the number of variables in each case would be near infinite. Again, however, one could claim that emergent A.I. could at least partly overcome these differences, because of its inherently context-bound, bottom-up nature. One should ask, however, how complex an emergent system would have to be in order to approximate human behavior in different contexts and how much of human behavior it would have to interiorize, even to pass the Turing test. The fourth and final assumption which strong A.I. research implicitly makes is the (d) *ontological assumption*, the idea that it is an objective fact that reality in its entirety consists of a set of mutually independent, indivisible facts. In other words, Dreyfus points to the discrepancy between computer processing, which consists of discrete states of discrete data, and reality, which is continuous. Being a discrete state machine, a computer may well be unable to interact with the world as a continuous human brain would. Again, however, one could point to the fact that, although it works with discrete states, a computer is able to simulate continuity very closely by working with extremely short constant intervals. Thus, although Dreyfus successfully points out the weak spots in A.I. theory, one could still claim that the emergent system approach will eventually be able to overcome all four limitations.

There is, however, a fifth assumption which not so much applies to traditional (logical, top-down) strong A.I., but all the more to the emergent variety. This assumption, which could be called the *cultural assumption*, has been implicitly referred to both by Dreyfus and by the A.I. research community, more precisely by proponents of robotics. Indeed, one could imagine an extremely powerful, emergent A.I. system running on future supercomputers, simulating zillions of neurons constantly adjusting weighting factors in a way similar to how the human brain functions. By means of extremely granular simulation of the brain's functioning, the biological dissimilarity of brain and computer could become irrelevant. One could imagine this future system to develop a psychology largely unencumbered by the basic epistemology and ontology of digital computing. However, even when all these difficulties would be overcome, one still has to ask why this complex system would start to behave like a human being. While growing up, every child goes through a complex process of exploration of its own self and its environment. It has certain genetically encoded character traits, but they develop dependent on its self-image, that of its family and its culture. In other words, one should ask why an emergent intelligence would start to behave like a human if it was not one in the first place. For example, why would it want to develop natural language abilities if it does not recognize itself as a human and if it does not feel the need to take its place within the human community. Why would it attempt to find meaning in life if it has no notion of a future death? Even if this system could become self-aware, would this self-awareness be that of a living being? Man is an extremely complex, context-bound 'machine', which develops in a specific socio-cultural context. It is highly unlikely that even emergent A.I. would ever be able to incorporate these cultural factors, and, until it can, it is equally unlikely, that it will pass the Turing test.

3. Modeling and Interpretation

As discussed earlier, a computer simulation is an implementation of a mathematical model over time. This model is not a replication of reality, but an approximation in several respects. First and foremost, only a portion of reality is selected to be represented within the model. A real-world phenomenon is analyzed and, depending on the purpose of the simulation, a number of relevant properties are isolated. When creating a racing simulation, for example, acceleration, velocity and road-holding will be implemented, but the convenience of the seat and helmet will probably not. Secondly, these properties are measured and combined into a model using calculable quantified relations between components. These relations are not exact representations of real-world relations, but, again, approximations. In most racing simulations, there is no actual simulation of an engine, only a calculation of its power which is then converted real-time into acceleration and speed. Thus, if the virtual engine blows up, it is not because of cracking valves or breaking shafts; it is because the simulation is implemented in such a way that when driving at speed x in gear y the probability of the engine blowing up is larger than the probability of it not blowing up. Particularly in the case of complex behavioral phenomena, probabilistic rather than analytical algorithms are used. Computer-guided opponents do not attempt to overtake you because there is an artificially intelligent driver *deciding* to do so in a way similar to how a human driver would. Rather he makes his move because the simulation stipulates that when close enough to the car in front, no curves, no rain, enough fuel, and so forth a driver is more likely to try to overtake than not. Thirdly and finally, a computer is a discrete state machine, which means that a digital bit is either 0 or 1 and there is no in-between. In order to represent motion, the computer is programmed to simulate time by changing (discrete) states at short regular intervals, which makes it approximative in yet a third way. Simulated movement is not continuous, but in fact consists of very fast jolts at regular intervals. Whereas real-world phenomena are complex, material and continuous processes, simulations are abstract, quantified and discrete approximations.

Simulations are idealized abstractions of real-world phenomena. Like other forms of representation, they are abstracted with a purpose in mind. They are meant to produce an effect and be interpreted in a certain way. Every simulation is a 'simplified' version of reality, and, as such, it is based on the conceptions and beliefs of its designers. In other words, some facets of reality are represented and others are not. For example, when simulating water in a primarily visual simulation, it could suffice to algorithmically mimic the flickering of its surface. Apart from its looks this simulated water would have nothing in common with the physical phenomenon. A simulation is a slice of reality, selected for a specific reason (to analyze a physical phenomenon, to streamline workflow, to create suspense etc.) and it is modeled to express this specific view on the world. Like all cultural representations, simulations are inevitably biased, representing some elements of physical reality and neglecting others, presenting one subjective view and ignoring others. Hence it is best to approach a simulation as a form of representation, a constructed interpretation and manipulation of elements from the real world. In the rest of this section, I go deeper into the 'constructedness' of simulation and analyze the politics of its functioning. First, I develop the idea of simulation politics itself and describe its functioning in computer games. Then I look at a number of concrete examples of covert simulation politics in strategy and simulation games. And thirdly, I look at examples where simulation is used to propagate real-world political views, and argue that it is time to get past the Manichean discussion of whether computer games as a whole are good or bad, and begin analyzing their functioning.

FICTIONAL SIMULATION

In 1984, Chris Crawford described simulation as “a serious attempt to accurately represent a real phenomenon in another, more malleable form,” and a computer game as an “artistically simplified representation” (8). Both computer simulation and game designers find themselves forced to simplify and abstract reality, but whereas simulation designers only reluctantly make simplifications as a concession to material and intellectual limitations, computer game designers do so deliberately in order to guide the player to those elements they deem important and entertaining. For Crawford, simulation designers are mere technologists attempting to imitate reality. Computer game designers are artists however. They make creative interpretations of the world and translate them into simulation. Simulations are a product of technological ingenuity while computer games are the result of a creative process. “A simulation bears the same relationship to a game that a technical drawing bears to a painting” (9).

Crawford's distinction is far from new. In his *Poetics* (ca. 350 BC), Aristotle notes that “it is not the function of the poet to relate what has happened, but what may happen—what is possible according to the law of probability or necessity” (9, 2). Similarly, computer games are not built to reproduce reality, but that which would or could have been. As Steven Poole notes, computer games' “somewhat paradoxical fate is the ever more accurate modeling of things that don't, and couldn't, exist: a car that grips the road like Superglue, which bounces uncrumpled off roadside barriers; a massive spacecraft with the maneuverability of a bumblebee; a human being who can survive, bones intact, a three-hundred-foot fall into water. We don't want absolutely real situations in videogames. We can get that at home" (2000: 50). Computer games are imitations of a reality that does not exist and that in some respect is more attractive than our own. "Remember, you don't want boring, invisible lasers; you don't want a Formula One car that takes years of training to drive; and you don't want to die after taking just one bullet. You don't want it to be too real" (63). Computer games are reconstructions of an imaginary reality, one that can only exist in a player's imagination. Hence the imagination plays a crucial role in filling in the gaps of the simulation (see also next chapter). Will Wright, maker of *The Sims*, describes how his Sims do not speak English, but instead communicate using icons in text balloons, and some sort of gibberish language. "In fact, when you're playing the game, and you hear them speak this language, you do get emotional intonations from them. Most people are basically filling in the blanks, and imagining the conversation in their head" (Wright 2005). By their very nature, simulations are constructions, and, computer games take advantage of this to create worlds it is pleasant escaping to.

MESSAGE IN A THROTTLE

Ironically, while computer games are a means of escape, a way to be temporarily free from the shackles of the here and now, they are also a place of seemingly absolute and transparent control. In a simulation, all relevant properties in the virtual world are represented by variables which are usually simple and numerical, i.e. quantitative and linear. In real life, when chopping wood, you may get tired in your back. When this is the case, you may want to take a break or try to collect some smaller pieces of wood further away as your legs have not suffered from the chopping. In a computer game, however, when tiredness is represented by a single linear variable, you can only be a value between fresh and eager, over somewhat worn, to tired and all relevant steps in between. In a linear representation of tiredness, you cannot be tired in your back and not tired in your legs for example. You can only be one number on a linear scale reaching from zero to maximum. Virtual environments are composed of dozens or even hundreds of these variables which are sometimes accessible as so-called augmenting indicators on the side of the screen. The interaction between the entities of a virtual world is governed by the values of its variables which constitute its underlying 'matrix'. The screen graphics and animations are only derivations of the absolute quantified reality that lies beneath. For example, if your character grows tired (variable 'agility' below x), the designers may have implemented a visual indication of this fact, making the character walk stooped forward for example. This visual clue is managed by an algorithm determining that, when endurance is below, say, twenty percent, the stooping animation is started. In other words, the indicators (variables) in a simulation are not indicators, but facts within the virtual world. Simulations and computer games are governed by the constant interaction and auto-updating of hundreds or even thousands of variables creating an absolutely determined and quantitatively controlled universe.

Simulations and computer games are not the first cultural forms to implement this quantified view on reality. In fact, all rule-based games are to some extent based on quantified relations between entities. Think of chess, for example, where each piece is determined by its possible moves, which is in turn determined by its type and position. Or *Stratego* {Milton Bradley 1961}, in which each piece is determined by its relative position on the hierarchical ladder, and so forth. The most extreme pre-computing implementation of quantifiable reality can be found in role-playing games. Unsurprisingly, one specific variety, i.e. *Dungeons & Dragons* {Gary Gygax 1974} was tremendously popular among computer science students in the 1970s, when computer games appeared. In *Dungeons & Dragons*, each player (except for the dungeon master, who takes the role of a conductor and a referee) chooses his character's gender, race (elf, dwarf, human, halfling etc.), class (fighter, sorcerer, cleric, thief etc.) and generates on the basis of these elements the character's basic characteristics (strength, dexterity, constitution, wisdom, intelligence and charisma) which are represented by numerical values and 'levels'. These qualities determine what the character is able to do in the game world, and how it evolves with experience. All character traits are represented in precise values and determined by other traits and experience. For example, humans may be good fighters and they may develop high levels of strength and constitution. Elves are proficient sorcerers, may become wise and intelligent and quickly learn new magical spells. Halflings are small, but cunning and make excellent thieves and so on. David Myers notes that in this type of quantified ontology, everything is shaped after Newtonian physics and randomness (luck, dice-throwing), even complex psychological and social realities. “By simulating the self as mass, the game designer is able to apply the empirical generalizations of classical physics to the actions of human characters. Complex social systems are modeled as vast collections of character molecules in some advanced, gaseous state of agitated motion” (1992: 424).

This quantified linear representation creates an illusion of transparency and control by reducing complex phenomena to a number of readily understandable and assessable linear variables. In a simulated environment, everything is graspable and all players have an equal chance of winning the game as the entire game universe is based on exact rules. This transparency and control do not apply to the rules themselves however. Every computer game is built of rules mimicking a number of complex phenomena, and these rules are in themselves unchangeable. The player only has control over the play generated by the rules, not over the rules themselves. “Making decisions doesn't change the system. It just allows you to see how it responds” (Will Wright in Herz 1997: 220). Within the virtual environment, the rules are both fixed and unavoidable. Or as J.C. Herz herself puts it “You can gain or lose weight, but you can't get away from gravity” (1997: 223). Every simulation is bound by its own format, which requires a reduction of a possibly endlessly complex reality to a fixed number of changeable variables. Within this reduction, through its embedded bias and assumptions, a simulation shows its politics and its indebtedness to the culture in which it was created.

SimCity, for example, has been criticized both from left and right because of its preference for low taxes (higher taxes can cause recession), investments in public transport (as opposed to building more roads), and its discouragement of nuclear power (whose implementation leads to accidents and nuclear fallout). In other words, the basic rules of the game world, its ontology, stipulates that to make your city more thrifty, you have to lower your taxes, build railroads and avoid nuclear energy. For the player, there is simply no way to control these basic facts; the only option is to subject to them. As Ted Friedman observes, this type of 'preference' is not a flaw in the game, but one of its founding principles. Its principles "can be engaged and debated, and other computer games can be written following different principles. But there could never be an 'objective' simulation free from 'bias'. Computer programs, like all texts, will always be ideological constructions" (1999). Significantly, this ideology is not part of the basic story of the game, which for *SimCity* is simply to build a city of your own design, but of its 'play mechanics', the inner workings that shape the game's behavior. In a simulation like *SimCity*, a complex dynamic such as city development is abstracted, quantified and represented as if it were objective reality. It is no more than one possible interpretation, however, and that is both its strength and its weakness.

War is Peace

Whereas *SimCity* is concerned with simulating the construction and expansion of a city, the *Civilization* series (Sid Meier 1991, 1996, 2001) is even more ambitious in that it aims not only to represent the birth and growth of a nation, but also its cultural history and geopolitical struggle. In *Civilization*, the player starts out as a settler in a wild, unexplored area, where she has to build settlements, roads, irrigation, develop science, build an army and expand your power (which is rewarded with a higher score). Like *SimCity*, *Civilization* has been criticized for its implicit assumptions and its political statements about globalization.[34] History is depicted as a "succession of conflicts or contests over land and other resources" (Jenkins & Squire 2002), whereby the only way to overcome struggle is to become the strongest nation and control or even conquer all others, which can only be achieved by being more efficient economically than others. "[T]he best player is the one who is the best manager, who can attain his or her goals in the most efficient way, increase the productivity (military, cultural, scientific, etc.) and still guard the social order." (Poblocki 2002: 168). *Civilization* was re-

[34] By this critique I do not want to attack *Civilization* as a game, nor its makers, but merely demonstrate that simulations are texts which are built on human conceptions and assumptions. They are not objective replications of reality, but subjective, partial and interpreted representations.

leased in 1991 and is still strongly influenced by cold war military thinking.[35] In the game, history ends around 2050 (which can be interpreted as a statement in itself), but if you want to achieve a higher score, you should try to end the game earlier, which is only possible by annihilating all enemies or by winning the Space Race, i.e. by building a space ship and by sending it to Alpha Centauri first (169).[36] Janet Murray notes that the goals of the game are not presented as an interpretive choice. "Why should global domination rather than, say, universal housing and education define the civilization that wins the game? Why not make an end to world hunger the winning condition? Why is the object of the game to compete with other leaders instead of to cooperate for the benefit of all the civilizations without jeopardizing any one country's security?" (1997: 89).[37]

Apart from the objective of the game and the reward structure, game mechanics can carry significant implicit messages. Because of its very ontology of measurement, simulation can only represent part of reality, and even less can be made interactive. In *Civilization*, it is interesting to analyze which parts of the game can be influenced by the players and which parts cannot. Because *Civilization* is an attempt to simulate or represent the workings behind cultural, economic and geopolitical history, its design decisions are also statements about the course of history and the influence man has on it. Like most of its predecessors, going back to *Dungeons & Dragons* and nineteenth century war games

[35] A rather amusing example of cultural preconceptions in *Civilization* is its choice of leaders for the different peoples. Poblocki notes that, for example, Abraham Lincoln manages to stay in power throughout *Civilization II* and *III*, but that Stalin has been replaced by Lenin and then by Catherine the Great (2002: 170).

[36] In later versions of *Civilization*, other winning conditions are added, such as a diplomatic victory, which requires finishing the United Nations Wonder, and a cultural victory, which occurs when a certain number of culture points are gained. It should be noted, however, that, despite the seeming message of collaboration and cultural sophistication, both of these victory conditions can only be attained through economic growth and keeping competing civilizations at bay.

[37] Some eight years after Murray's plea, the United Nations World Food Program released *Food Force* {2005}, a computer game aiming "to educate youngsters about hunger and the work of the aid agency." The aim of the game is to complete a series of missions, guided by a team of World Food Program characters. The missions range from dropping food parcels from the air to a sim-game in which players use food aid to rebuild a country's economy. At the end of each mission, players are shown a short video explaining how the aid agency would have dealt with the situation (BBC 2005).

before that, *Civilization* adopts the three-part representation of power, sharing decision making between world, man and chance, in that order. The very basis of cultural development is fixed. You first have to develop alphabet, then writing and only then philosophy. This 'scientific' development is fixed in a 'knowledge tree' which is strictly hierarchical and in which choice is limited and no steps can be skipped. It is impossible, for example, to avoid developing sophisticated military technology if you want to become a modern nation. Secondly, on top of this deterministic foundation, the player can make her own decisions. She can decide where to build her settlements, which buildings to develop, how much to spend on science, and when to attack other civilizations. Note, however, that she cannot invent her own buildings, write out a research program for, say, a universal love drug or found a United Nations global government. There is no outside the rules of the game. Finally, random factors and chance come into play when conflict arises with other civilizations. Like in *Dungeons & Dragons*, military units are determined by numerical values which differ according to terrain, strategic position, health, stamina etc., and the battle is based on virtual dice-throwing, i.e. random number generation by the computer. This can theoretically lead to unexpected outcomes, e.g. tanks losing from phalanges, but this is only seldom so. Technology rules, man executes, and chance is there to be eliminated by predominance.

A MATERIAL WORLD

Most so-called 'god games', which include simulation games such as *SimCity* and strategy games such as *Civilization*, position the player outside the ongoing action, giving her a managerial role, building cities, preparing for war, but not actually living in the city or wielding a sword (see also chapter 4 on transcendental and avatarial introjection). The player manages the material conditions, clears, builds, attacks, and the inhabitants behave accordingly. Their lives and thoughts are not directly controlled by the player, but indirectly by how she organizes their world. In this sense, these god games are technologically deterministic but not socially. Their virtual inhabitants can only live according to what is given to them by an invisible hand, but their actual lives are hidden from the player. The highly successful social simulation game *The Sims* {Will Wright 2000}, goes one step further in that it depicts its virtual inhabitants not only as living in a technologically determined universe, but also as being socially determined. Sims (the inhabitants of the simulation) live their lives doing their daily tasks of working, cleaning and going to the bathroom, but the player can make them change their course of action and take various initiatives.[38] The implicit aim of the game is to improve your character's living standard and lifestyle by working on material well-being and social position. This can be done by making the house more comfortable, by going out, making friends, finding a partner, having children etc. Expansion packs give Sims the opportunity to go on holiday, keep pets, visit all kinds of exotic locations and take part in social activities. If the Sims' basic needs are not met, they become unhappy, unpopular and may eventually die. Whereas in traditional god games, the player controls only the virtual world, in *The Sims*, she has access to the individual's character and lifestyle. For Nutt and Railton, the move from traditional god games to *The Sims* should be seen as a reflection of the individualization of contemporary society (2003: 583).

Ever since it came out, *The Sims* has been a subject of contention between cultural critics who interpret its game mechanics in highly diverse – sometimes even contradictory – fashions. Nutt and Railton see it as a confirmation of traditional capitalist and patriarchal values because social relationships in the game are made subject to material concerns. “Relationships can be one of the ‘tools’ in the game for enhancing career opportunities and increasing income, which then makes it possible for the player to enhance the ‘lifestyle’ of the characters, and households” (586). They see the necessary instrumentality of Sims' relationships as a reflection of “the intense speed of life in late modernity,” but ascribe this to the computer game format (587). Celia Pearce, on the other hand, stresses the artificial nature of the game, which she describes as a “cross

[38] In *The Sims*, intelligence is not programmed top-down rationally, but distributed through the environment. Will Wright based its simulation on earlier work done for *SimAnt* {1991} in which, for the first time, he used a form of “distributed environmental intelligence” for simulating the behavior of ants interacting with pheromone trails. It turned out that the simulation of the ants was more intelligent than that of a human character, also programmed for *SimAnt*, but using traditional A.I. techniques. This made Wright decide to engage in creating a simulation of human behavior using distributed intelligence rather than decision trees (cf. Wright 2005).

between a dollhouse, a *Tamagotchi* [{Aki Maita 1996}], and the television program *Big Brother* [{John de Mol 1999}]" (2004). She also observes a strong anti-consumerist satirical subtext in the game consisting in the fact that characters need material goods "to make them happy, but over time, the things begin to own them. A larger house requires more cleaning time. You can hire a maid, but the higher expenses require that you maintain a certain earning power" (ibid.).[39] Gonzalo Frasca, finally, does not see *The Sims* as a vanguard work because of the way it simulates life, but because, by attempting to simulate it, it is affirming that human life can be simulated, that man can be modeled as a less complex system. (2001: 52).

PLAYING PROPAGANDA

The term *serious games* is sometimes used to designate computer games that are meant to train or educate players in certain areas. By introducing game elements into more or less realistic simulations, educators try to make use of the autopoietic (self-generating) and the autotelic (self-motivating) quality of games. The main purpose of serious games is not to entertain, but to communicate or teach through play. They are used for training in a growing number of sectors such as the military, medicine, government and commerce. *Advergames* are serious games which advertise a product, an organization or a viewpoint and they are sometimes used to create sensitizing political art by, for example, creating tragic, unwinnable games. In *New York Defender* {Stef & Phil 2002}, for example, no matter how successful the player is at shooting down airplanes heading for the twin towers, she is doomed to fail. Every time she manages to shoot one down, multiple others appear. Shuen-Shing Lee (2003) interprets *New York Defender* as a symbolical representation of the trauma of 9-11 "which projects a tragic sense of powerlessness and hopelessness in confronting terrorism."[40] An-

[39] If there is such a subtext, it would be interesting to know if it was deliberately planted by the game designers or the result of trying to simulate a certain way of life popular at the beginning of the 21st century. In the latter case, the satirical subtext can be seen as an emergent phenomenon produced by the simulation itself. From an entertainment point of view, the game designers have then been too successful in simulating everyday life, in that not only its pleasures and minor challenges emerge from the simulation, but also its more basic problems.

[40] Lee probably bases her semantic analysis on the text that is shown on the opening screen of the game . "Utilisez votre souris pour combattre le sentiment d'impuissance" (Use your mouse to

other example is Gonzalo Frasca's *Kabul Kaboom* {2002}, which is a comment upon the military operations by the USA against the Taliban regime in Afghanistan. For weeks, the US air force bombed the Taliban infrastructure from the air while at the same time air-dropping food to show the civilians their good intentions. “Frasca illustrates this moment of moral contradiction in an interactive environment by juxtaposing two symbols, bombs and hamburgers, swooping down from the sky. The avatar is meant to grab as many hamburgers as she can while avoiding the pouring rain of bombs” (Lee S. 2003).

Whilst games such as *New York Defender* and *Kabul Kaboom* are meant to sensitize the player or to playfully point to an inherent paradox, other advergames more firmly impose a particular world-view upon the player. A well-known example is *America's Army*, which has been developed by the United States Army in 2002 in order to increase the number of recruitments which had dropped to a historic low. According to the game's official website, *America's Army* “provides civilians with an inside perspective and a virtual role in today's premier land force: the U.S. Army. The game is designed to provide an accurate portrayal of soldier experiences across a number of occupations.” The game is a team-based war game and first-person tactical shooter. Each player is assigned to fight in a band of American soldiers against a team of 'opposing forces', which are described as insurgents, enemy forces or terrorists. The goal of the game is to complete the mission's objectives, e.g. capture or kill an important terrorist, or kill all members of the opposing force within a certain period of time. In the past few years, there has been a lively debate over the usefulness and desirability of a government institution like the military using computer games for advertising. This is not the only problem with the game however. *America's Army* is presented as a message about the actual world from an actual institution run by the actual government. Whereas the large majority of shooting games are instances of fantasy play set in grotesque, unrealistic settings,

fight your sense of impotence). Many American players failed to see that message, however, and interpreted the game as mockery (partly because it was made by French designers, and the French refused to support the invasion of Iraq in the United Nations Council in 2003). I also came across *Watch out behind you hunter*, another game by Uzinagaz (Jay, Phil & Stef), on the website of the White Aryan Resistance with the caption “Shoot the fags before they rape you.” As I was saying, the meaning of computer games is open to interpretation.

America's Army situates the player in war, in most cases against Arabs, claiming that it is a depiction of the real world. *America's Army* is not meant as a piece of fiction or a form of entertainment. It is meant as a piece of propaganda in order to advertise the greatness of the American army, justify conscription and funding, and convince the public of the necessity and glory of armed conflict.

One step further down the ladder are what is sometimes referred to as *agitprop games*, which are not just meant to advertise a point of view, but to incite violent action. One year after the appearance of *America's Army*, the Lebanese organization Hizbullah created *Special Force*, a radical agitprop game in which the player is to take the role of a Hizbullah warrior and conduct operations against the Israeli army in South Lebanon. One of its features is a training simulation in which players can practice their shooting skills on targets such as the Israeli Prime Minister Ariel Sharon. The text on the game's box reads like an echo of the description of *America's Army* quoted earlier: “The designers of *Special Force* are very proud to provide you with this special product, which embodies objectively the defeat of the Israeli enemy and the heroic actions taken by heroes of the Islamic Resistance in Lebanon.” *Special Force* is meant as a reaction to *America's Army*. As Mahmoud Rayya, a Hizbullah official explained in a telephone interview with the *Daily Star*: “Special Force was designed to compete against foreign computer games that depict Arabs as enemies and Americans as the heroes that defeat them.” (WND 2003). Of course, neither *America's Army* nor *Special Force* are anywhere near an objective representation, even if such a thing were possible. They may have been programmed using 'objective' mathematical and logical formulas. Their design is all the more subjective however. Just as you can use brush strokes or words to depict situations more or less realistically, mathematics can be used as a form of representation subject to manipulation.

The bottom rung of the agitprop ladder is occupied by so-called 'white-power'-games created by organizations such as the National Alliance neo-Nazi group. Titles include *Shoot the Blacks* {ASA productions 2000}, *KZ-Rattenjagd* {'Concentration Camp Rat Hunt', NSDAP/AO 2000}, and the most technologically advanced *Ethnic Cleansing* {Resistance Records 2003}. The premise of *Ethnic Cleansing* is that New York has been destroyed by gangs of 'sub-humans' controlled by Jews who plan world domination. The aim for the player, who can dress in Ku Klux Klan robes or as a Skinhead, is to clean the streets and subways of Blacks, Latinos and Jews which, when they are killed, produce ape sounds or shout “I'll take a siesta now!” or “Oy vey!” The soundtrack of the game consists of racist songs and in the game world, National Alliance signs and posters are there to support the player in her quest. At the end of the game, the player is faced with the 'end boss' who is a rocket launcher-wielding Ariel Sharon who shouts lines like “We have destroyed your culture!”; and “We silenced Henry Ford” and when he dies “Filthy White dog, you have destroyed thousands of years of planning.” Abraham Foxman, the national director of the American Anti-Defamation League notes that organizations like the National Alliance “use modern technology to seduce young people who are attracted and addicted to games, into bigotry, prejudice and anti-Semitism”. As such, they “piggyback on the popularity of games and are a perversion of a well-meaning entertainment vehicle” (Scheeres 2002). Computer simulation is a form of representation. As such, it is neither good nor bad intrinsically. Hence it is not the medium or the technology as a whole that needs to be evaluated, as is all too often done in public debate; it is the message it carries. Instead of inducing fear of new technology and new forms of entertainment, children should be educated about what computer games are, how they function, and how their representation of events can be manipulated. It is only when everyone realizes that they are just another form of depiction, like painting, literature, photography, film etc. and knows how they are subject to interpretation, that we can live in a healthy relationship with this new system for representing reality.

4. MODELING AND CULTURE

In *Life on the Screen* (1995), Sherry Turkle identifies and describes what she sees as a fundamental shift in the way in which we see and use computers. During the Second World War, the computer was developed as a number-cruncher for code-breaking and impact calculation. In the 1970s and 1980s, however, as an increasing number of computer games and graphical applications appeared, designers began to realize that the true power of a computer does not lie in pure calculation, but in the fact that real-time calculation can be used to simulate the effects of certain real-world phenomena. In other words, it was only when software developers realized that computing was not just a matter of analytical understanding, but also of creative inspiration, of imitating real-world phenomena, that the computer managed to rid itself of its image of being a giant calculator. While, for programmers and system analysts, the computer has always remained an information processing device, for the average user, today, the logical and mathematical processing is hidden behind colorful interfaces. Computer lessons longer deal with calculation and rules, but rather simulation, navigation and interaction (19). Today, the role of the computer in people's lives is very different from what most expected in the late 1970s. Early personal computers such as the IBM PC, presented themselves as "open, transparent, potentially reducible to their underlying mechanisms" (23). With the introduction of the Macintosh by Apple in 1984, however, a second, more closed paradigm appeared. The Macintosh boasted a graphical user interface (desktop, icons, windows, folders, trash can etc.) which did not reflect its underlying structure. Instead, it created a simplified interface for the user based on familiar real-world situations and tools. Turkle sees the movement from calculation to simulation as a correlative of a broader cultural move in the second half of the twentieth century. "There was IBM reductionism vs. Macintosh simulation and surface: an icon of the modernist technological utopia vs. an icon of post-modern reverie" (Turkle 1995: 36).[41]

As simulation apparatuses, computers are extremely versatile and malleable machines which can be used to mimic the behavior of a broad array of natural phenomena and tools. Just like the shift from analog to digital storage introduced an additional layer of mathematical abstraction between carrier and form, the shift from calculation to simulation allowed computing to shake loose its ontology of number-crunching and replace it with one of representation and

[41] Microsoft Windows came out one year after the Macintosh and combined the MS-DOS command-line operating system with the feel of the Macintosh interface, thus the "modern and postmodern aesthetics of computing became curiously entwined" (Turkle 1995: 37). In 2001, Apple released OS X, which is based on the Berkeley Software Distribution (BSD) and which combines a polished user interface with extensive command-line and scripting capabilities so today both paradigms have become hybrids favoring the graphic layer, but also providing more direct access to its underlying mechanics through a command line interface.

virtuality. Simulation introduced a separation between the computer's surface structure and its underlying mechanics. This, in turn, allowed it to become a creative environment, one that can be used for creative expression. In a sense, the largest innovation spurred by computers is not computing, but the realization that, by combining large amounts of data in logical structures, dynamic real-world phenomena can be mimicked. Simulation gave computing its own form of representation. Regarding computers as mere calculators today – which from a purist point of view, they are – is as reductive as speaking of literature in terms of paper and ink. Computing has acquired the role of a facilitator rather than a final goal for the majority of users. In computing, the (modernist) illusive dream of finding a computable essence of the universe through analytical calculation has been pushed aside. There is a reality and we are part of it, but it cannot be caught as a whole in any form of representation, be it in words, images or logic. When simulating the real, choices have to be made, and trade-offs accepted. A computer simulation does not logically deduct a solution to a problem, but by approximating a phenomenon, by showing a slice of reality, it can raise consciousness regarding the matter.

MEASURING THE WORLD

As a framework for understanding and representing reality, computer simulation can be seen as part of a broader cultural move to increasingly interpret the world in terms of quantity and measurement. This move from a more language-based analysis and depiction of reality to one in numbers, scales and vectors goes hand in hand with the development and success of statistical methods in science and government and with the introduction of the market principle and competition in more and more sectors of society. As for computer simulation, ironically, it was only when mathematics was subjected to an ontology of measurement that it was able to fulfill its role in cultural understanding. It was only when it ceased to attempt to grasp the essence of the world, and restricted itself to superficial modeling, that it was able to become a form of representation. Turkle cites Rafe, a forty-six-year-old video editor as an illustration of the rationale of the move toward simulation: “Simulation offers us the greatest hope of understanding. When a world, our world, is far too complex to be understood in terms of first principles, that is to say, when the world is too complex for the human mind to build it as a mental construct from first principles, then it defies human intellect to define its truth. When we reach that point we must navigate within the world, learning its rules by the seat of our pants, feeling it, sharing it, using it. By getting our analytic intelligence out of the way, we can sometimes more efficiently negotiate that world" (1995: 46). It was only by accepting the limitations of quantitative modeling as a sign system, that computing was able to overcome its own theoretical limitations and become a cultural tool for analyzing and interpreting the world. For Ted Friedman, this makes simulation the perfect form of expression for the postmodern age. "Escaping the prison-house of language which seems so inadequate for holding together the disparate strands that construct postmodern subjectivity, computer simulations provide a radically new quasi-narrative form through which to communicate structures of interconnection" (1999).

Computer simulation was not the first cultural form to use a complex framework of quantified relations between elements for the representation of reality. One highly influential implementation of quantified thinking in pre-computer games can be found in tabletop role-playing games such as *Dungeons & Dragons* {Gary Gygax 1974}. In RPGs, characters, challenges, actions and story are based on quantified relations between elements. The player's character, for example, is determined by its gender, race and class and is defined by some six characteristics: strength, dexterity, constitution, wisdom, intelligence and charisma. In the game, a dungeon master presents opponents and obstacles to the players loosely following a rule-book. These obstacles can consist of dangerous monsters or deadly puzzles. As the players progress through the game, killing enemies and collecting loot, their character increases in power, a process generally referred to as 'leveling'. After defeating a band of orcs, for example, their strength and dexterity may improve and by solving puzzles they may reach a higher level of intelligence or wisdom. Significantly, not only physical qualities such as strength are quantified on a linear scale, but also complex psychological traits such as wisdom, intelligence and charisma. This type of analysis of human psychology is of course reductive as a person can, for example, react intelligently in one situation, but not in another, or can be deemed wise by one and arrogant by another. Even magical power – whose very essence implies that it cannot be understood – is defined by objectified and quantified mental characteristics. Even the secret foundations of sorcery are unveiled, counted, quantified and interwoven in one large interconnected system of relative value.

A similar logic of quantification is present in computer games. Characters in *The Sims*, for example, are defined by five main characteristics: neat, outgoing, active, playful and nice. These characteristics are seen as virtues and the underlying aim of the game is to increase them by climbing the social hierarchy. In this way, *The Sims* implicitly claims that to be neat, outgoing, active, playful and nice is the main recipe for leading a successful and fulfilling life. Being creative, critical, intelligent and sexy does not help you as a Sim. There are only five characteristics that matter. "Not ten thousand nor three: the Sims have five" (Frasca 2001: 46). There are also exactly three modes of playing in *The Sims*, i.e. 'building', 'buying' and 'living'. When moving into a Sim neighborhood, the player receives an amount of money with which to build a house (walls, floor, windows, garden etc.) in 'building' mode; furnish it in 'buying' mode; and only then do interesting things in 'living' mode. Again, a familiar interpretation of life today. In *The Sims*, life is a matter of material well-being. You have to be financially independent, build a house, make it a nice place and then you are able to lead a fulfilling life. The virtual life of a Sim is not divided in learning, caring and helping, for example, but in building, buying and living. Everything is already there in the catalog. It only needs to be bought. The highest goal in the game is to become successful, earn more money so that you can move to a larger house and buy more expensive goods. It is not to be there for your family, to lead a truthful life in the face of a god or to realize yourself creatively. It is to function within and contribute to the economic system. Computer games are a construction, a cultural form which reflects the meanings, understanding and preoccupations of the culture in which it was developed. In itself, measurement and modeling are a perfectly legitimate and powerful new means of understanding and representing the world. What should not be forgotten, however, is that they are just that: quantifications of qualitative judgments which are part of a cultural construction. *The Sims* is a reflection of the contemporary lifestyle of the American middle-class (who are also its primary target audience). As such, it is only one, very narrow interpretation of how one can lead a fulfilling life. It is a partial representation of a cultural image, not an analytical fact.

THE PRISON HOUSE OF QUANTIFICATION

In 1976, ten years after he had programmed *Eliza*, Joseph Weizenbaum published *Computer Power and Human Reason: From Judgement to Calculation*, a defense of the power and uniqueness of human judgment and the necessity to distinguish it from mechanical rule-based thinking. In his book, Weizenbaum laments the invention of the intelligence quotient by the French psychologist Alfred Binet in 1905. “Few 'scientific' concepts have so thoroughly muddled the thinking of both scientists and the general public as that of the 'intelligence quotient' or 'I.Q.' The idea that intelligence can be quantitatively measured along a simple linear scale has caused untold harm to our society in general, and to education in particular” (1976: 203). As is the case for many measuring systems, uninformed observers tend to interpret their approximative model as an objective truth, or even worse, as a reality of its own. Measurements such as IQ testing are a relative indicator in more than one way however. First of all, they are not objective. When evaluating a thought, this is always done in relation to other thoughts and not to some kind of objective fact. IQ testing, although it can provide regular and to an extent culturally independent results, has been designed by psychologists with specific problems and tasks in mind which are far from absolute indicators of the problems one is faced with during one's lifetime. Secondly, IQ testing reduces a non-linear phenomenon to a linear scale. A person may be good in logical thinking, but not so good in linguistic tests, for example. When these separate results are reduced to a linear scale, the maker of the test has to decide how she will represent them proportionally, which adds another subjective layer to the testing. Third and finally, intelligence is not a physical phenomenon which can be measured in the same way as distance or mass. It is not the number of neural connections which determine the quality of a thought, but its socio-cultural impact. In a sense, measurement and quantification of complex psychological phenomena are a form of metaphorical representation. Man is highly competent in judging and comparing phenomena expressed in quantitative terms (distance, price etc.). Hence it is useful to refer even to more complex realities in numerical terms. It should be remembered, however, that these measurements are simplifications and do not correspond to the phenomenon itself.

An often heard counterargument to this line of argumentation is that the proposed tests are not yet perfect, but that they will become more granular and objective in the future. This is a fallacy however. Making a subjective measure more complex does not result in objectivity. It may obfuscate its own subjective ontology, but it will never result in an objective truth. As an illustration of the fact that strengthening a technique does not necessarily contribute to its validity, Weizenbaum refers to computer horoscopes. "There are computer programs that can carry out with great precision all the calculations required to cast the horoscope of an individual whose time and place of birth are known. Because the computer does all the tedious symbol manipulations, they can be done much more quickly and in much more detail than is normally possible for a human astrologer. However, such an improvement in the technique of horoscope casting is irrelevant to the validity of astrological forecasting. If astrology is nonsense, then computerized astrology is just as surely nonsense" (1976: 34). Quantification does not make a proposition impervious to qualitative criticism, nor does it make it objective; it only renders it more precise in its subjectivity. The quantitative view on reality opens interesting perspectives for new ways of cultural understanding, but it also inheres a fundamental danger. Quantitative systems are always based on qualitative judgments, yet they tend to emphasize the results of their measurements and hide their qualitative underpinnings. Hence there is an imminent danger that the model will increasingly be seen as an objective fact or even a replication of the phenomenon that is measured. Like most forms of fundamentalism, this allows to trade the daunting complexity of reality for the seemingly safe and trusted familiarity of a single principle. At the same time this trade is illusive however. A model is no more than a representation and measurement only a tiny slice of the cake that is reality.

HYPERREALITY

In the 1980s, French cultural philosopher Jean Baudrillard pointed at the danger that too many of our interpretations and decisions are based on models rather than reality itself. By way of example, Baudrillard refers to mass media and the capitalist economic system. His ideas are primarily a semiotic theory of representation and the role played by signs and values in our society.[42] Due to our extensive exposure to media, especially media images, in our everyday lives, these images have begun to play a major role in our understanding of the world. For Baudrillard, these images are gradually replacing reality as our basic frame of reference. When we are today confronted with a sign or a representation, we no longer base our understanding of it on our own experience of reality, but on other signs and images. For Baudrillard, this means that signs increasingly derive their meaning from one another and are losing their referential link with reality. As our experiential horizon is built of media representations, the signs we ourselves create no longer refer to a reality we know, but to other signs and representations.[43] Thus we are creating a layer of images between ourselves and the world. and these images, as they refer only to other images, slowly develop their own alternative reality: "the generation by models of a real without origin or reality: a hyperreal" (Baudrillard 1988). Images are being created increasingly on the basis of other images, rather than on reality. For Baudrillard, they no

[42] Baudrillard's philosophy of the hyperreal is a semiotic theory of representation, but it has often been mistaken for a theory of perception or even an ontology. One often heard criticism, for example, is the fact that his theory is contradictory because he laments the disappearance of reality, but how can something disappear which he claims never existed in the first place? This seeming contradiction is based on a misunderstanding. When Baudrillard writes about the hyperreal that is replacing the real, he is talking about the role signs and signification play in our culture, not about the non-existence of an empirical reality. He is simply describing the fact that due to the ever larger role media play in our lives, these media are becoming the basis of our understanding of the world rather than the world itself.

[43] In 1991, Baudrillard provocatively claimed that the (first) Gulf War never took place. Many critics of poststructuralist thinking took this example as the proof of poststructuralism's relativism or even cynicism. What they failed to see was that Baudrillard's statement was not about perception or the world, but about the statement itself. What he meant was that when we use the term 'Gulf War', it refers to something to which both speaker and listener can relate, but which they only know from media images and subjective analyses. Of course there have been terrible bombardments, man to man fighting, thousands of dead etc., but this is not what the word 'Gulf War' refers to for Baudrillard. 'Gulf War' refers to media images of SCUD rockets being launched against Israel, precision bombardments and a fast and clean victory of the allied forces.

longer function as representation as they do not re-present something in the world. Rather, these hyperreal images are the result of a process of what he calls *simulation*,[44] the creation of an image to be an alternative to reality rather than represent it. Images have become simulacra, copies of originals that never existed, e.g. Disneyland's Main Street.[45]

Baudrillard situates the appearance of the mechanism of simulation in our culture with the crash of the stock markets in 1929 and the collapse of a whole range of national currencies in the 1920s and 1930s (1993: 21). To him, this marked the beginning of the acceptance that the economic model is not a derivation of reality, but that reality is dependent on it. The loss of the Bretton Woods gold standard in 1971, he sees as the definitive loss of any possible reference for economic value, turning our economy into one large relative system of belief without a referential link with reality. The economy has become a simulation, a quantitative model based solely on exchange value, which, for Baudrillard, does not mask or hide use value, but replaces it. "[Simulation] is no longer a question of imitation, nor of reduplication, nor even of parody. It is rather a question of substituting signs of the real for the real itself; that is, an operation to deter every real process by its operational double, a metastable, programmatic, perfect descriptive machine which provides all the signs of the real and short-circuits all its vicissitudes" (1988). This leads to the removal of significance from production and the installation of the 'economic' as its rationale. Production is no longer seen as a meaningful activity in relation to other ideas or activities, but rather for the sake of production and growth itself

[44] Baudrillard opposes simulation to representation, whereby representation is seen as carrying reference to reality and simulation as only referring to itself, "the sign as reversion and death sentence of every reference" (Baudrillard 1988). In this study, I use 'simulation' not in the philosophical sense, but to refer to a specific type of dynamic representation, i.e. computer simulation.

[45] Baudrillard's theory can be seen as a manifestation of a deeper cultural fear of technology and its control over man. Many cultural representations of technology refer to this conflict between man and machine (see also chapter 5 on the purpose of play). The entire dystopian tradition can be seen as an expression of the fear that technology is taking over our daily existence and that the world is slowly being dominated by models instead of the other way round. This ontological fear is based on a misunderstanding, however, as technology is a tool and simulation a form of representation created by man. Hence, if there is a problem, it should be formulated in epistemological terms. It is because in many cases models are mistakenly presented as a form of über-reality, that this fear of technology and feeling of loss of control increases.

(1993: 33). Whilst I do not agree with Baudrillard's fatalistic perspective, I tend to agree at least partly with his observation that modeling and measurement have in some parts of our society transcended their own role of being a representation. What Baudrillard sees as a loss of reality, a definitive ontological fact, however, I tend to see as a basic epistemological misunderstanding. Like all forms of representation, models are human creations for understanding complex dynamic processes. They are not, nor will they ever be the processes themselves. Economic simulation is a window onto the world and when making decisions, it should be taken into account, but only as that which it is: an approximative constructed model of one specific aspect of a possibly endlessly complex reality.

In conclusion, what I object to most strongly in Baudrillard's analysis is its undertone of inevitability. Baudrillard regards the ubiquity of media imagery and the growth of the capitalist economic system as inevitably resulting in the definitive replacement of reality by the model. Like Neil Postman, he describes the cultural history (of the image) as a succession of stages induced by technological development, without questioning this development or the role that man plays in it. As I have argued before, this is a naive and reductive view on development. Technology is not something that develops outside and independent from society. If media have acquired a more prominent place in everyday life in the second half of the twentieth century, this is not because we are all sheep and some evil genius wants us to watch television commercials. Rather, it is the result of a complex cultural dynamic dealing with a world continuously growing larger and more complex.[46] Our cultural horizon broadens as our planet develops toward a globalized society, and our knowledge about the world deepens with scientific progress. The growth of technological imagery and the development of dynamic modeling are part of this process. Ironically, technology and

[46] One instance of a geopolitical strategy in which computer simulation played an important role was the Cold War military doctrine of mutual assured destruction (MAD). This strategy was based on the theory of deterrence and stipulated that, to prevent an enemy to launch a nuclear attack, it would suffice to preserve so-called second strike capability, the force to retaliate even after a first strike, e.g. from ballistic missile submarines. Simulations allowed to calculate all possible outcomes of a global nuclear war and thus helped to support the MAD doctrine and prevent this war from actually taking place. In this example the model did not obscure the view on reality, but rather allowed to see it at all without endangering the entire human species.

representation are a prerequisite for a global society based on empirical fact. Simulation is a powerful form of representing the world and can help organize a complex global society. If some try to push the model to become a reality of its own, this is not due to some inherent logic of the model itself, but to a misunderstanding or to political motivations. A simulation is an instrument, not a god. It is a form of dynamic representation created by man to assist him in interpreting the world, not to replace the process of human interpretation.

III

Virtual Ontology

> The imitator or maker of the image knows nothing of true existence; he knows appearances only.
>
> Plato, *The Republic*, book 10, 360 BC

In 1984, William Gibson published *Neuromancer*, a science fiction novel telling the story of computer hacker Case who is approached by Wintermute, an artificial intelligence program which is assembling a team to raid Tessier-Ashpool's headquarters and liberate Neuromancer, another A.I. The novel is set in the near future when the world has been devastated by nuclear warfare and ecological disaster. Technology has come to dominate life on earth. Electronic gadgets and implants have turned man into a cyborg, chemical treatments keep him young and healthy, and synthetic drugs help him cope. People have cranial jacks installed in their skulls which allows their brain and nervous system to access microsofts (powerful memory chips), Simstim units (a sort of virtual reality whereby the spectator is cast into the role of one of the actors: viewing, hearing and feeling what they do), and most importantly the matrix, a digital space connected to all computer systems in the world.[47] Despite its gravely dystopian theme and overall grim outlook on the future of man, *Neuromancer* has been received with great enthusiasm, triggering the cyberpunk movement, popularizing the idea of artificial intelligence, and most of all paving the path for the popularization of the Internet. Whilst the idea of a virtual space was not new – it had previously popped up in various other science fiction novels and films – Gibson was the first to describe it in such compelling, illustrative terms and attach a name to it: cyberspace. The term 'cyberspace' is derived from the word 'cybernetics', which refers to the scientific study of communication processes between man and machine. 'Cyberspace' filled a cultural and semantic gap while at the same time strongly appealing to the imagination. In no time, it lost its biological connotations and came to refer to any computer-generated virtual space. As such, it was picked up by marketeers and played a primary role in the hype surrounding the Internet and in the steep rise and consequent downfall of the dotcom economy.

Meanwhile, since the 1970s, researchers and artists had been experimenting with three-dimensional virtual environments such as the *Aspen Movie Map* {Andrew Lippman 1977} which takes the user on a virtual tour through the city of Aspen, Colorado. Myron Krueger was an artist who aimed to create virtual immersive environments referred to as 'artificial realities'. The definitive breakthrough of the idea of a simulated environment in which the user is cast appeared in 1989, when musician and visual artist Jaron Lanier boldly replaced Krueger's accurate but somewhat dry modifier 'artificial' by the more suggestive 'virtual' thus coining the now commonplace notion of 'virtual reality'. While the term 'artificial' referred to the constructedness of the space generated by the computer, the term 'virtual' implicates its almost being real. Etymologically (see also below) the term 'virtual' is related to the idea of potentiality, referring to an inherent capacity of it coming into being. This permitted Lanier's concept to jump on the cyberspace bandwagon launched five years earlier. The fact that

[47] The term 'matrix', which was also used in *Doctor Who, The Deadly Assassin* {Robert Holmes 1975} and *Tron* {Steven Lisberger 1982}, was derived from the mathematical notion referring to 'a rectangular array of elements organized in rows and columns'. Fifteen years after *Neuromancer*, it inspired the Wachowski brothers to make the *Matrix* film trilogy.

virtual reality technology was (and still is) nowhere near its implicit goal of potentially replacing actual reality was not a problem. The mythical potential and theoretical attraction that emanated from the notion were more than enough to catch the public ear and eye and to enter the collective imagination. Two years after Lanier's coinage, journalist Howard Rheingold published *Virtual Reality*, an imaginative contemplation of the possibility of man building his own perceptual worlds. Rheingold's book was absorbed in the Internet frenzy of the early 1990s, received much critical and academic attention and managed to further popularize the term. Since that time, virtual reality technology has not made that much progress, yet the idea of virtuality in relation to three dimensional computer simulation has become so common that it is most likely here to stay.

1. Analyzing the Virtual

The term 'virtual' means something like 'potential', 'almost real', 'being such in appearance or effect though not in actual fact'. Etymologically, it is related to ancient Latin 'virtus' meaning 'manliness', 'power', 'virtue' (cf. by virtue of: on the strength of). In medieval scholastic philosophy, a more ontological notion was derived referred to as 'virtualis' and used to designate that which lies within the power of the world (God) to become actual. It was derived from Aristotle's metaphysical theory which makes a distinction between potential and actual existence (in potentia vs. in actu) whereby the potential refers to that which could exist, the only obstacle being that it is not yet actualized, created if you like. A classical example is that of the acorn and the oak. While an acorn is not a tree, it has been blessed with the ability to become one. Godly providence has foreseen that an oak can be present in every acorn. Every acorn has the potential to actualize into an oak tree. It is important, however, not to mistake the Aristotelian and Scholastic notion of virtual for a scientific concept. It is a general, metaphysical idea and thus it does not just apply to natural phenomena such as the growth of a fruit, but to any object with certain applications or abilities. Hence it could be used with regard to man who has the potential to become a carpenter for example, but also to iron which can become a sword, grain which can become bread and a brick which can become a house. In Scholastic theory, a brick could be referred to as a virtual, a potential house.

Around the eighteenth century, the concept of virtuality was introduced to natural science to describe the optical phenomenon of virtual focus. Lenses and mirrors are artifacts crafted to shape an image of an object by modifying the path of its light rays. Thereby images can be real or virtual, enlarged or reduced in size, and erect or inverted. Whereas the latter categories are straightforward enough, the former merit some more attention. A *real image* of a scene is one formed by rays of light actually passing through the image point, converging to a focus there. This type of image can be projected on a screen placed at the image location. *A virtual image*, on the other hand, consists of diverging rays of light which appear to come from a point within or behind the mirror or lens. As the rays are diverging, they cannot be focused at any point making it impossible to project the image on a screen. Significantly, the image reflected by an ordinary mirror is virtual.[48] Marie-Laure Ryan (2001a: 27) notes that, with its use in optics, the term 'virtual' at the same time lost its metaphysical connotations and moved further away from the idea of 'potentiality' to also come to mean 'real in appearance but not actually so'.

In the early days of computing, the term 'virtual' was picked up by computer scientists to refer to that which the machine thinks it is dealing with, but with which it is not actually dealing. In this sense it was used for example in the compound 'virtual machine' where it refers to the intermediate layer created between human programmer and machine. Because low-level computing is concerned with the switching of bits and bytes, it is almost impossible to program complex routines in low-level machine code. For this reason, higher-level programming languages have been created which are easier to deal with for programmers and which are themselves translated to low-level instructions by automatic interpreters and compilers. A virtual machine is an apparatus with which programmers pretend or imagine to be communicating while in reality it exists only as a programmatic construct, an intermediate software layer. In a

[48] The image formed by a concave mirror (as in a reflecting telescope) is real while a magnifying glass can form either a real or a virtual image depending on how far it is held from the object in point. When held close, the image is virtual and erect. When held further away, it is real and inverted.

similar sense, the term 'virtual' is used to describe other computer phenomena whereby it invariably refers to constructs which pretend to be something without actually being so. A virtual disc, for example, is a portion of random access memory used for high-speed storage and retrieval but which presents itself to the computer as a hard-disc. Virtual memory, inversely, refers to a software construct which reserves a part of the hard drive to function as memory in case all actual ram memory is used up. It is here that Jaron Lanier in 1989 picked up the idea of referring to digital constructs as 'virtual' and generalized it to refer to any simulation of a real-world object by a computer: a virtual home, a virtual car, a virtual character and so forth.

Becoming Virtual

In 1998, the French philosopher and multi-media theorist Pierre Lévy published *Qu'est-ce que le virtuel?* (*Becoming Virtual: Reality in the Digital Age*), a philosophical exploration of the ontological nature of the digital age. Lévy's main claim is that, with the advent of information technology, we are increasingly being faced with the limitations of the traditional opposition between real and possible reality, the former referring to that which surrounds us and the latter to that which is not there but could be. For Lévy, this opposition has been superseded by a new one which is beginning to dominate our lives: the opposition between the potential and the actual, whereby, increasingly, we are seeing the world not in terms of distant possibility, but as nearby potential. The main difference, for Lévy, is that the potential is not just a question of logical possibility, but that it is in fact part of reality. One can stand on a hill and imagine the *possibility* of building a house there. When looking at a brick, however, one can see its *potential* to become one. Whereas, both the possible and the real are so-called ontologically complete – they are fixed in their either being or not being – the actual and the virtual are not ready-mades. The virtual is a solution to a question that poses itself, and the actual is the result of a complex interactive process of development, not of binary creation. Hence, when looking at virtual objects generated by a computer, they should neither be seen as possible nor as real creations, but as a sort of in-between category: objects which have not yet been actualized, but which have the potential to become so. For Lévy, this is the essence of the information age in which no longer the object alone has value, but also its analysis and description.

According to Lévy, our culture and society are reorienting from the opposition between real and possible to that between the actual and the virtual. Whereas previously the world was interpreted as a collection of givens, now the emphasis is increasingly on the changeability and potential present in the world. This move can be observed in, for example, the virtualization of communication, economy and identity at the end of the twentieth century. To Lévy, the virtualization of our culture is part of our "poursuite d'une hominisation continuée," our continuous pursuit to become more human(e). For Lévy, there are at least three virtualization processes that have helped the human species to break loose from its natural condition: the development of language, that of technology and that of institutionalization (69). The development of language allowed for the virtualization of time in that it enabled man to gain control over his own development in time by handing him a tool for referring to past and future events. Technology, which is seen in a McLuhanesque light, has allowed man to virtualize his actions (for example by planning), his body by extending it (the car extends the feet, an excavator the hands), and his physical environment (global telecommunications abstract physical location). Finally, institutionalization – the way in which man organizes himself in political, economic and social entities – is for Lévy a way for man to virtualize violence (75).

In the second half of the 1990s, utopian claims such as Lévy's regarding the potential of information technology to deliver man from his restrictions as a physical being were the rule rather than an exception. During the Internet hype, in a sort of inverse fin-de-millénaire frenzy, it was believed that, now that the Cold War had ended, technology would be there to empower and unite man to form one 'global village'. The primacy of the real would be broken. Virtual economies, cut loose from the restrictions and boundaries of the real, would compete and eventually replace real-world economies. And the world as a whole would become a more humane, democratic and free place to live in. It is also in this light that the dotcom boom is to be understood. Companies with ambitious (virtual) plans, but few (real) achievements were catapulted towards soaring stock prices. When this news was picked up by the media and the public, they, in turn, began to believe the hype and contributed to it by buying their share. At the end of the 1990s, when the problems and limitations of the Internet began to sink in and it became clear that the dream had been only that: a dream, the virtual economy was in no time reduced to its real proportions. The dotcom hype became a nightmare, stocks plummeted and large numbers of well-meaning utopianists lost many years of savings. Today, the utopian calls for a new virtual world have largely disappeared except in one area, that of persistent world games, also referred to as massive multiplayer online games (mmogs).

PERSISTENT WORLDS

Since their inception, computer games have been accessible to multiple players at once. *Space War* {Steve Russell 1962}, for example, was made for two players; there was no computer opponent. And *Pong* {Nolan Bushnell 1972} could be played against the computer, but the two-player version was more engaging and more popular. Experiments with so-called networked gaming with multiple players each sitting at their own computer terminal followed not much later. Already in 1969, Rick Blomme programmed a networked two-player version of *Space War* for Plato, a distant forerunner of today's Internet. A second important milestone in networked computer gaming was *Maze War*, a multi-player maze game developed around 1974 at the NASA Ames Research Center in California. As the name suggests, *Maze War* is a combat game set in a labyrinth of which a small map is displayed at the bottom of the screen. The player is represented in the virtual world by something that looks like an eyeball and which can move around and shoot in a rudimentary but coherent three-dimensional setting. The aim of the game is to steer your avatar through the maze chasing and shooting other players.

Maze War was what could be called a sessional multi-player game. As with most computer games which are played over the Internet today, a number of players would log on to a central computer and a game session would start. Some time later, when a winner has been appointed, the game session would end, players would log off, and the game software would be reset to its initial state or wiped from memory entirely. Hence, apart from being accessible over a network, games such as *Maze War* are not so different from earlier multi-player games like *Space War*. All through the seventies, *Maze War* was a hit in computer laboratories all over the USA just like *Space War* had been in the 1960s. Interestingly, *Maze War* still has its influence on the gaming scene today. Because it was developed in the public domain, no company that came after it has been able to claim ownership of the rights to the invention of multi-user, networked, three-dimensional computer games.

A rather different type of multi-player game is that of so-called persistent environments. Whereas in sessional multi-player games, every time a game is played, a new virtual game world is generated, persistent environments exist independently from any player's game session. Whereas in sessional games the virtual world is dedicated to the players temporarily entering it, a persistent world is always already there and continues to evolve even when all players have logged off. An early example of a persistent multi-player environment was *Multi-User Dungeon* or MUD, developed in 1978 by Roy Trubshaw and Richard Bartle at Essex University, England. It was a text-based dungeon-crawling game which could be accessed simultaneously by multiple players, who each controlled their own character. When the player is logged on, she can move around in the virtual environment by typing commands such as 'go north' and carry out actions like 'open door' or 'hit troll with ax'. When she logs off, her avatar will temporarily refrain from taking action, but other players will come and go and computer characters will make sure that the virtual environment continues to evolve. The game usually referred to as the first graphical persistent game world was *Neverwinter Nights*, designed by Don Daglow and Cathryn Mataga. It was a fantasy role-playing game which was accessible on America Online between 1991 and 1997.

THE QUEST FOR GROWTH

The fantasy role-playing game genre can be traced back almost in a straight line to Gary Gygax and David Arneson's *Dungeons & Dragons*, a tabletop game played with several players and a Dungeon Master who orchestrates and referees game-play based on a rule- and a story book. Thematically, the *Dungeons & Dragons* universe goes back to J.R.R. Tolkien's Middle-Earth as it was described in the *Lord of the Rings* trilogy (1954-1955). It is a fantasy universe in which peoples such as hobbits, dwarves and elves live in a land roamed by wonderful magical creatures and dangerous monsters such as orcs and trolls. Tolkien's world stems from Celtic and Germanic legend with medieval elements added, from Arthurian legend for example. The power of the fantasy universe and theme lies neither in intrinsic refinement nor in an ingenious plot, but in its imaginative power and its flexibility. Because of the distance between the fantasy story world and our own, an almost infinite number of possible magical spells, weapons and monsters can be introduced to resolve a plot-level problem or create suspense without leading to anomalies. Typically, fantasy stories are driven by the quest topos whereby a hero sets out to retrieve a valuable object or rescue a damsel in distress. This topos which sports at the same time movement, exploration and narrative development is ideally suited to support the episodic nature of gaming in which the player moves, fights, moves, puzzles, moves, rescues and so forth. Finally, the fantasy theme allows for the thematic representation of the gaming experience itself. As its name suggests, *Dungeons & Dragons* is for the larger part set in an underground environment inspired by Tolkien's descriptions of the passage of Frodo, Sam and others through the dark caves of Moria in *The Fellowship of the Ring* {1954}. This type of descent into a dark and dangerous depth can be seen as a metaphorical reflection of the gaming experience itself, whereby the player is cast into the game world and descends to the heart of the system so as to master it (see also next chapter on introjection).

A second, arguably even more fundamental influence on *Dungeons & Dragons* were tabletop war games, from which the role-playing genre is essentially a derivation with story and fantasy elements added. As discussed in the previous chapter, one typical element of both war and role-playing games is their quantitative and mathematical setup. Every element in the gaming universe is defined by a number of characteristics and numerical properties which determine its role in the game world. In *Dungeons & Dragons*, each player chooses her game character by selecting her race (human, elf, dwarf etc.), gender and class (fighter, mage, thief etc.) and by throwing dice in order to generate numerical values for her basic properties (strength, dexterity, constitution, wisdom, intelligence and charisma). The progression in the game is driven by a growth topos, a desire to increase the strength and abilities of one's character by gaining experience points. Killing monsters and solving puzzles yields experience and goods, which leads to more powerful weapons and magical spells, which in turn allows to go on more dangerous quests, kill even more frightful monsters and gain even more experience. One strong point of this type of organization is its extremely long tension span. The ultimate goal of the game is almost infinitely far away, but nonetheless, as the player solves subplot after subplot, she always has the feeling that she is working toward it by increasing her character's skills. Hence, in a role-playing game, an obstacle is never just an obstacle, but also an opportunity to reach a higher level or find a magical sword which will later serve to finish the ultimate quest. Finally, it is interesting to note that, whereas in fantasy literature the growth topos is still subjected to the quest topos – Frodo and Sam go on a quest to destroy the Ring and in the process accidentally gain experience and become men – in role-playing games it is the inverse: the player wants to gain experience and in the process accidentally goes on a quest. The essence of game play is quantitative progression, qualitative progression in the form of the story being only of secondary importance.[49]

When the growth topos is implemented in a multi-player game, this generally leads to an interesting economic dynamics whereby players try to exchange those assets and goods of which they have ample for others of which they have too little. In a persistent game world, one could, for example, become a blacksmith and start forging tools, which would lead to more forging experience points, which in turn allows to produce higher level weapons and armor. These goods can be collected, taken to the market, sold either to other players or merchant bots, and the acquired money can be used to buy other goods or pay for learning new skills in a university for example. Another player may de-

[49] It is difficult not to note the parallel between this switch and the movement to prominence of quantitative arguments to the detriment of qualitative (ideological) ones in everyday social and political discussions in the second half of the twentieth century.

cide to become a soldier and buy weapons from the above blacksmith. She may venture out and attempt to kill small vermin just outside the safe walls of the city. This will make her gain experience and loot which she can sell on the market where she can buy better weapons and so forth. Persistent worlds can accommodate thousands or even tens of thousands of such characters. The result of the sum of all their decisions and market transactions is an emergent virtual economic system, which in certain respects behaves not unlike an actual economy. Virtual goods are produced, traded, used and replaced and their prices rise and fall when either demand or production increases. When there are too many fighters in comparison to the number of blacksmiths, for example, the price of weapons will rise steeply. Such inflation is scarce however. More common is the inverse case whereby more and more players reach high experience levels which allows them to forge higher quality and more expensive weapons and bring back more valuable loot. This results in a devaluation of the virtual currency and causes massive inflation of goods in the game world, a phenomenon sometimes referred to as 'mudflation'.

LAND OF MILK AND HONEY

In the USA, persistent gaming was popularized by *Ultima Online* {1997}, a role-playing game based on Richard Garriot's *Ultima* heritage {1981-}.[50] At the beginning of the game, each player defines her avatar's characteristics and is cast into a virtual world called Norrath. The aim of the game is to increase your character's stats while protecting a number of chivalric values. This is done by going on quests, killing monsters, gaining experience points and bringing back loot. This loot can then be brought to the market and sold to merchant bots or to the highest bidder for Norrathian platinum pieces. Around 1999, however, *Ultima*'s game makers began to notice that some trades of highly valuable items and gaming accounts no longer took place on the internal game market, but on real-world online auction sites such as eBay for up to one thousand real US dol-

[50] In South Korea, *Nexus: The Kingdom of the Winds*, which was designed by Jake Song, was published in 1996, one year before *Ultima Online*, and eventually reached over one million paying subscribers. Its successor *Lineage*, which was published two years later, became an even larger success.

lars (Castronova 2001: 32). Money would be transferred via real-world bank accounts and virtual items would be exchanged at an agreed-upon location in the game world. Electronic Arts, the publisher of *Ultima* did not intervene, but Sony Online Entertainment cracked down on the practice of selling virtual game items for real money in *Everquest* by changing the end user license agreement in April 2000. In the agreement, it was stipulated that it would be forbidden for players to buy or sell in-game characters, items or currency for real money. One year later, this was followed by an action by Sony to have all *Everquest* virtual items removed from eBay. The intervention had little effect, however, and only led to the launch of auction sites dedicated to virtual trading such as *Player Auctions* and *Gaming Open Market* where hundreds of items change hands every day for real money. Moreover, companies such as *Internet Gaming Entertainment* appeared, which are dedicated to buying and selling virtual items to players in various persistent worlds where they sometimes even have their own stalls where your avatar can buy or sell virtual items for real money or transfer virtual into real-world currency and vice versa. In early 2005, Sony gave in to the trend and announced *Station Exchange*, their own secure service for trading virtual goods between players for real money.[51]

Recently, a number of online meeting spaces such as *Second Life* {Linden Lab 2003}, *There* {Will Harvey & Jeffrey Ventrella 1998} and *Project Entropia* {MindArk 2003} have jumped on the virtual market bandwagon by allowing their visitors to create and sell virtual goods for real money and by presenting themselves as a virtual investment. *Second Life*, for example, describes itself as a land of opportunity. "Make real money in a virtual world—but not through any gray market 'harvesting' of currency or scavenging for artificially rare items. *Second Life* is a fully-integrated economy designed to reward risk, innovation, and craftsmanship." Visitors of *Second Life* can build their own virtual goods

[51] In the summer of 2003, new media journalist Julian Dibbell announced that he would attempt to earn a living from buying and selling virtual goods for a year and try to convince the Internal Revenue Service that his primary source of income came from the trading of imaginary goods. For months, Dibbell has been 'working' in *Ultima Online*, buying and selling virtual weapons, suits of armor and gold pieces to live up to his self-imposed challenge. At one point he decided that he would measure his success or failure by comparing his monthly income as a broker of virtual goods to his best month as a writer. In the end, Dibbell did not make it, but he only fell short some $683 and turned a profit of around $3,917 in the last month (Terdiman 2004).

and sell them in the game for Linden dollars, *Second Life*'s virtual currency. These Linden dollars can then be exchanged for real ones on third-party web sites where they are bought by other investors in the virtual world. The virtual meeting place *There* does not require the visitor to take this detour and permits her to transfer money directly from her real-world credit card into virtual Therebucks. *Project Entropia*, finally, flirts with the idea of migration to the virtual. It is set on a planet called Calypso – named after the nymph who offered Odysseus immortality in the Homer's *Odyssey* {8th century BC} – and does not charge any monthly fees. It is entirely funded by money that is transferred into the game. In August 2004, MindArk, the maker of *Project Entropia* announced the sale of a virtual treasure island on Calypso. For several months, players could visit and bid for the virtual estate, which was eventually sold to an Australian gamer for $26,500 US.

Economist Edward Castronova (2001, 2003) sees great economic opportunity for persistent world economies. In his 2001 working paper, he notes for example that the value of Norrathian platinum pieces exceeds that of the Japanese Yen and the Italian Lira. He further observes that the "creation of dollar-valued items in Norrath occurs at a rate such that Norrath's [gross national product] per capita easily exceeds that of dozens of countries, including India and China" (2001: 2). From Castronova's perspective, virtual economies are a logical development. "Value is subjective, wholly created in the minds of people. If people in free markets determine that a shiny crystal called 'diamond' is worth $100,000, economists basically accept the reality of that valuation. If the object in question is not a shiny crystal called 'diamond' but is rather a magic sword called 'Excalibur', that exists only in an online game, economists would still put the value of the item at $100,000." For Castronova, if Earth economies suffer as people spend more time in cyberspace, this does not imply that anyone is worse off. "The fact that labour hours that were once producing automobiles are now producing avatars does not mean anything about the level of wealth in society. The basket of produced goods is simply changing. A proper accounting would show, in fact, that the actual production of well-being per capita is rising" (Ibid.).

In the upcoming sections, I develop my own perspective on the ontological nature of the virtual based on the simulation framework sketched in the previous chapter. First I look into possible-worlds semantics as a possible theoretical basis for my discussion. I lay out its basics, what is required from a world to qualify as a logically possible one and what it could mean if it does. Next, I look at the proposal to regard fiction as a world-creating activity. I point towards a number of advantages, for example when dealing with linguistic reference to fictional entities or when explaining emotional response to fiction. I also point out two theoretical objections against the use of possible-worlds semantics for fiction, however, i.e. the problem of superposition and that of contradiction. Finally, I look more closely at the application of possible-worlds theory to virtual environments and reject it on the basis that they are not independent logical constructions and are hence subject to contagion from the real world. In the third and final section, I explore Kendall Walton's theory of representation as a game of make-believe. I first describe the Ancient notion of mimesis and then zoom in on Walton's approach to its description. I lay out his framework and point to a number of useful applications both when dealing with representation in the more traditional sense of the term and with play. I criticize his views on the relation between representation and truth, however, and reject his attempt to describe the difference between fiction and non-fiction as a binary opposition. Finally, I return to the issue of the ontological status of virtual economies as discussed earlier in this section and point to their being an imitation rather than a form of possible reality. Hence I reject the theoretical possibility of long-term value creation in persistent environments as it is sometimes put forward by virtual economy proponents.

2. THE VIRTUAL AS A POSSIBLE WORLD

Saul Kripke's theory of possible worlds (1963) is a logical model devised for the semantic description of modal operators such as possibility and necessity. In traditional, truth-functional logic, it is impossible to assess the truth-value of a counterfactual statement such as "If you had put one more folder into that cabinet, everything would have fallen out." The listener did not put another folder in the cabinet and therefore, in traditional logic, the statement would be judged wrong on the basis of the falseness of the proposition (from a false proposition anything follows). This is counterintuitive, however, as one can imagine a case in which the statement would be correct. It is true that the listener did not put another folder in the cabinet, but that does not mean that it would not have emptied itself if she had. Kripke realized this problem and proposed to consider the first part of the proposition "If you had put one more folder into that cabinet," as a sort of world-creating speech-act, placing the second part "everything would have fallen out" in a projected possible world. Because of the counterfactual nature of the if-clause, the rest of the proposition is projected into a theoretically constructed world which is identical to the real one, except for the fact that the listener *did* try to cram another folder into the cabinet. Possible-worlds theory is a useful framework for gaining insight into how we construct our conditional and counterfactual opinions about the world. It should be noted, however, that it is not a litmus test for measuring the correctness of a statement. It can serve as a basis for discussion, but it is not a formula for calculating the probability of whether the folders would have dropped.

The modal relationships between the actual and possible worlds are expressed using operators ranging from impossibility to absolute certainty. A possible world is logically acceptable when it satisfies the laws of non-contradiction and excluded middle. The *law of non-contradiction* states that something cannot simultaneously be true and false (for proposition P, it is impossible for both P and not P to be true). The *law of excluded middle* states that something is either true or false (either P is true or 'not P', one of both). These logical restrictions imply that a possible world must be both possible (non-contradictory) and complete and transparent (excluded middle).[52] In the possible world created by the cabinet statement, for example, either the contents have fallen out or they have not. It cannot be both at the same time (law of non-contradiction) and it

[52] There is much to say for the fact that the actual world itself does not satisfy the law of excluded middle by not being transparent. When I say that the car is the fastest means of transportation, for example, this can be deemed correct or incorrect depending on the situation and the interpretation of the listener. In this section, I do not pursue this issue any further. Rather, I assess the application of possible-worlds semantics to fiction on its own terms and formulate my criticism from within.

must be one of the two (excluded middle). You cannot say, for example, that in the proposed possible world there is no cabinet and that hence the contents have neither fallen out nor remained put. Possible worlds must be theoretical duplicates of the real world except for that which is stipulated by the counter-factual. What it means to be a 'theoretical' duplicate has been the subject of much contention however. Marie-Laure Ryan (1991: 23) distinguishes between two major positions. On one side there is David Lewis who professes *modal realism*. For him, possible worlds are what they are and there is no ontological difference between actual and possible worlds. The actual world is just the realization of one possible world among many.[53] On the other side, there is the *modal fictionalism* or anti-realism of thinkers such as Gideon Rosen and Nicholas Rescher. For them, possible worlds are constructs of the mind rather than absolute entities. They equate actuality with reality, restoring the uniqueness of the actual world.

FICTION AS POSSIBILITY

Marie-Laure Ryan notes that one of the first philosophers to approach fiction as a logical issue was Gottlob Frege. For Frege, a statement about an imaginary object, place or time is not automatically false, but because one or more entities do not exist in reality, it cannot be referential. “Sherlock Holmes smokes a pipe,” for example, is not a false statement for Frege, but it is not true either as Sherlock Holmes cannot be referred to as you would refer to an actual person. “Margaret Thatcher smokes a pipe,” on the other hand, is a product of either error or lying on the part of the speaker. For Marie-Laure Ryan, Frege's approach becomes problematic, however, when mixing real-world and fictional entities in one statement, e.g. “Conan Doyle created Sherlock Holmes.” For Frege, this statement would not be false, but it could not be true either as Sherlock Holmes cannot be referred to.[54] Conan Doyle *is* the author of the Sherlock

[53] Lewis' position is close to the original Leibnizian concept of possible worlds (17th century) on which the modern notion is based. According to Leibniz, an infinity of possible worlds exist as thoughts in the mind of God and only one is actual: the best of them all, chosen by the divine mind to be instantiated.

[54] It can be argued that Frege would reject this argumentation on the basis that, of course, Doyle created the fictional character Holmes to which can be referred as such, but not Holmes the detective.

Holmes detective novels and he *has* created the fictional character of Sherlock Holmes. Therefore, the statement should be deemed correct. In a similar way, Ryan notes that the statement “Sherlock Holmes created Conan Doyle” cannot be rejected on the basis of Frege's theory and would remain in a logical twilight being neither true nor false, but unreferential. In order to solve this dilemma, Ryan refers to David Lewis' (1978) proposal to regard fictionality as a type of possibility and fit fictional worlds within the logical framework of possible-worlds logic. Fictional worlds then become possible worlds existing in a modal constellation with the real allowing for the separation of reference and existence. Within the possible worlds theoretical framework it is perfectly acceptable that language crosses borders between worlds and allows to formulate fully referential statements about fictional entities.

Aside from explaining the complex intertwinings of linguistic reference between real and fictional situations, possible worlds logic can help to evaluate interpretative statements about fictional worlds. Marie-Laure Ryan notes that “[o]ne of the greatest theoretical advantages of the possible-worlds approach to fiction is that it provides a convenient method for assessing the truth value of statements describing or interpreting the universe of a fictional text” (Ryan 1991: 48). The concrete method she proposes is based on David Lewis' theory to determine truth conditions for counterfactuals and is based on the intuitive evaluation of modal distance (i.e. degree of possibility) between possible fictional worlds. For example, if I were to claim that Sherlock Holmes wears a baseball cap in his spare time, Ryan proposes to imagine two worlds – one in which Holmes wears a baseball cap and one in which he does not – and evaluate the modal distance between these worlds and our own system of reality. As Conan Doyle set his Sherlock Holmes stories in late 19th century London, and we know that the British played little baseball at the time, it is highly unlikely that there would be baseball caps. We also know that Holmes is a somewhat eccentric, not so young anymore detective gentleman, which does not make it any more likely, even if there had been baseball caps, that he would have worn one. Hence the world in which Holmes wears a baseball cap is significantly more remote, more modally distant from our own system of reality (i.e. less likely) than the world in which he would keep to his deerstalker hat.

A third way of using possible-worlds semantics is to describe how different fictional layers are embedded in a story. It allows, for example, to analyze and describe the various strategies employed by a text in order to be able to make covert statements about the actual world. One technique often used for blurring modal relations between the real and the fictional is to frame the main story within another. Imagine a frame story in which people are sitting around a campfire when a mysterious stranger joins the group. Later at night, after he has drunk more than is good for him, he begins to tell a mysterious tale... Apart from various stylistic advantages such as the possibility to temporarily pause the embedded tale and have other characters comment upon it, this technique also allows the author to pass on responsibility over style and ethical issues to the character telling the story. In other words, the author (or his substitute narrator) creates a fictional world in which a number of people are sitting together, listening to the story of a mysterious stranger who creates another possible/fictional world within the first, and it is only in this second, embedded world that the more sensitive events take place. Hence, when they are in some way unlikely, morally dubious or politically sensitive, the author can ascribe it to the opinions or style of the fictional character, passing on responsibility over the main story to the fictional world.

Fourth and finally, the possible worlds approach can be used to resolve the so-called 'paradox of emotional response to fiction', formulated by Colin Radford in the 1970s. This alleged paradox consists of the fact that readers experience *actual* engagement or even emotionally respond when reading about *non-actual* fictional characters and events. For Radford, this implies that the human capacity for emotional response to fiction is irrational: “our being moved in certain ways by works of art, though very ‘natural’ to us and in that way only too intelligible, involves us in inconsistency and so incoherence” (cited in Schneider 2002). Basing his argumentation on a strictly binary system of truth evaluation, the issue is simple for Radford: fictional worlds are untrue; readers respond to them emotionally as if they were true; therefore readers are irrational. If we take possible-worlds logic as a basis for discussion, however, the situation is different. Fictionality is then no longer a question of truth or falsity, but one of possibility. When responding emotionally to a story, a reader is not irrationally losing herself into believing that the events actually happened, but she is considering the possibility that they could happen. When a character dies, for example, the reader may be confronted with the future probability of her own death or that of a member of the family and react accordingly. Hence, Radford's paradox no longer stands as no one should find it contradictory that people feel involved when considering a possible reality. In fact, it can be argued that emotionally assessing different possible scenarios lies at the very basis of decision-making. Fiction can then be seen as an exploration of these faculties.[55]

Have Theory, Will Travel

The use of possible-worlds semantics as a theoretical framework for fiction analysis is not unproblematic however. In order to qualify as being possible, a world is required to be fully accessible by a speaker at all times, i.e. to satisfy the laws of non-contradiction and that of excluded middle. The law of non-contradiction states that propositions about possible worlds can never be both true and false at the same time. It is impossible that the contents of the cabinet both remain in place and fall down in one and the same possible world. The law of excluded middle, on the other hand, states that every proposition about a possible world must be either true or false, one or the other, there is no third possibility. Either it is true that the contents of the cabinet fell out or it is not and they remained in place. There is no other way. Fictional worlds and virtual environments do not meet these two requirements however. Representations are partial sketches approximating situations and events rather than duplicating their every aspect. It is the reader or viewer who completes the picture by filling in the gaps in the representation if needed. In fiction theory, this phenomenon is referred to by the notion of 'Leerstellen' (omissions, Wolfgang Iser 1970), gaps in the story which are filled in by the reader. Without the possibility to omit certain elements, it would be impossible to represent anything. It is only

[55] The active creation and emotional assessment of possible realities by the reader can in fact explain the functioning of fiction and media as means of coping with various emotions and situations without actually being exposed to them. I explore this idea further in chapter 5 where I describe game play as a form of coping with reality.

because of the human faculty to 'complete the picture' that man is able to communicate, using partial sketches referring to their real-world counterparts rather than duplicating them.

The inability of a representation to fulfill the laws of non-contradiction and that of excluded middle is a direct consequence of its incomplete, approximative nature. It is impossible for a text, a drawing, a film, a simulation etc. to depict every aspect of a given phenomenon. A text can (and should) never describe every scratch on the table, every speck of dust on the cupboard. A painting can never show every angle, every light ray reflected by a church. And a computer simulation can never imitate the behavior of every subatomic particle of a system. For this reason, there will always be statements about any instance of representation which simply cannot be verified. Objectively, these propositions will forever remain in what could be called a logical superposition being neither true nor false and both at the same time. If, for example, the color of Sherlock Holmes' socks is not explicitly mentioned in the text, the proposition that he is wearing white socks is neither true nor false. There is no objective information regarding the matter so the logical status of the statement remains superposed. Objectively, Holmes does not wear white socks and neither does he not wear them. The law of excluded middle states that every proposition about a possible world should be either true or not true. Hence the Holmes fictional world violates the law of excluded middle and does not qualify as a possible world.

Representations are not meant to be objective. They are partial depictions which only come to life in the subjective imagination of the reader or viewer. When reading a text, viewing an image or playing a game, a person automatically fills in those elements which are not objectively present, but which she needs so as to make sense of the representation. A reader of a short story about a young man assumes that he has a head even if it is not explicitly mentioned in the text. She may even imagine him handsome with steel-blue eyes while the author had a plain, brown-eyed midget in mind. One person may see Holmes as a nerdy type and imagine him wearing white tennis socks. Another may place more emphasis on his being a gentleman and a respected detective and imagine no such a thing. Hence the claim that Holmes wears white socks may at the same time be true to one reader and false to another thus violating the law of non-contradiction. With a few words or lines, a gifted artist may conjure up an entire universe for the onlooker to step into. This is what makes representation so powerful and communication so complex. From a logical point of view, however, it is representation's most severe weakness. Representation is never complete. It is a translation of a limited set of qualities of a phenomenon to another format, not its duplication. Hence only those readers or viewers who are familiar with the depicted events are able to complete the picture more or less correctly. And even to them, it will never be fully complete. Representation is a way of making reality accessible to man by omitting the trivial. Hence superpositions and contradictions with regard to interpretative statements are to be accepted as part of their nature.

SIMULATION AS POSSIBILITY

When applying the possible-worlds semantic framework to the analysis of virtual environments, we note that there are a number of similarities with the more general fictional framework sketched above. Like their fictional counterparts, virtual items can be referred to by natural language as if they were actual objects. 'Mario is a plumber' is a correct proposition although Mario is a computer game character. Apart from that, possible world semantics can also help avoid the pitfall of rejecting mixed-world statements between the actual and the virtual simply on the basis that they mix worlds. 'Shigeru Miyamoto created Mario' is a correct statement and 'Mario created Shigeru Miyamoto' is a false one because Shigeru Miyamoto is the designer of *Donkey Kong* {Nintendo 1981} which depicts a virtual world in which Mario the plumber first appeared. Similarly, the possible world framework can be used to map embedded worlds within a computer game environment. In the first-person adventure game *Myst*, for example, you, as a player, have to deliver a number of virtual worlds designed by the virtual character Atrus. In this way the actual game designers are able to attribute the puzzles and designs of the different worlds to the mastermind of a character by presenting them as worlds within worlds. Moreover, the idea of possible worlds can help to describe the evaluation of cognitive strategies by the player.

When confronted with a problem generated by the simulated environment, the player evaluates the desirability of a number of future game states, picks the most favorable possible virtual world and works toward it. Finally, viewing virtuality as a form of possible reality can explain the fact that players respond emotionally to virtual happenings, be excited when they find a solution to a problem or sad when they do not.

Apart from these merits, a possible-worlds interpretation of virtuality also inherits the theoretical problems of the framework for fiction. As described in the previous chapter, like other forms of representation, computer simulations and games are incomplete depictions, approximations of phenomena rather than their actual duplication. Hence, only a limited set of qualities are explicitly represented in the virtual environment evoking thoughts and perceptions and not reproducing objects. It is the player who is free to fill in the omissions made by the representation or leave them in an interpretative superposition. What is in the barrels that Kong is throwing down and Mario is trying to avoid is not described in *Donkey Kong* because it is irrelevant to the game. Hence, the proposition that they are oil barrels is in an interpretative superposition – it is neither true nor false objectively – which is a violation of the principle of excluded middle and would cause *Donkey Kong* to fail as a logically possible world. Furthermore, equally due to the incompleteness of the simulated environment, some omissions may be filled in differently in different playing sessions or by different players. One player may imagine that Kong is going to do terrible things to Pauline, if Mario does not succeed in delivering her in time. Another may imagine Kong to be in love with Pauline and wanting to take her with him to live together on a tropical island. Hence, for one player, the proposition that Kong is going to kill Pauline is true, while for another it is false. This is a violation of the law of non-contradiction, which again underlines that a fictional environment cannot qualify as a logically possible world.

MULTIPLICITY AND INTROJECTION

Apart from the problem of superposition and that of contradiction, when making a statement about a virtual entity, there are at least two additional fields of problems when we try to describe virtual environments as logically possible worlds. First of all, when reading a book or viewing a film more than once, a reader or viewer is given access to the same fictional world in which the same fictitious events take place. Her interpretation of what happens may differ but the events and characters portrayed remain the same. Even across episodes or books, fictional characters remain unique. There is only one Sherlock Holmes. All Conan Doyle's adventures happen to the same person living 221B Baker Street. Virtual characters, however, have a more ambiguous status. On the one hand, there is only one virtual character Mario in, for example, *Donkey Kong* and *Mario Bros* {Shigeru Miyamoto 1983}. On the other, each time you play a game of *Donkey Kong*, a slightly different series of events takes place within the virtual world. On one occasion you (Mario) are bitten by a crocodile, and on another you successfully pass the crocodiles, but are hit by one of the boulders Kong is aiming at you. Each game generates a different life course for Mario. But then how can it be the same Mario living in the same possible world? Imagine Sherlock Holmes in one version of a story revealing that the baroness is the killer and in another the butler. Could these events coexist in one and the same accessible possible world? They could not. One possible, if not very clean, solution is to accept that, with every game that is played, a new instance of a virtual world is generated in which unique events take place, which happen to unique characters (bearing generic names). Every time a game is loaded, a new Pauline is abducted and a new Mario the plumber has three chances to try and rescue her. According to this scenario, virtual entities could be seen as unique, but existing in multiple differing instances. A good analogy to go with here, is that of toys like Barbie dolls {Ruth Handler 1959}. There is only one Barbara Millicent Roberts, but there are many instances of her in different outfits and settings for sale at the same time. Similarly, there is only one Mario, but every time a game of *Donkey Kong* or *Mario Bros* is played a unique instance of Mario is generated. This solution would make it impossible to state a proposition about anything larger than one playing session, however, which would preclude the analysis of a simulation as a whole and would lead to analytical solipsism.

A second additional problem which occurs when analyzing virtual environments from the perspective of possible-worlds semantic theory is the ambiguous status of the avatar or rather the introjected I more generally (see also next chapter). Whereas in traditional fiction, the reader or viewer remains a distant onlooker, in a computer simulation or game, the player steps into the virtual world and takes part in the ongoing action. In hyperfiction and interactive cinema, although the participator or interactor can choose her own path through the material and can steer the action within the fictional world, she does not actually step into it. A computer game player, on the other hand, assumes an identity within the game world which can be that of a character that of a more abstract presence like a mayor, a general or a king guiding and ordering large numbers of semi-independent units. Anyhow, the player does not merely feel present like a reader or a spectator could, but she acts as if she were present. This can be observed, for example, in the fact that a player refers to indexical clues within the game world as if they were her real-world environment. Whereas a reader or a spectator does not refer to the main protagonist using the first person pronoun even if the novel is written in the I-person or the film recorded from a personal perspective, a player unproblematically refers to her avatar as 'I' and to that of her fellow player as 'you'. “I ran into a transporter right after I saw you running down the corridor.” Thus, if we want to evaluate statements about virtual worlds using a possible-worlds framework, we have to take into account that they are not strictly separated theoretical constructions. Computer game players or visitors of a simulation can cross the border between the real and the virtual and a statement like “I was killed by Sub-Zero” can be perfectly true whereas “I met Sherlock Holmes on Baker Street” can only be false.

CONTAGION

The phenomena of introjection and the double status of personal pronouns can be related to the more general process of contagion: the fact that dynamic models like simulations and computer games are subject to real-world influences. Simulations are representations which are dynamically generated by real-world software programs. These programs are not logico-theoretical constructs created to make counterfactual statements about the actual world, but they are artifacts devised with a specific purpose in mind. This purpose can be tied to intrinsically semantic or aesthetic motives, but it can also be blatantly pragmatic with regard to real-world material gain. A first example of contagion of the real into the virtual is that of commercial product placement: a technique which has been popular with film makers and television series directors since the early 1990s. Product placement is an advertising technique whereby companies pay, not to have their products presented and praised in separately marked advertisements before or after a film or series, but to have them quietly yet observably inserted into the fictional world. Close-ups of cereal boxes, accidentally mentioned car brands, seconds of typing fingers on a branded mobile phone and so forth have all helped to finance productions. In the mid-1990s, when game characters like *Tomb Raider*'s {Toby Gard 1996} Lara Croft became virtual stars, marketeers came to realize their potential marketing value. In *True Crime: Streets of LA* {Luxoflux 2003}, for example, Nick Kang, the player's avatar, is dressed in hip and trendy Puma clothing. Players are expected to identify with Kang's personality when playing the game and marketeers hope that this will influence their real-world buying habits. Other campaigns introduce their product as an in-game object with which the player must become familiar in order to continue the game. *Splinter Cell: Pandora Tomorrow* {Tom Clancy 2004}, for example, features two types of Sony Ericsson cell phones and when the player fails to master them, she will not be able to advance any further into the game. Again, marketeers hope that virtual acquaintance with the product will stir real-world interest in the brand. Finally, there are companies delivering in-game dynamic advertising over the Internet, whereby, for example, advertising panels are placed in sports stadiums or on billboards along the road in a virtual world. These panels are real-world advertisements mostly for products which do not even exist in the game world.

A second example of contagion from the real into the virtual does not so much evolve from the influence game makers and marketeers have on game mechanics, but from the input produced by players. Game environments are participatory in that they allow the player to project her wishes, fantasies and aberrations into the game world irrespective of whether they are logically appropriate or anticipated by the game designers. Nutt and Railton, for example, report on one Cyncla, a vivid fan of *The Sims*, who describes how she uses pictures of her ex-boyfriend to create a Sim character, and then proceeds to torment him by forcing him to take a horrible job which makes him unhappy, and by not giving him a bed to sleep in, which tires him out. Apart from that, she also makes him live in a house without a toilet so that he is constantly wetting himself which is not only degrading, but also forces the character to do perpetual washing and cleaning in order to raise his health points (2003: 589). Cyncla is not the only example of a *Sims* player who enjoys moving to the dark side. In fact, torturing Sims seems to have become a rather popular practice and when new torments are discovered, they are proudly posted on dedicated discussion forums. As one sadistic Evergrey testifies: "I guess people actually play this game to make their little sims happy. I'll admit that i did that for awhile, but to be honest, it just got boring. So of course I reverted to my typical gaming pattern of torturing innocents to death." After which he proudly describes how he created a random couple, built them a tiny room, made them go inside and then removed the door. His poor Sims would wet themselves, become hungry and thirsty, get depressed, but they would not die of natural causes fast enough for Evergrey, after which s/he set everything on fire (Nematoddity 2004).

CHEATING AND HACKING

The third and probably most significant form of interference from the real in the game world is cheating. Roger Caillois observes that one of the basic principles of playing a game is to allow all participants to start on an equal basis. Cheaters pretend to abide by this rule, but in reality they know a way of manipulating the game so that they gain an advantage vis-à-vis other players. A cheater violates the game rules while pretending to respect them. "He is dishonest, but hypocritical. He thus, by his attitude, safeguards and proclaims the validity of the conventions he violates, because he is dependent upon others obeying the rules" (1958/2001: 45).[56] In computer games, obeying the rules is not a

[56] For Caillois professional playing of either games or sports is also a form of contagion against which a game should take precautions, otherwise it becomes corrupted. Playing and working should be separate undertakings and the professional player is a sort of minor cheater in that she pretends to be playing a game, but is secretly practicing a profession. When playing a game becomes a form of work, the essence of the game is lost and therefore so is the game for Cail-

choice, but an imperative. Input from the player is controlled in such a way that the rules of a game cannot be broken by standard actions. Hence, within the scope of these commands, anything that is possible is allowed in order to try and win the game. In a real card game, if you are a highly skilled cheater, you may try to slip in an additional card from your pocket. In a computer card game, however, there are no pockets and no additional cards unless they have been explicitly programmed by the makers of the game. When they have been programmed, cheating simply becomes part of the computer game and, in a strict sense, it would no longer be cheating. Computer pinball games for example allow the player to bump the virtual pinball machine so as to alter the course of the virtual ball. If you bump it too hard or too often, the virtual machine tilts and you lose your game. Whereas in a real pinball context, bumping the machine is forbidden and the tilt mechanism is added to enforce the rule, in the computer game, since it has been programmed, it is allowed, a calculated risk but not a form of cheating. Cheating in computer games only occurs when players succeed in changing the game itself, when they hack into the game code and adapt its rules. Typical hacks in online shooters, for example, are the so-called god mode, whereby the player's avatar is recoded to be impervious to enemy fire; hacks providing unlimited resources, weapons or health or allowing to manipulate physical laws like gravity; and wall-hacks, whereby the player can move through walls within the game environment while his opponents cannot (see also Kücklich 2004).

Game hacks can affect entire persistent worlds with thousands of online players at once. In January 2005, for example, *The Sims Online* {Will Wright 2002} was subjected to an attack by a community of hackers who reverse-engineered, changed and added game programming code. Amusingly, the attack was not malicious and was in fact intended to make life easier for the Sims. "Entire neighborhoods of Sims are being mysteriously graced with eternal youth, while some characters are finding all their needs fulfilled by a single shot of magic espresso. Others no longer need to empty the toilet after potty training their toddler. Some Sims are being abducted by aliens when they glance

lois.

through their telescope -- every time, instead of just occasionally, which is normal" (Poulsen 2005). This does not make it less of a cheat of course as making a game easier may be just as pernicious to its functioning as making it more difficult. Not all attacks on online worlds have been so harmless to its inhabitants however. In May 2003, for example, *Shadowbane* {Wolfpack Studios 2003}, an online persistent fantasy game, was hacked, but whereas most hacks only alter the a limited set of entities or properties, this one changed the basic rules of the virtual world turning it into a virtual Twilight Zone. "The population of an entire *Shadowbane* town was forcibly moved to the bottom of the sea, where they drowned. City guards turned feral and attacked town residents. Mobs of never-before-seen superpowerful creatures, seemingly spontaneously spawned from the ether, began to prowl the streets unchecked, killing characters in the most painful way possible" (Delio 2003). Fortunately, the game makers were able to identify the culprits disrupting the game and forced a roll-back, reverting all virtual entities to their status shortly before the attacks.

Finally, persistent worlds can be hacked in order to generate unnaturally large quantities of virtual goods. One Rich – what's in a name – Thurman, for example, is known to have earned more than US $100.000 by farming 9 billion gold in *Ultima Online*. By using a macro, a small piece of software automatically performing the various clicks required to create a virtual object, he was able to generate an almost infinite amount of virtual wealth. At one point, Thurman had up to 30 personal computers running 24 hours a day, automatically generating virtual gold for him (Lee 2005). Similarly, in *Everquest*, players found a combination of profession, skill level and a macro that turned small cash piles into larger ones. By running the macro countless times, they were able to generate huge amounts of virtual money, which created uncontrollable inflation in the game world and threatened its virtual economy (BBC 2002). In other cases, players discovered bugs in the programming code which could be exploited to make virtual gains. In February 2005, for example, in the Korean persistent environment *Maplestory* {Wizet 2002}, a player created a hack that enabled him to kill every enemy on the map and deposit the drops of these kills at his feet. Needless to say that in no time unearthly amounts of goods were collected, collapsing the Maple virtual economy (Queen 2005). One final example occurred a few months later in the tremendously popular *World of Warcraft* when a player had discovered that when you give an item to a friend and then try to enter an overloaded area, you are refused access, but have the item again and so does your friend. Virtual worlds are not actually possible ones, but only representations generating objects of imagining. Tricks like macros, cheats and hacks painfully expose the artificiality of the virtual and its indebtedness to and dependence on their real-world software counterpart.

3. The Virtual as Mimesis

The concept of 'mimesis' goes back to Old Greek metaphysics and philosophy of the arts. A precise translation of the term is difficult as it is used with different connotations in various fields and by various authors. On many occasions, also in later aesthetic theory, 'mimesis' is placed next or in opposition to the concept of 'diegesis'. In this context 'mimesis' is used refer to those arts that *show* reality such as painting and sculpture, whereas 'diegesis' is used to describe those that *speak about* it, particularly literature. Etymologically, 'mimesis' is much richer however. The usual Latin translation is 'imitatio', which is useful, but which does not cover the meaning of mimesis entirely. Possible translations in modern English include: imitation (as in acting like, impersonating), simulation, copying, forging, mirroring, doubling, representing and citing (based on IJsseling 1990: 7). 'Mimesis' is said to originate in the world of music, dance and ritual from where it migrated to theatrical discourse, literature, the visual arts, and from there to philology, education and culture in general. Music is built up of different movements such as rhythm and refrain which are repeated and varied thus guaranteeing the continuity of a song. Through this repetition and imitation (or mimesis), music comes into being (9). In theater, actors impersonate historical or fictional characters by copying words and gestures and thus representing their deeds. Both the actors playing and the resulting plot are instances of mimesis, products of imitation of something else (10). Today, theorists tend to restrict the application of the concept of mimesis to art and culture in the narrow sense, but in Ancient Greece and Rome, this was not the case. For the Greeks and the Romans, every form of 'technè' and 'ars' (craft, skill, technique) is mimetic in that it is based on other manufacturings and creations. In this context, it is important to keep in mind the difference between the ancient concept of 'art' as creation and the romantic view of art as creative genius. Finally, not only making ('poèsis'), but also everyday acting ('praxis') was seen as a mimetic activity, a practice based on a principle of imitation and repetition (19). Thus, for the ancients, mimesis was not just an aesthetic form or a cultural practice, but one of the very principles underlying human behavior and culture itself.

When we look at the various present-day meanings of 'mimesis' (from representation over imitation to forgery), we notice a certain ambiguity, placing it balancing on the thin line between authenticity and non-authenticity, truth and falsity (7). On the one hand, there is the fear that imitation and representation of reality estrange people and thought from the reality at hand, a conception shared by Baudrillard for example (see previous chapter). On the other, there is the knowledge of the power and necessity of representation for cultural dynamics and scientific development. In Plato's philosophy, the idea of mimesis is directly linked with the idea of truth as correspondence and identity. For Plato, that which exists in reality is in itself already an imitation, an instance of mimesis, of the 'ideal', the world of absolute and essential ideas. Reality is an incomplete and imperfect derivation of the absolute forms (which would later be seen as ideas in the mind of god) determined by time and place. Visual art in turn exists in a mimetic relation to an already mimetic reality of which it is again an incomplete representation. Thus, for Plato, a real bed is an imperfect 'shadow' of the absolute idea of a bed and a painted one is a derivation of that derivation: it cannot even be slept on (15). Mimetic art creates a world of appearance and deception. Painters and poets replace reality with words and images and replace the essence of its objects with their superficial appearance. Hence Plato bans the poets from his ideal state in *The Republic* (11). Aristotle, on the other hand, places mimesis in a much more positive light, describing it not as inferior imitation, but as a form of representation carrying the power to make reality appear differently and thus generate new and unique understanding of that reality. For Aristotle, the essence of representation lies in the fact that man, in his very nature, tends to imitate and represent others and derive pleasure from recognizing this representation. Mimetic art enables man to point to the essential and necessary in the seemingly incidental and arbitrary of the real (16). For Aristotle, it is not the function of the poet to relate what has happened, but what may happen, what is possible according to probability and necessity. Hence poetry is more philosophical and more true than history as it describes the general rather than the specific (10).

MIMESIS AND PLAY

Imitative activity can be observed in animals as diverse as insects, birds and mammals, but man appears to be the imitator par excellence. Not only do we imitate our parents and environment, we also develop complex structures, codes and technologies so as to be able to observe and imitate that which we do not have at hand. As Aristotle describes in his *Poetics*, man seems to be directed towards mimesis in his very nature. But how should we look upon this ability? How is it introduced in our lives, how does it function, and what purpose does it serve? A recent, original, and highly useful perspective on the matter can be found in Kendall Walton's *Mimesis as Make-Believe: on the Foundations of the Representational Arts* (1990). In this study, Walton describes the functioning of the arts as a form of pretense play based on the same fundamentals children's play. His analysis is refreshing because he succeeds in relating the practices of representation and art to human culture without resorting to the mechanical linguistic/communicative scheme of sender-medium-receiver, which offers little room for the description of mental representation and interpretation within a cultural context (5). Mimesis as pretense play provides a useful framework for the description of how media, art and culture function in our society today, and allows to shift the analytical emphasis away from the maker and the technology towards the socio-cultural context of reception.

Children devote enormous quantities of time and effort to make-believe activities (see also chapter 5 on the purpose of play), a preoccupation which appears both natural and nearly universal, not particular to any specific culture or social group. The urge to engage in play and the needs these activities address for children are fundamental, and Walton appropriately poses the question whether such fundamental activities could disappear entirely as we grow up. His conclusion is that they do not (11). Adults still play games of pretense alone or in group when they look at a painting, a photo, read a novel, go to the theater, watch a film or, as I shall claim, play a computer game. When they decide to enter into a relationship with these objects, they enter a game of pretense in that they consciously accept what is being represented to be objects, people and places, although they know it consists of only words, enactment, brush strokes, light or geometric simulation. Readers spectators and players participate in pretense play in which cultural artifacts function as props much as children use plastic revolvers in games of cops and robbers, cowboys and Indians or dolls, and mud pies when playing family (213). Of course there are important differences between children's and adults' games of pretense. As we grow up, our interests change and so does our play. It becomes more subtle, more refined, but this should not obscure the underlying similarities between the activities. As Walton explains: "The games children play with dolls and toy trucks are in some ways more transparent and easier to understand than their more sophisticated successors. This is one reason why children's games will help illuminate the games adults play with representational works of art" (12).

Props, Prompters and Objects of Imagining

For Walton, activities such as daydreaming, interiorizing a representation and playing a game are all activities which appeal to the same imaginative faculties of a person. Man is able to imagine certain objects, situations and events without them actually being present. There is a difference, however, between dreaming or imagining per se and mentally evoking an image based on an object. Whereas per se imagining is only bound by the imagination of the individual, mental evocation is constrained by structures in sound, language, geometry or movement actively shaping the perceptions that are generated. When looking at a painting, reading a novel, viewing a film or playing a computer game, the viewer, reader or player engages in pretense play, generating perceptions, but they are based on the forms and structures presented to her. Walton describes the role of these fixed elements as *props* or aids, accessories in pretense play, evoking the image of a stage-play in which actors make use of requisites to suggest actions and events. In other words, representations are objects possessing the social function to serve as props in games of pretense (69). As Walton argues “Indeed, I advocate regarding these activities as games of make-believe themselves, and I shall argue that representational works function as props in such games, as dolls and teddy bears serve as props in children's games” (11). It should be noted, however, that props are not necessarily representations. Walton gives the example of children playing in a forest and imagining that a stump of wood is a bear. In this case, the prop is not an artifact, but an object found in nature which may or may not bear visual similarities to what it represents in the game. These stumps are ad hoc props, pressed into service for one instance of pretense play. Dolls and toy trucks (like mimetic representations) are artifacts designed to be props; they were made specifically for that purpose as chairs are designed to be sat in and bicycles to be ridden. Moreover, within their very design, they suggest the games in which they can serve as props. They are determined to generate certain perceptions and not others (51). A rag doll is meant to serve in playing family and a toy truck in playing workman. Similarly, representations are artifacts meant to serve in some instances of pretense play and not others. A comic strip of *The Smurfs* {Peyo 1958} is meant to figure in imagining small blue creatures wearing white hats and *The Guernica* {Pablo Picasso 1937} is meant to figure in imagining the consequences of carpet bombing and in extenso the hopelessness and cruelty of war.

A second role played by real-world objects in pretense play is that of *prompter*. When walking in a forest, hearing creaking noises and seeing a large stump of wood, one could suddenly be prompted to imagine that there is a bear blocking one's path. In this case the creaking and the stump serve as prompters in that they trigger the process of imagining a scene, i.e. that of running into a bear in the forest. Different kinds of objects can serve as prompters: a cloud formation looking like a dragon, a star constellation suggesting the form of an archer, or the sight of other people or animals triggering the imagination of being someone or something else. Similarly, artifacts like toys, books, drawings or television images can function as prompters of playful imagining. Placing a drawing of a lion on a cereal box, for example, is meant to prompt the idea of power and energy, qualities anyone can use in the morning. But also more generally, any form of representation is meant to convey information. These very words are meant to prompt certain perceptions in the reader. As such, prompters have an important social function in that they generate and structure imaginative activities which can help the subject to become acquainted with images and ideas which are not available in her direct real-world environment. "By constructing artificial prompters, we share our imaginative thoughts with others; and all of us can profit from those who are unusually imaginative, creative, perceptive, those who possess special talents for thinking up provocative or illuminating or comforting lines of imagination" (22).[57] Finally, real-world objects can also be an *object of imagining*. When children build a snow fort or play family, they not only imagine a snow fort, a mud pie or a baby, they imagine a sculpted heap of snow to be a fort, a bucket of sand to be a pie and a rag doll to be a baby (25). There is a direct association between the representing artifact and the imaginary object which can at the same time be the prompter of the imagining, but not necessarily so. Walton gives the example of a water faucet triggering a fantasy about a trip to Italy (25), but in many cases the objects serving as props in pretense play also serve as its prompter and parts of it act as objects of imagining (38).

In this study I claim that computer simulations and games are forms of mimesis or representation which function as props in pretense play like, among others, paintings, novels, comics, photos and films. Simulations and games are artifacts built to serve as props in individual and collective games of pretense. Even users of a scientific simulation temporarily pretend that the model they are dealing with is the real phenomenon and study its behavior. Similarly, com-

[57] It has been noted that the 'paratext' to computer games, its cardboard box, introductory screen and cut-scenes are often more photo-real than the games themselves which are usually restricted by computing limitations and therefore offer only crude and abstract graphics. The box of *Super Breakout* {Steve Wozniak 1981}, for example, contains a high quality print of a handmade drawing of a man in a space suit playing something like space hockey while the game itself is a simple derivative of *Pong* in which you have to return a ball using a small bar at the bottom of the screen. This use of photo-real imagery in the margin of the game has been described as a premature yearning by designers and players to have more graphical computing power at their disposal. This may be true, but it does not mean that these graphics are without a purpose, however, as they, together with the frame story of the game, serve as prompters of the player's imagination, as an entrance, as it were, into the semiotic codes of the game.

puter game players pretend that the images, sound and behavior of the objects generated by the computer are coherent and meaningful as if they were real-world entities. Like toys, drawings, prints, descriptions and so forth, models are approximations of real-world forms representing some characteristics of the represented and leaving out others, suggesting the presence of an object or environment, but not duplicating it. What distinguishes simulation from most other forms of representation is that, due to its quantitative layout and dynamic nature, it can be used not only to represent static elements, but adds a behavioral component. This does not, however, make it less of a representation. Simulation as a form of mimesis allows for the analysis and representation not only of sound, visuals and movement, but also real-time dynamic behavior and the generation of participatory environments. Again it should be noted, however, that this behavior is no more real than a brush stroke is a church spire. Behavioral simulation is the result of human analysis and imitation and only mimics those situations that were foreseen by the programmers, showing its nature as an approximation in others. Computer simulations and games are forms of mimesis functioning both as props in pretense play and as prompters of their imagining eliciting player actions only meaningful within the unfolding game of pretense.

ASSOCIATIONS, CONVENTIONS AND RULES

The moment pretense play starts and the process of imagining is triggered, objects and artifacts used as props acquire a sort of double identity. Outside the game, a pebble stone is a pebble stone but within, it becomes a car, a soldier, a coin... Outside the game, a matchbox car is a small iron and plastic toy which can be pushed and watched rolling on its tiny plastic wheels. Within, it becomes an escape car full of robbers being chased by the police on narrow forest roads through mother's begonias. “All play presupposes the temporary acceptance, if not of an illusion (indeed this last word means nothing less than beginning a game: in-lusio), then at least of a closed, conventional, and, in certain respects, imaginary universe” (Caillois 1958: 19). Similarly, when confronted with a representation like a drawing, a short story or a computer game, elements in these props take on a double role. Outside pretense play, a drawing is a piece of paper filled with lines, a short story a collection of abstract signs and a computer game a set of instructions for a discrete state machine. Within the game, the forms, syllables and algorithmic constructions become objects, people and places. The various elements in the prop are linked to outside entities using the beholder's imagination to create an association between representation and represented, referrer and referent, material object and imagining.

Associations between elements in the representation and objects of imagining are usually suggested by the artifact itself. A drawing, a description or a simulation of a horse is likely to suggest an association with... a horse. This does not mean, however, that the viewer, reader or player does not have an active part in the imagining of the horse. She may imagine certain characteristics of the horse that are not in the representation, e.g. the touch of its hair, its smell, how it would be like to ride a horse and so forth. She might even be reminded of a holiday camp as a child when she fell off a pony and was too afraid to come near one for the rest of the week. Finally, representations are not always clear as to what they represent. More abstract visual art, poetry or computer games may suggest particular objects and situations to different people or none at all. Strictly speaking, in the latter case we are no longer dealing with representation or mimetic art, but I do not believe there is a strict distinction between the two. Mark Rothko's *Red on Maroon* {1959}, T.S. Elliot's *The Waste Land* {1922}, or Alexey Pajitnov's *Tetris* {1985} may not represent easily identifiable objects or situations, but they do generate associations and perceptions to which the viewer, reader or player can relate.

Pretense play does not maintain strict borders between what is inside and what is outside the game. When children are playing family, they continuously add objects to their imaginary universe. They may introduce pebble stones as currency for going to the market, a bread box as first aid kit or the bamboo sticks between mother's begonias as swords for fighting off imaginary intruders. Similarly, the dog may be just the dog in one scene, become a horse in another, and rebecome the dog when getting back from the market. Importantly, however, although there is no strict delineation as to what is part of the game and what is not, the introduction of objects is never arbitrary. First of all, associations are more easily accepted when there is a formal likeness between prop and imaginary object like in the case of pebbles and currency: both are small, can be put away easily and are countable. And second, associations are more easily accepted when they serve a specific purpose within the pretense play. Introducing pebbles for going to the market is useful because it allows the enactment of a scene in which money and goods are exchanged for one another.

What is introduced into the game is the result of a social process of negotiation resulting in a convention. One participant in the game of pretense introduces the pebbles and the others either accept the idea or reject it – often by ignoring her. Significantly, not just one specific set of pebbles is associated with money, but pebbles themselves 'become' money, all pebbles. The association becomes an understanding, an agreement, a convention and in some cases even a rule. In a similar way, representation does not always maintain a strict border between what is represented and what is not; one person may generate more associations and imagine more than another when looking at an image, reading a story, or playing a computer game. Importantly, however, these associations are also subject to the restrictions sketched above. When interpreting a representation, elements are only accepted into the game when there is a certain formal similarity, when they are functional within the game of representation as a whole and when they are acceptable as a form of understanding or agreement. Hence both children's pretense play and representation function within a human, social context not determined by, but bound to cultural convention.

Both in children's pretense play and in games of representation, the player is allowed a strong sense of freedom in engaging in the game and in accepting or rejecting various elements. When a child does not want to play market within the game of family, she may continue to make mud pies in the kitchen while the others are catching the dog to go to town. Similarly, when looking at a painting or reading a book you do not find pleasing, you can take a quick glance at what you are interested in and then move on to something you find more appealing. Once competition between contestants enters the 'picture', however, free play and imagining move to the background.[58] In competitive games, associations

[58] It should be noted that other forms of representation such as stories and paintings also stage a form of competition, conflict or contrast between emotions, characters or concepts like good and evil. The difference between this type of conflict and the competition I am discussing with regard to game rules is that in the former, conflict is hard-coded within the artifact whereas

are no longer just understandings or agreements: they become strict rules which you can either follow or not, but if you do not, you are at once outside the game. When a simulation, a board game or a sport is created to allow for competition between contestants, rules are agreed upon when the playing starts to allow for equal treatment by the game, and they must be guaranteed for as long as the game lasts. When taking part in competitive play, one cannot introduce new elements or rules. If one would introduce pebble stones as extra currency when playing *Monopoly*, for example, the game would collapse. It is precisely the constraint of having a limited amount of money which allows for competitive play. In a competitive game, winning automatically replaces the simple act of taking part in playful imagining as its main goal. Rules are not inherent to play, but they can be used to structure it, to allow for equal treatment and honest competition. Roger Caillois claims that "rules themselves create fictions. The one who plays chess, prisoner's base, polo, or baccara, by the very fact of complying with their respective rules, is separated from real life where there is no activity that literally corresponds to any of these games" (1958/2001: 8). I do not agree. How would we explain traffic rules? Value exchange? Law? Science? Are they all fictional because they are governed by rules? Not at all. Rules are fixed conventions which can be used to organize both real-world activities and imaginary play. Computer simulation and games are forms of rule-governed imaginary play refereed by the rule-governor par excellence: the computer.[59]

MIMESIS AND TRUTH

Walton describes the process of mimesis as loose associative pretense play, but when he reaches the question of truth in representation, he changes his vocabulary and theoretical perspective entirely. For Walton, representations, as they

competitive games merely have a role of enabling competition between human contestants, human against computer or human against oneself (e.g. through highscores) and most often a mixture of several of these.

[59] In a sense, computer simulation and games use the very concept of rules as a form of representation for mimicking decision-making and behavior. Due to their limited computing power, early computer game systems could only process highly abstract games, but today more complex rule systems manage to approximate real-world phenomena realistically. This ontological restriction of being tied to rules may also lie at the basis of the fact that it is much easier to represent competitive play in a computer environment than free associative participation like the eagerly awaited interactive narrative.

occur in art and literature, *generate* fictional *worlds* as props in games of make-believe, a theoretical discourse obviously derived from logical analytical philosophy, more specifically from possible-worlds semantics. Although Walton denies that his notion of fictionality is a type of truth, he does acknowledge their relatedness. “Fictionality has turned out to be analogous to truth in some ways; the relation between fictionality and imagining parallels that between truth and belief. Imagining aims at the fictional as belief aims at the true. What is true is to be believed; what is fictional is to be imagined” (41). In a similar way, he acknowledges the indebtedness of his notion of fictional worlds to the possible-worlds semantic framework, but he rejects their similarity immediately afterwards. “Our pretheoretical notion of fictional worlds is a dangerous one, one that can easily mislead the unwary theorist. I noted that it is linked to the temptation to think of fictionality as a species of truth. Other dangers arise from the inevitable tendency to associate fictional worlds with the possible worlds of recent semantic theory (1990: 57). Despite this warning, however, Walton does not succeed in overcoming the analogies which he first employs and subsequently rejects. While his main theory is based on the fact that a representation functions as a prop, one element among many in a game of make-believe, he claims that propositions about a represented something can be objective fictional truths. “[A] fictional truth consists in there being a prescription or mandate in some context to imagine something. Fictional propositions are propositions that are to be imagined – whether or not they are in fact imagined” (39). Although his basic framework is that of children's play, when he discusses the truth-value of representations, they are suddenly claimed to *mandate truths* (albeit fictional ones) and these truths form clusters and even worlds just as in possible-worlds semantics. “To speak of a fictional world is, in part, to speak of the class or cluster of fictional truths belonging to it. One reason for having a notion of fictional worlds is to be able to refer conveniently to such clusters” (62)

There are at least three arguments that can be brought forward against Walton's line of thought on mimesis and truth. First and foremost, ironically as he himself most ingeniously points out, the process of mimesis is always tied to a particular context, i.e. the 'pretense play session', and is relative to its socio-cultural context. Like props in pretense play, artifacts in representation do not *mandate* fictional truths, they take part in a complex interplay between prop(s), player(s) and context. Therefore, when formulating a proposition about a representation, this proposition does not solely or even directly deal with the artifact (painting, story, game), but with the relation between artifact and 'player'. It is not some sort of truth about a fictional world that is somewhere within the artifact, but a statement about what the artifact means to a person, a group of persons or even an entire culture. Of course, I do not claim that there can be no objective elements in representation. As I said, formal likeness plays an important role in pretense play, but reducing representation to verisimilitude and ignoring the concrete situation and socio-cultural context would be an enormous mistake.

Second, the truth-relation between a representational artifact and what it represents in reality is not binary, not even a matter of linear degree, but one of multi-dimensional approximation. Certain aspects may be represented, while others are merely hinted at or not represented at all. Hence, propositions about a representation are also always relative and approximative vis-à-vis the representation as artifact, something Walton denies when stating that props mandate fictional truths, but which he again accepts in contexts like the following. “A proposition is fictional, let's say, if it is to be imagined (in the relevant context) should the question arise, it being understood that often the question shouldn't arise. In normal cases the qualification can be understood thus: If p is fictional, then should one be forced to choose between imagining p and imagining not-p, one is to do the former” (40). And third, Walton believes that all pretense play is based on rules, whilst in most cases rules are only one aspect of play or representation, taking the form of loose conventions or even silent understanding. At one point (40), he refers to a children's game whereby every stump in the forest is a bear from which they must flee. For Walton, this conditional rule is an example of how fictional truths are generated in all play and representational contexts. This is not true however. The majority of pretense play is based on free association and cultural convention. Conditional rules play a role only in competitive play and remain a marginal phenomenon in general associative play or when dealing with a representation. Association and convention are complex sociocultural and psychological mechanisms which cannot be described as a purely logical process taking the prop's formal characteristics as its input. Interpretation is shaped by context, not determined by law.

FICTION AND NON-FICTION

In the second chapter of *Mimesis as Make-Believe*, Walton discusses the difference between fictional and non-fictional representation. Because he has identified representations as artifacts mandating fictional truths he runs into a number of difficulties however. In the beginning his study, he accepts that all representations have in common a role in make-believe (4) yet further down he claims that these same representations mandate fictional truths, true propositions about a fictional world that exists outside the real one. Of course, when he then reaches the question of non-fictional representation, he automatically places himself outside his own framework for representation where there is only room for fictional and not for real truths. Strangely enough, instead of rethinking his notion of fictional truth, Walton opts for the reanalysis of the very concept of representation which he redefines as being restricted to fiction. Fiction *represents* reality but non-fiction presents "another relation that may obtain between representations and things in the world, (...) *matching*" (108). For Walton, "'matching' is complete correspondence between a representation and something in the world. (...) [A] man-picture matches a man if the man is in every detail exactly like 'the man in the picture'. A story matches a person if that person is and does everything that a character in the story is and does" (Ibid.).

As amply discussed in the previous chapter, this constitutes a somewhat naive and problematic conception of representation. How can something like a picture or a description match something or someone in every detail without being identical to them, i.e. without being the person or thing itself. If we were to make a quick drawing of a man using a circle and five lines for body, arms and legs, would that be an example of matching as most real people clearly also have a head, a body, two arms and two legs? Is a photograph an example of matching? Then how do we explain that it does not match the size of its subject for example? Is a news report fictional when it is edited and does not exactly match the depicted events? Is a scientific theory fictional when it is approximative or does not apply to all instances of a phenomenon? Finally, if there is such a radical difference between fiction and non-fiction, then how do we explain that some forms are mixtures of the two, like historical novels in which historical events are mixed with fictional ones? And how do we explain that representations can be non-fictional to some people, but fictional to others, like for example ancient mythology which was conceived to be non-fictional at the time, but is regarded as fiction today?

Further in his discussion, Walton recognizes the difficulties of his conception of non-fiction as matching and fiction as representation, and he admits that the difference between the two is far from clear-cut. “The actual literary works that populate our libraries do not come neatly differentiated into two discrete piles, fiction and non-fiction, nor do works of other media. It is not at all obvious, in practice, where to draw the line” (89). Walton's second attempt at defining non-fiction is no longer formal, but based on the function it fulfills in a concrete socio-cultural context. “What counts as fiction will depend on whether we understand a work's function to depend on how its maker intended or expected it to be used; or on how, typically or traditionally, it actually is used; or on what uses people regard as proper or appropriate (whether or not they do so use it); or on how, according to accepted principles, it is in fact to be used (whether or not people realize this); or on one or another combination of these” (91). Again, however, because he has claimed representation to be exclusively tied to fictional truths, Walton finds himself forced to look outside his own theoretical framework to explain the phenomenon of non-fiction, which he this time, without retracting the previous analysis, situates with the author's intention or the work's culturally accepted status vis-à-vis reality.

Thus, for a second time, Walton's choice of a discrete logical discourse derived from possible world semantics and his fundamental belief in the unassailable truth and objectivity of science and knowledge prevents him from stating the obvious conclusion that should be drawn from his own theory of mimesis as pretense play: i.e. that there is no radical difference between fictional and non-fictional representation. Both function in similar pretense play: 'Let's pretend that the words, images, camera shots, simulated objects and so on are not just themselves, but also something else.' Fiction and non-fiction use similar codes, forms and materials[60] and they can be mixed in one and the same artifact. Non-fictionality is not an inherent quality of a representation, but it is a form of meta-knowledge about the representation which can be signaled by its formal features, but is more often communicated through para- or meta-communication such as book covers, spoken introductions or other meta-knowledge about the magazine or program in which it appears.[61] Historical writings, news reports, scientific theories and so forth function in pretense play as do their fictional counterparts, it is only the meta-knowledge of their being meant to mimic real world events, their claim to verisimilitude, that causes the reader or viewer to make a direct link between the depicted and real-world happenings.

Both in the case of fictional and non-fictional representation, an artifact is created to serve as a prop in pretense play and trigger certain perceptions. The difference between fictional and non-fictional representation is not to be sought in the artifact itself, but in the status of the imagining it triggers. In one way or another, non-fictional representation introduces its aim at verisimilitude into the game of pretense and this is either accepted by the reader or viewer, or it is not. If it is, the non-fictionality of the representation becomes a convention within the pretense play, one determining that the perceptions triggered correspond to certain aspects of real-world events. Compare it to the functioning of a

[60] A famous example of confusion as to the fictional status of a representation is Orson Welles' radio play *The War of the Worlds* {1938}, an adaptation of H.G. Wells classic science fiction novel by the same name. It dealt with the invasion of the USA by Martians and was organized as an ordinary music show periodically interrupted by news bulletins in documentary style. Although the program had started with an introduction explaining that the broadcast was only a radio play, people tuning in later were panic-stricken and are reported to have called the police and even gone to see the purported landing area carrying firearms. Afterwards, neither Welles nor CBS were punished, but CBS had to promise that they would never again use the phrase 'we interrupt this program' for dramatic purposes. It is sometimes said that the attack on Pearl Harbor three years later was at first received in skepticism by the American public as a consequence of *The War of the Worlds*.

[61] This is the main reason for my criticism on the use of computer games for propaganda purposes in the previous chapter. When a game like *America's Army* presents itself as a faithful representation of army life, it deliberately 'forgets' to mention that this fidelity is very much related to the task at hand which is to generate more conscriptions. If this discussion is to serve but one purpose, it is to demonstrate computer simulations and games are just another form of mimesis and that, like all forms of representation, they serve a purpose and should therefore be interpreted critically in light of its goals.

clock. A clock is a representation of time: a device mimicking the running of seconds, minutes and hours. When we see a clock in a station, for example, we presume it runs correctly, we accept the convention that it corresponds to the real time and act accordingly. From this analogy, a number of conclusions can be drawn regarding use of representations to communicate about the world.

First of all, formal features play only a minor role in the acceptance of the clock as a 'true' representation. An observant commuter may note one day that the clock is broken, because it is not moving for example, and on that basis reject its indication of time, yet generally it will be accepted simply on the basis that clocks in stations are supposed to run correctly. Second, our acceptance of the clock representing the correct time is directly related to the task at hand. The time indicated in the station may not be exact to the second, but if it allows you to catch your train, its correspondence to reality is sufficient. Similarly, a newspaper article, a news report, a scientific theory etc. are verisimilar when the perceptions they trigger correspond sufficiently to reality relative to the task at hand. Just as a station clock will be rejected for scientific experiments, a news report may sufficiently correspond to reality as a news report, but not as a scientific reference. And third, a representation is never the phenomenon it represents as a whole, but an imitation and approximation of a limited set of its characteristics. A clock, for example, is a device imitating the rotation of the earth around its axis, imitating and approximating a single aspect of a natural phenomenon, one that has become so important to us that it is accepted to be a category in itself, i.e. time. In a similar way, a report or an article represents a limited number of aspects of a phenomenon relative to its goal. A broadcast of a football match, for example, does not show the playing field as a whole including every movement (how could it?), but rather follows the action surrounding the ball. A representation is not a duplication of a natural phenomenon, but an artifact triggering perceptions corresponding to it relative to the goal of the representation.

Imagining as Coping with Reality

Children participating in a game of make-believe are generally less interested in the props used in the game than in the fantasies they evoke. Props function only as aids, attributes. It is the imagining that is triggered by the game and the emotions that come with it which are the real incentive to play. When children are walking in a forest and one of them starts a game of make-believe in which a stump of wood is a dangerous grizzly bear, she is not interested in the stump of wood itself, but in the situation it evokes in her imagination. She wants to know what would happen if a bear appeared on her path, how she or her friend would react, how brave they would be. The stump of wood merely functions as the prompter of the imagining; it triggers it, but it is not its underlying motivation. Another prompter like a rustling in the thicket could have triggered the same fantasy. One could even argue that it is not the stump which is the actual prompter, but the entire situation of being alone in a forest: wandering through the woods, the sun going under, recently heard a story about bears, and so forth. It is a particular context that generates an imagining and in this context the imaginer, with her preoccupations, fears, and joys, is an important, in many cases the most important element. Man has a tendency to imagine, to generate associative thoughts prompted by environmental factors. For Walton, imagining and pretense play are an opportunity to toy with, explore and try out new and sometimes far-fetched ideas (22). By projecting objects, situations and problems into an imaginary context, a safe and malleable environment is generated for trying out new and risky solutions, for rehearsing specific future tasks or for coming to grips with certain emotions like fear and uncertainty. In this way, imagining and play provide "practice in roles one might someday assume in real life, that it helps one to understand and sympathize with others, that it enables one to come to grips with one's own feelings and that it broadens one's perspectives" (12). They are a means of coping with our environment, our life, reality.

When we read a novel, look at a painting, watch a film or play a computer game, it is the pleasure, understanding, recognition or perhaps simply the adrenaline rush accompanying the imagining in which we are interested. Art, literature and media are artifacts conceived and manufactured for generating perceptions relating to our emotions and we choose them on that basis. Just like the child in the above example may be imagining a bear because she is coping with her own fear of encountering one, we choose our representations based on what they mean to us, how they generate perceptions which somehow help us deal with our environment and our emotions toward it. Fictional representations allow for the generation of a safe environment in which we can deal with various emotions toward present, possible future or entirely imaginary situations. Pretense play based on fictional representation could be introduced as "let's imagine the events represented in these descriptions, images or models, explore them, and see how they relate to how we experience our lives." As such, fiction presents an alternative configuration of reality which can be used both for comparison and consolation. Similarly, if we look at forms of mimesis that do aim at verisimilitude such as newspaper articles, documentaries, biographies, scientific studies etc. they are used as props in games of pretense which could be introduced as "let's imagine that these descriptions, images or virtual objects are how the things they remind us of truly work and let's see how they can help us deal with them." Different forms of mimesis, both as meticulous imitation and willful distortion can be seen to form part of a human attempt to learn about and cope with his environment by evoking clarifying and consoling imagining.

SUBJECTIVE IMAGINING AS COPING WITH THE SELF

Representations are artifacts built to be used as props in pretense play in which they function as tools for helping to generate imagining. Walton distinguishes between two types of imagining: subjective and objective. Subjective imagining (de se, from the inside) occurs when imagining a scene or a series of events in which an imaginary self is projected into the imagining. For example, in the game of make-believe sketched above, in which children are walking in a forest and suddenly imagine a bear where there is a stump of wood, they project themselves into the very center of the scene they are imagining. It is not the bear that matters, but their encountering it and the possible developments emerging from that encounter. By projecting themselves into a safe imaginary setting where they are faced with a dangerous animal, they are able to anticipate the situation's possible outcomes and evaluate different strategies like fighting, running away or climbing a tree. Thus they are able to prepare for possible future dangers and cope with their feelings of anxiety toward them.

When imagining objectively (de re, from the outside), on the other hand, the subject refrains from projecting herself into the imagined scene. She could, for example, imagine a cloud to be a locomotive without imagining herself being present to that locomotive. When imagining a train objectively, she is not necessarily imagining herself seeing one. She is not part of the imagining. It is the mere pleasure of exploring the imagined appearance of a locomotive that guides her thoughts, not the interest in making contact with it.[62] In a similar way, imagining generated in pretense play with representations can be subjective or objective. If we look at a person reading a novel or watching a film, she may identify with a character and feel deeply immersed in the story world. She does not, however, project her own self into the fiction. She observes characters with whom she may become acquainted, sympathize and identify, but she does not *become* one of them. Novels or films generate objective imagining about events taking place separate from the reader or viewer. Other, more subject-oriented and usually more participatory forms of poetry, interactive theater, board or computer games, project the player's self into the imaginary environment generating subjective imagining. In the next chapter, I go deeper into this issue and develop the notion of introjection (casting, projecting into) and computer games as an introjective cultural form.

When looking more closely at the distinction between objective and subjective imagining, we notice that objective imagining (de re, imagining from the outside) is usually a more distanced, more cerebral activity. In this sense it is

[62] After introducing the distinction between subjective and objective imagining, Walton relativizes and eventually neutralizes his own proposal by stating that "all imagining involves a kind of self-imagining" (28). This is true when considering every trace of perspective as a form of subjective presence. For my analysis, however, the idea of restricting subjective imagining to presence of an imagined self makes more sense. Therefore, I do not follow Walton's claim that "[i]magining an elephant in Central Park is likely to involve imagining oneself seeing an elephant in Central Park, especially if one visualizes the elephant" (28). One can perfectly imagine an elephant in Central Park without imagining being there oneself.

more closely associated with what we generally understand by 'thinking', 'conceiving' or 'reckoning'. When imagining a bear objectively and keeping oneself outside the imagining, a distance between the imagined and the self is established and maintained. Hence objective imagining, as its denomination suggests, is more suitable to exploring and learning to cope with the world by understanding it. Subjective imagining (de se, imagining from the inside), on the other hand, is more directly concerned with the relation between self and environment and is more self-engaging and emotional. Hence it is associated with what we generally refer to as 'play'. Imagining a bear subjectively involves active self-engagement and introduces the self and her behavior as a variable into the pretense play. Subjectively imagining an encounter with a bear on a forest path more easily turns into a playful evaluation of what could happen to oneself and what the consequences could be of different actions in that situation. Whereas objective imagining can be seen as a way of coping with one's environment through understanding, subjective imagining is more generally concerned with emotional coping, with learning to cope with oneself.

Finally, it should be noted that, by introducing the self into the imagining, almost automatically a notion of imitation and intersubjective comparison enters play. When children are playing family or cowboys and Indians, for example, they cast themselves into a role within the imagining and try to play it according to certain self-imposed standards allowing them to measure their imaginary performance and compare it to that of others. Introducing rules and turning the imaginative play into a regulated competitive game is then only another step in facilitating the comparison between different players and an enhancement of the process of probing the self and finding one's place in the world. In the last chapter of this study, I delve deeper into the idea of imagining as coping and subjective imagining as coping with the self.

MIMETIC ECONOMY

To conclude my inquiry into the ontological nature of the virtual, I would like to return to the issue of virtual economies and their status vis-à-vis the actual world. Without aiming to make a judgment regarding the practice of selling virtual goods for real money, I would like to stand still at the nature of the goods being bought and sold. Based on the previous discussion of the virtual as mimesis, my claim is that a virtual economy is not an actual economy like a brush-stroke is not an actual church spire, but an imitation of one. A virtual economy is a system devised for giving players the impression that they are dealing with a real economic situation where there is scarcity, price fluctuation and so forth. There is no scarcity in a virtual world, however, unless the programming rules artificially create and maintain it. When a virtual entity has been programmed, it can be reproduced almost infinitely, only bound by the physical limitations of the computer system on which the simulation is run.[63] In other words, if persistent worlds develop an economy, this is because they are meant to, because the programming rules of the game world create constraints for production, control supplies and generate artificial scarcity. Technically, a computer simulation could provide each player with an armory full of the newest and most powerful weapons, but then the tension between being and not being, having and not having, maintained through artificial scarcity, would be lifted and the growth topos of the game would collapse. When the player becomes a smith and starts forging virtual axes, she is not really creating anything. All she is doing is performing a number of preprogrammed tasks after which the simulation launches the event of creating an instance of the object ax. It may seem to the player that she is creating a virtual item, but in reality the system could have generated thousands of them on the spot if it were only programmed to do so. Functionally, a virtual economic system is almost the opposite of a real one. Whereas a real economy is a system for dealing with scarcity and for distributing goods in an optimal manner, a virtual economy is a system for creating scarcity where there would be abundance and maintaining it.

Designers and maintainers of persistent game worlds sometimes refer to virtual economies as faucet-drain systems, using the metaphor of a sink to de-

[63] If we look for an analogy, we could try comparing a virtual object to one card in a deck. From a structural point of view, however, this comparison is invalid. A better analogy would be to compare a computer game to a game of chess, whereby a virtual item is not a chess piece, but one specific position in the game. In this sense, buying a virtual item for real money would be like paying your opponent in chess to be allowed to move one of your pieces.

scribe their behavior. The game world with everything in it is the sink, the total amount of money that circulates within the simulated environment. Above it, there is a tap running money into the system when robot merchants buy freshly-forged axes from players, when monsters are killed and looted or when hidden treasury is discovered and sold. At the bottom of the sink, there are a number of drains pulling money out: for example when players pay a merchant for goods or weapons or when they are attacked, killed and pillaged by a monster. When money comes out of the faucet, it is 'minted', generated by the game system on the spot, and when it goes out through one of the drains, it is deleted from the system. There is no reuse, neither of money nor of goods; there is no central bank, only faucets and drains opening and closing so as to keep the total amount of money and items in the sink in balance with the number of players. A virtual economy is an imitation of economic reality from the perspective of the player; it is a system devised to generate and maintain the illusion of scarcity without endangering the game's topos of character-development and progression. A virtual economy is no more an economy than a virtual car is a car. In certain limited conditions it behaves like a real economy would. It is not the same, however, and neither will it ever be. A virtual world is not a possible world and a virtual economy is not a possible economy. It is a behavioral simulation devised to imitate an economic system, an instance of mimesis.[64]

[64] Information technology has a history mystification. Around the turn of the 19th century Parisians are reported to have hidden under their chairs when an approaching train locomotive was projected and a Brazilian spectator is said to have shot at displayed thugs (Lunenfeld 2004: 381). In the 1950s, shots heard on television are claimed to have scared away burglars. Virtual economies may well be an example of the same myth-making mechanism.

IV

Simulating a Self

> If images make their subjects present to us, digital representations make us present to them.
>
> Timothy Binkley, *The Vitality of Digital Creation*, 1997

In 1932, Aldous Huxley published *Brave New World*, a dystopian science fiction novel about a future society in which rational collectivism reigns to the detriment of human emotion. War, scarcity, pain and old age have been eliminated, but the resulting equilibrium has come at a price. Family, religion, art and culture have been erased and replaced by detachment, sexual promiscuity and anti-depressant drugs. Children are no longer born, but genetically manufactured and psychologically conditioned to fit specific categories of man and women predetermined to carry out specific tasks in society in the most efficient way possible and be happy whilst doing so. Everything in the World State is either directly related to material production or meant to sustain the equilibrium and safeguard future production. One of the tools employed in this latter process is information technology. Sound recording and playback, for example, play an important role in the conditioning of children in their sleep. Over and over they are subjected to spoken rules and adages until they accept them to be their own. Nonetheless, in *Brave New World*, information technology does not yet represent the overwhelming force that it becomes in later dystopian nightmares. It is still a means toward a goal, i.e. to serve collective interest, rather than an independent agent. At one point, Lenina and John (the savage) go to the feelies, a sort of cinema with added scent and nervous stimulation. The film is pornographic. John, who has not been conditioned and is unfamiliar with feelies and pornography, is shocked. "I don't think you ought to see things like that." Lenina, who *has* been conditioned, does not understand and answers that she found it lovely. John's conscience keeps playing up, however, and he finally denounces the film on moral grounds. "'It was base,' he said indignantly, 'it was ignoble'". The feely is unacceptable to him. Again, however, it should be noted that it is not the technology itself that is the subject of contempt, but the way it is used. In Huxley's universe, man has become part of the technological apparatus, but the decision to do so was still his own. The technological imperative is eminent, but it is the result of the human choice to replace human intuition by rational collectivism.

In 1949, George Orwell published *Nineteen Eighty-Four*, again a nightmarish dystopia set in future London where the state has seized absolute control over the lives of its citizens. The story deals with one Winston Smith, a middle-aged member of the outer Party who silently resists the state's control by keeping a diary and having a sexual relationship with Julia, one of his colleagues.[65] Initially everything appears to go well and Winston and Julia make contact with the underground resistance movement. The movement turns out to be a façade, however, and they are caught by the thought police and 'cured' from their deviant ideas by electroshock therapy and torture. Whereas in *Brave New World*, information technology was used to support other mechanisms of oppression such as psychological conditioning and sexual promiscuity, in Nine-

[65] Contrary to *Brave New World*, in *Nineteen Eighty-Four*, not sexuality is used to suppress human nature, but its prohibition. Any ties between party members that are outside the state's control are forbidden and when caught one will be sent to the Ministry of Love, which is really a ministry of torture, for reeducation.

teen Eighty-Four, it has become a mechanism of oppression in itself. Television-like devices called telescreens are omnipresent both on the street and in private residences and are used to disseminate propaganda and spy upon citizens through built-in cameras. Winston works in the records department of the Ministry of Truth where he is responsible for falsifying history to make it reflect present interests. Even language itself is being molded into artificial Newspeak which is to eradicate all thought that deviates from Party doctrine by simply making it impossible to think beyond its principles. In *Nineteen Eighty-Four*, reality is determined by the information controlled by the Party rather than the other way around. Information and information technology are a means to control human thought, symbolically represented by the obliteration of logical reasoning in doublethink. Although you know something cannot be logically true, you believe it is; that is, you do not just accept that you are supposed to think that it is, you believe it! On the closing page, Winston writes the equation 2+2=5 and as he is lead to the execution squad, his last thoughts are of loving Big Brother, not Julia.

In 1968, Philip K. Dick published *Do Androids Dream of Electric Sheep?*, a third dystopian novel which was later adapted into the cult classic film *Blade Runner* {Ridley Scott 1982}. The world has been devastated by atomic warfare and nuclear fallout is slowly suffocating all terrestrial life. Earth's few remaining inhabitants are encouraged by government programs to emigrate to colonies on other planets in the solar system. Life in these colonies is hard, but human-like androids are manufactured to do the heavy and dangerous labor. *Do Androids?* tells the story of six of these artificial humans who have escaped to earth and are being chased by Rick Deckard, a bounty hunter who has been contracted to kill them. Although the novel is primarily concerned with the ethical question of artificial humanity and how man as a creator would decide about their life and death, it also contains a distinctive subplot dealing with the status of reality and information technology in modern society. Whereas the feely and the telescreen were direct derivatives of existing technology, i.e. cinema and television respectively, the empathy box is not. It is described as a sort of console with a handle and a screen, but the experience it generates is much more than that of present-day digital representation. It is a transcendental experience. It allows its user to "participate in fusion" (57) with the Christ-like figure of Wilbur Mercer and share his sufferings. At one point, Deckard is fused with Mercer when being hit by a rock within the simulated world. When he breaks off his session, it turns out that the wound is not just virtual, but that he is actually bleeding. Also, toward the end of the book, Mercer appears in the actual world when he helps Deckard to eliminate the three remaining androids effectively lifting the border between virtual and actual, imagination and reality. In *Do Androids?*, technology is not just something that can be used to change or control reality like in *Brave New World* and *Nineteen Eighty-Four* respectively, it becomes a device that is able to generate a reality of its own and make it accessible to man.

The science fiction novel that completed the symbolic switch from technology existing in a man's world to man existing in a world of technology is again *Neuromancer*, William Gibson's 1984 cyberpunk dystopia. In this novel, Gibson describes how people have cranial jacks installed which allow them to plug into SimStim units and into the Matrix, a cyberspatial meta-world of three-dimensional digital renderings, corporate information systems protected by thick layers of security ice, and artificial intelligences such as the Flatline and Wintermute. *Neuromancer* is not the first narrative to play with the idea of a computer space enveloping the user however. That credit goes to the science fiction film *Tron* {Steven Lisberger} which came out two years earlier and which was most likely one of Gibson's principal sources of inspiration for *Neuromancer*'s cyberspace.[66] *Tron* tells the story of Flynn, a hacker who used to be a computer game programmer, but whose designs have been stolen by

[66] The resemblance between *Neuromancer* and *Tron* is rather striking in fact. Both tell the story of a 'fallen' computer hacker who is raiding a well-protected corporate computer system. In both cases, the raid is carried out by two characters working together: in *Tron* it is hacker Flynn and fighter Tron, in *Neuromancer* it is hacker Case and 'razor girl' Molly. Moreover, in both cases, the computer hacker has to reach the heart of the system so that his companion can carry out their ultimate task which, in *Tron,* consists in preventing the unification of the central artificial intelligence and other demon programs, and in *Neuromancer* in helping to unify the two artificial intelligences Wintermute and Neuromancer. Furthermore, apart from these thematic and plot level similarities, there is also Gibson's description of cyberspace which is highly reminiscent of Lisberger's game space: "Cyberspace.(...) A graphic representation of data abstracted from the banks of every computer in the human system. Unthinkable complexity. Lines of light ranged in the nonspace of the mind, clusters and constellations of data. Like city lights, receding" (55). *Tron*'s last scene is in fact an image of city lights gradually transforming into an image of the matrix as the camera zooms out. Finally, there are a number of descriptive elements from *Tron* that return in *Nuromancer* such as 'the matrix' for cyberspace and 'space cowboy' for Flynn.

Dillinger who made fame and became rich marketing them. Flynn, however, is determined to find evidence of *his* creating the highly successful arcade games and breaks into the company network which is controlled by the Master Control Program (MCP), an artificial intelligence which has become self-aware and is planning to take over computer systems all over the world and thus subject humanity to its will. As Flynn is hacking into the system from a terminal in the corporate laboratory, the MCP dematerializes him using a computer-controlled laser reading Flynn's molecular code into the internals of the computer system. There, he becomes a character in his own games and competes against the computer system.[67] Because Flynn is a hacker, he has control over cyberspace however – a theme which is also highly present in the film *The Matrix* {Andy & Larry Wachowski 1999} – and eventually succeeds to penetrate into the heart of the Master Control Program, where he manages to destroy the central unit and restore human control over cyberspace.

In this chapter, I take a closer look at one of computer simulation's more distinctive characteristics vis-à-vis other, narratologically fixed cultural forms such as literature and film, i.e. the fact that the player's reactions are registered by the system and projected into the simulated environment. I refer to this phenomenon as *introjection*, a term which I derive from Latin 'being thrown, projected into'. In the first section, I discuss the notion of introjection in relation to existing concepts such as 'presence' and 'immersion' which I deem unsuited for my present purpose. Both 'presence' and 'immersion' are primarily psycho-emotional concepts referring to the observer's subjective feeling of being present in a virtual environment and feeling surrounded by it respectively. In the second section, I go deeper into the actual role that is reserved for the player by the simulation and I distinguish between two configurations. *Avatarial introjection* occurs when a player steps into the simulated world taking the role of an avatar: a simulated entity with which she not only identifies herself, but which she also controls. As its name suggests this first type of introjection can be associated with Hindu mythology in which avatars are God's representatives in the materi-

[67] The games featuring in *Tron* are based on a number of early Atari classics. The disc throwing game with bouncing walls is reminiscent of *Pong* {Nolan Bushnell 1972}. The motorcycle racing game in which the contestants have to try to corner their opponent is a derivative of *Surround* {Alan Miller, Atari 1977} and the tank war game resembles *Battlezone* {Ed Rotberg 1980}.

al world. The second type of introjection is *transcendental introjection*, often referred to as God's perspective, which complies more with the Christian idea of an invisible, omnipresent, interventionist God. In the third and final section, I go deeper into the question of point of view in graphical computer games starting from Britta Neitzel's suggestion to transpose Gérard Genette's conceptual apparatus for describing narrative focalization to computer games. As a comment upon and specification of Neitzel's theory, I propose an analytical framework based on three levels of modeling: that of the virtual world, that of the role of the player and that of the virtual camera.

1. Introjection

In June 1980, Marvin Minsky published an article titled "*Telepresence*" in *Omni* in which he coined the concept by the same name. His idea was that as communication technology would become more powerful and more precise, an increasing number of specialized tasks such as surgical operations could be carried out by robotic systems remotely controlled using tele-operating technology. This would allow specialists to gather in one physical location and operate anywhere the robotics have been installed, which, in turn, would lower transportation costs, increase efficiency and promote specialization. Moreover, dangerous tasks such as mining and nuclear power generation could be carried out from a distance so that miners and controllers would no longer have to unnecessarily expose themselves to radiation, pollution or risk mining accidents. By making use of robotics manipulated using telematics, operators could stay above ground or keep their distance from a nuclear reactor without relinquishing control over its systems. This would both save lives and lower insurance fees. A third and final possible application Minsky suggested was teleworking, i.e. working from home instead of commuting to an office building on a daily basis. This is not just a more practical solution for the employee who can be home when his children return from school, it can also lower the costs for the employer as less office space is needed and it can help reduce traffic jams which is beneficial to everyone. 'Telepresence' refers to the degree to which operators feel present at a distant location evoked using telematic technology and measured by comparing the efficiency with which they are able to carry out their task to the efficiency with which they would be able to perform if they had actually been present.

Twelve years later, in 1992, Thomas Sheridan introduced the concept of *virtual presence* as a counterpart to Minsky's 'telepresence' meant to describe the degree to which a user feels present in a simulated environment. Sheridan's aim was to describe a theory and a measuring device for the analysis and comparison of virtual reality systems. Conceptually, 'virtual presence' is much more elusive than 'telepresence', however, because of the highly variable nature of simulated environments. Whereas tele-operating systems are always constructed with more or less the same goal in mind – i.e. to enable to perform a task as if you were there – simulations can be constructed to facilitate the carrying out of certain tasks (e.g. a word processor), but also to transfer knowledge (e.g. a medical simulation of the bloodstream), to conduct experiments (e.g. chemical reactions), to train certain skills (e.g. a flight simulator) or to provide entertainment as is the case for computer games. Because of this diversity, it is difficult, if not impossible, to create a single system of measurement. In the case of telematics, the question is rather straightforward: how good are you able to carry out your task as compared to if you were there? In the case of virtual environments, however, the question is much less uniform and tends to vary from one environment to another. Sheridan recognizes this and admits that virtual presence "is a mental manifestation, not so amenable to objective physiological definition and measurement. Therefore (...) subjective report is the essential basic measurement." However, different users tend to feel present in different types of virtual environments and the factors determining the experience can be as diverse as the number of sensory stimuli (image, sound, touch), the quality or depth of the information they present (colors, resolution, sound bitrate etc.), but also the meaningfulness of the media content and personal factors such as gender and mood.[68]

In 1997, digital literature and media theorist Janet Murray published *Hamlet on the Holodeck*, a hypothetical study of the narrative potential of digital technology and virtual reality. One of the principal concepts she introduces for the description of digital narrative is 'immersion' referring to the sense of transportation and envelopment experienced by users of virtual systems. "Immersion is a metaphorical term derived from the physical experience of being submerged in water. We seek the same feeling from a psychologically immersive experience

[68] For an excellent overview, see Lee K. M. 2004 a &b.

that we do from a plunge in the ocean or swimming pool: the sensation of being surrounded by a completely other reality, as different as water is from air, that takes over all of our attention, our whole perceptual apparatus” (98). Whereas the concept of 'presence' primarily refers to how technology can be used to give the user a feeling of being present in the simulation, of being close to its virtual entities, 'immersion' is more concerned with disappearance than with proximity. Someone who is immersed in a book or a game is no longer emotionally present in the actual, but is willingly transported into the fictional world depicted by the representation. As a possible future scenario, Murray imagines the staging of a performance of Shakespeare's *Hamlet* {1602} in a Holodeck-like virtual reality environment.[69] Thereby, her implicit assumption is that more powerful virtual reality technology and more refined artificial intelligence forms the impetus behind a reanalysis of the principles of narrative and will lead to new, more engaging and more immersive forms of virtual performance.

Both the notion of '(virtual) presence' and that of 'immersion' refer to the emotional experience of a non-actual reality by a person stepping into a game of make-believe evoked by the simulation. What these concepts do not, however, is describe the role of the reader, spectator, user or player within the presence-inducing or immersive work. 'Presence' is associated with a feeling of being close to the elements of the representation, of being present in a different reality. 'Immersion' designates a state of absentmindedness, of cognitive transportation into a world evoked by a book, a film or some other form of representation. Hence one can feel 'present' or 'immersed' when looking at a holiday picture of Petra, Jordan, when reading a detective novel set in the ancient Arabic capital, when watching *Indiana Jones and the Last Crusade* {Steven Spielberg 1989} or when visiting a virtual reality simulation of the city in a Cave Automatic Virtual Environment. In all of these examples, it is likely that the person

[69] The *Holodeck* was introduced in *Star Trek: The Next Generation* {Gene Roddenberry} in 1987 and consists of an enclosed room in which objects and people can be simulated by a combination of projection, holography and magnetic force fields. Sound is provided by speakers and smell by fluid atomizers. The *Holodeck* can be seen as an imaginary yet more advanced precursor to the *Cave Automatic Virtual Environment* {CAVE}, a present-day existing virtual reality technology using projections on the walls of a room-sized cube of which the first example was developed at the University of Illinois and demonstrated in 1992.

subjecting herself to the game of make-believe does, to some extent, feel present among the ancient buildings and immersed in their alternate reality. My focus in this chapter is not on the user experience, however, but on the actual role assigned to her by the representation. Typically, a game player is not just an innocent bystander watching the ongoing action, but is projected into the game world where she is to make decisions and carry out tasks which can have important consequences for the course of the (virtual) events and their outcome. As previously discussed, I refer to this projection and active role-assignment as 'introjection' from Latin 'being thrown into'. In this section, I go deeper into the conceptual nature of 'introjection' and will further motivate my coinage.[70]

ROLE-PLAYING AND REPRESENTATION

As discussed in the previous chapter, for Kendall Walton (1990), representations such as paintings or works of literature are objects meant to serve as props in games of make-believe. They are artifacts created for evoking imagining in those spectators and readers that accept to engage in their pretense play. As such, representations generally inhere a role for a 'player' or 'imaginer' who completes the depiction using her imaginative faculties. Most literary forms, for example, are accepted to present not only a narrating instance, but also a narratee or receiver role. In some instances, this role may be minimal, present in no more than the shape of the book showing it to be meaningful for someone reading it. In other cases, it can be an explicit entity which narrator and characters can address as in *A Clockwork Orange* {Stanley Kubrick 1971} “You, my brothers and only friends.” Similarly, since the development of linear perspective in the fifteenth century, painting and later also photography and film have been fashioned after how man sees the world from a single point of view. By projecting all distance upon lines converging toward the center of the horizon, the represented space is depicted as if seen by a person, deriving information

[70] The notion of 'introjection' is my own, but it is based on the work of several other researchers and theorists. Special note goes to Marie-Laure Ryan whose influence – through her earlier work on 'recentering' (1991), her later effort to elevate 'immersion' to a narratological status (2001a) and her idea of 'internal interactivity' (2001b) – is difficult to overestimate. Another important source of inspiration has been Britta Neitzel's work on 'point of action' in computer games (2005), see also below.

regarding depth from the two slightly different images recorded by her eyes. The exact location and hence also the role of the spectator are coded within the very coordinate system of the representation. When looking at a perspective painting, for example, not just glancing over its colors and lines but taking in what is on it, a person automatically fills in the role of a spectator as is foreseen in its structure, and only then that person is able to really see what is represented. In film, finally, there is the additional mechanism of the moving camera, not just recording what is in front of it, but taking on the role of an onlooker, moving with the action and zooming, panning, tilting, and tracking as required. Accordingly, the mechanism of introjection did not appear in a void and can be said to be announced by earlier technologies such as the moving camera. This does not mean that it is indistinguishable and that simulation is merely a form of interactive cinema however. As discussed in the second chapter, simulation is a form of dynamic representation of behavior and, as could be expected, its reserved role for the player is one of active in-world participation.

In the heyday of hypertext literature in the early 1990s, an often heard claim was that hyperfiction would 'empower' the reader, place her on the same plane as the author. Some theorists even suggested that hypertext would turn all readers into authors. New forms of textuality had been predicted by (post)structuralist theorists such as Roland Barthes and Jacques Derrida and hypertext would redeem such promises. Interactive computing technology would bring forth a new type of decentered, organic, multi-dimensional textuality in which reader and author would be indistinguishable: clearing paths, creating links and adding notes. All these Utopian promises have yet to come true however. Readers, spectators and players alike do not really want to be the authors of the stories to which they submit themselves. They want to be their hero. In 1984, several years before the first successful hypertext systems began to appear, Sherry Turkle observed that when practicing sports, "the player is held by the power of total concentration on action, the sense of melding body and mind. The television spectator's body is out of the picture. Here the sense of immersion is through imagination and identification. The entertainment industry has long believed that the highest payoffs would come from offering the public media that combine action and imaginative identification" (75). Indeed, it is not the idea of being an author that urges the player to dive into the game world, but the desire to be part of the action and to bring it under her control. Hyperfiction and so-called interactive cinema assume that the reader or spectator would become a creator, shuffling bits and pieces so as to guide the storyline as desired. What they did not foresee, however, was how to make that guidance meaningful. One of the more successful strategies, as it turned out, was to give the spectator a role within the story and make her a player. Interaction without introjection into the virtual environment tends to be directionless and ultimately tedious. This may be one of the explanations of the limited success of hyperfiction and interactive cinema.

Transcendental Unity

When we look at the identification mechanisms between imaginer and imagining, reader and fictional world, spectator and image, we cannot but conclude that they are as old as representation itself. Arguably, the very structure of storytelling is a way of conveying a perspective, offering a view on reality for the listener to identify with and take part in the experience. Literary and other, visual narrative forms such as film and television series offer the viewer access to the experiences of a number of fictional characters, providing an opportunity to identify and place oneself in their position. Computer games are no different in this respect. They offer a background story, introduce a protagonist and present a problem needing to be solved during the game. Hence, like older, more traditional forms of narrative media, computer games are inscribed with a role for the receiver, the imaginer of the game of make-believe to complete the representation. Like other forms, they offer one or, as is sometimes the case, several characters to identify with. What makes the mechanism of introjection different, however, is the fact that both the role-playing and the identification are part of one and the same movement. A player of a game does not just fill the role of audience, and apart from that identify and place herself in the position of a character: she does both at the same time. When playing a game, you take an active role and identify with that same role while you try to overcome the problems your character is confronted with. For the duration of the game, you form a transcendental unity with the game-persona, thinking what she would think, doing what she would do. Contrary to film, for example, in a computer game, you, yourself, as a player are also a prop in the game of make-believe, you become one of the entities of the computer simulation. In the case of deictic reference, for example, the player of a game refers relative to herself when speaking about the game character. Unlike in film, personal pronouns and spatial reference are tied to the game role as if the player were positioned inside the game world. As Stephen Poole observes, "A game player whose ship has just exploded does not say ruefully, 'The ship just exploded'; he says, 'I died'" (2000: 183).

The process of stepping into the role of a player and identifying with that role by accepting the game rules and the character's goals is not exclusively tied to computer gaming however. Arguably, any kind of game or sports, even that played by young mammals or birds, involves a degree of role-playing, of accepting and unifying with a position in the game system. What exactly that position is and what sort of material manifestation the identification involves varies. In most sports and in many games, the representative body in the game is simply the player's physical body, albeit tied to the game rules. If you are a defender in a game of football, for example, it is your own body you can use to stop the strikers from scoring, but you cannot use your hands nor tackle from behind. In tabletop games such as *Monopoly* {Charles Darrow 1935} on the other hand, every player has a material entity within the game representation. Whereas in the previous category, the player can use all of his bodily abilities as long as she stays within the rules of the game, in representational games, there is no more than a sign, a representative entity moving within a representation of a space. Hence, while in the first category, game rules are generally restrictive, guiding and limiting bodily actions, here, they are constitutive of the entity's actions. In other words, in the first category, game rules determine that you cannot tackle from behind whereas in the second, they say that you can tackle when you are in front of or next to your opponent. Games in which the player is represented by a sign are not a recent phenomenon. In fact, the idea of moving a projection of oneself about a projection of the world is an ancient one, dating back as far as some of the oldest board games in recorded history such as *The Royal Game of*

Ur, played in Ur, Mesopotamia (now Iraq, close to Basra) around 2500 BC. Finally, the shape of the representational entity within the game may vary. In many cases, it is one piece, as for example in *Monopoly* or in avatarial computer games like *Pacman* {Toru Iwatani 1980}. In other games, the entity consists of multiple pieces as in *Chess* and in most strategy and simulation computer games. In some games such as *Tetris* {Alexey Pajitnov 1985}, there is not even a visible entity within the game world. In the next section, I go deeper into the symbolic role of the player as a god and describe her engagement from that perspective.

Introjection is more than identification with a game protagonist. The player steps into the world of the game and assumes an active, participatory role in its emergent game play.[71] Thereby it should be noted that introjection is not something the player does alone. As a computer game player, you accept the role that is offered to you by the system. Within this role, you can do whatever is permissible by the rules, but you cannot change the rules themselves, you cannot control the nature of your own introjected self. When you play *Pacman*, for example, you have to accept that you are a dot-eating slice of pizza for the duration of the game and that eating as much as you can while avoiding the spooks is your highest goal in life. In other words, it is the game system which offers you a role in its internal functioning and as a player you cannot do much more than either reject the offer and refrain from playing or accept and live by it.[72] The main difference between so-called old and new media is not so much that the user has become active or empowered, but that the medium has. When beginning a computer game, the player finds herself cast into a role that is not her own without the ability to change its fundamentals. As such, playing a com-

[71] Note that 'the world of the game' is not necessarily restricted to what happens in the computer's memory or on screen. Game paraphernalia such as the Nintendo Zapper {1985}, a plastic gun used to shoot onscreen ducks or villains, and the Sony EyeToy {2003} extend the imaginary universe to what happens in the living room.

[72] What role the game system has foreseen for the player is basic to the game experience itself. In the *Grand Theft Auto* series, for example, the player is cast as a criminal in an extremely violent and hostile milieu, hence she has to behave like one. Another example is *Head over Heels*, an Amstrad classic created by John Ritman in 1987. It is a fairly conventional puzzle game, but by presenting the player with two avatars having to work together, it projects a particular view on the game world creating an atmosphere of solidarity, friendship and even love (see Van Looy 2002 for an extensive analysis of *Head over Heels*). Just like the camera work in a film is constitutive of the viewing experience, the role of the player is a determining factor in how the game is interpreted.

puter game can be seen as a reflection of role-taking in real life. As you grow up, you find yourself cast in the middle of ideas, theories and expectations about yourself which are not your own. You are given more and more responsibility, but it is not on your own terms. You are empowered in that you do not have to listen anymore, but you are at the same time impeded by the system's rules. Interestingly, the idea of introjection is often reflected thematically in computer games. The whole idea of being cast in a maze, which is present in games as diverse as *Dungeons and Dragons*, *Pacman*, and *Tomb Raider* can be seen as a contemplation of the feeling of being stuck in the world itself, expressing a desire to descend into the heart of the system to change its rules and create a better world with a more acceptable role for oneself.

2. PLAYING GOD

Computer simulations and games are human creations, sets of instructions for a finite state machine meant to generate complex forms of emergent behavior and game-play. Virtual objects and characters are entities generated by such systems. They are collections of shifting zeros and ones, temporarily imprinted in the computer system's random access memory, moving according to rules devised by human programmers. Within the computer's internals, man is a creator, a god who can decide over virtual life and death by typing no more than a few key-sequences. At the same time, however, emergent systems tend to defy their creators by seemingly having a will of their own. As they grow more complex, involving an increasing number of rules, interacting and neutralizing one another, their behavior becomes less predictable, even for their programmers. Emergent systems tend to resist their creator's will by constantly singling out those cases the latter has not foreseen, forcing her to carry out endless debugging, checking the values of variables at different states and reworking the programming code until the system is back under control. The film *Tron* can be seen as a symbolic representation of the struggle between programmer and code, creator and creation. Flynn is a computer hacker and game programmer who has lost control over his programming code. It is only by entering the internals of the computer, destroying the malevolent code and replacing the kernel by a human controlled system that the Master Control Program can be prevented from subjecting and possibly destroying the whole of humanity.[73] Computers are there to serve man, not the other way around. By pointing to that fact, *Tron* further refined the topos of war between man and machine introduced into popular culture by a.o. *2001: A Space Odyssee* and the epic battle between Dave, the last surviving crew member on a mission to Jupiter and his artificially intelligent board computer HAL. This theme of man as a creator battling against artificial intelligence was reflected in *Neuromancer,* but also in films such as *WarGames* {John Badham 1983} and to a lesser extent in *Terminator* {James Cameron 1984}, was further popularized by *The Matrix*, and eventually even came to replace the topos of alien invasion in the recent remake of *Battlestar Galactica* {Ronald Moore 2003}. In this section, I investigate the symbolic relation between player and game as one between a god and his creation and I describe the different forms of introjection as reflections of different conceptions of the role of the divine Creator in his creation.

Two types of introjection can be distinguished: avatarial and transcendental. In the case of a*vatarial introjection*, which is the more common form, the player controls one well-defined entity in the game, e.g. a character, a vehicle, a party of fantasy creatures or some other element in the virtual world. In *Space War* {Steve Russell 1962}, for example, generally recognized as the first computer game, there are two players, each controlling a spaceship circling around a planet at the center of the screen. The aim of the game is to shoot your opponent while avoiding the planet's gravity pull which would irrevocably tear you to bits once in its grasp. In *Space War*, although the player assumes a bird's-eye perspective, she has control over her ship as if she were its pilot. She can change direction, thrust the engines, and shoot its missiles. Within the game world, the player *is* the spaceship and whatever goal she wishes to attain, she has to pursue it by directing her actions through her unit.

---

[73] Echoes of these ideas can also be heard in the discourse surrounding the development of free and open source software such as Linux. By opening up software development and replacing the heart of the operating system by a modularized, transparent and publicly owned kernel, the open source community aims to return mankind's control over his creation so that it cannot be used to leverage economic power or support monopolistic practices.

In the case of *transcendental introjection*, on the other hand, there is no definite, visible entity representing the player in the game world. Rather, she assumes the role of an outside observer managing and controlling the events in the game world which is directly placed under her supervision. In *SimCity* {Will Wright 1989}, for example, the player takes on the role of a mayor and city planner, but as such she is not represented as a person living among computer characters. Rather, she takes the perspective of a manager bent over a continuously refreshing satellite image of her city, collecting taxes and ordering buildings to be built at specified locations. When represented transcendentally, the player is not restricted to one specific entity such as a puppet, through which she is forced to direct her movements. She can move and act across the entire game map as if she were a ghost instilling thoughts in the inhabitants of the virtual world, guiding and controlling their behavior. In this section, I go deeper into the nature of avatarial and transcendental introjection and associate them with two theological conceptions of the relation between a Creator and his creation, namely that of avatarial representation in Hindu religion and the interventionist God present in the Judaeo-Christian tradition.

If God Was One of Us

The word 'avatar' has its origins in Hindu religion. For a Hindu, every living being is essentially a spiritual entity. When he or she is born into the material world as an animal or a human being, this is only a temporary measure, a sort of punishment. Within the material world, the soul is caught in an endless cycle of rebirth, an ordeal of suffering and mortality, but at the same time a chance to abide by the dharma, the moral law prescribing the religious and ethical duties of every individual. Following the rules of dharma allows the soul to ascend the moral ladder, be born in ever more virtuous appearances, and eventually be allowed back into the spiritual world never to be born again. Hindu gods equally live in the spiritual realm, but every now and again they descend into the material to deliver a message to the mortal or to carry out a specific task. The word 'avatar' comes from Sanskrit 'Avatāra' meaning something like 'descent'. It "refers to an incarnation of the God Vishnu, who always remains in his godly realm, but who can, at the same time, appear on earth as a finite being fighting evil and averting tragedy” (Wessely 1997: 177, author's translation from German). Hindu legend states that Vishnu has already assumed nine avatars of which Krishna and Rama are the best known, with a tenth, Kalki, due to appear to usher in a golden age. Arguably, the idea of avatarial descent also shows a resemblance to the Judaeo-Christian notions of messiah and angel. The main difference, however, is that an avatar is an appearance of the god itself. Like the Ancient Greeks, Hindus believe in a multitude of gods, each having their own form and identity and when one of them appears as an avatar, it is the god itself that appears, not just a representative. In the Judaeo-Christian tradition, on the other hand, there is only one God and He remains within the spiritual world. A Messiah is merely a mortal who has been chosen to receive God's message, and angels are celestial beings believed to function as messengers or agents of God. Neither of them are an appearance of God Himself.

The concept of 'avatar' was introduced into American popular culture by Poul Anderson in his science fiction novel *The Avatar* {1978}. It describes how man discovers the existence of T-machines, interstellar transportation portals left by an ancient alien civilization, and decides to use them for galactic exploration and expansion. In 1985, Richard Garriot started his second *Ultima* trilogy with *Ultima IV: Quest of the Avatar*. For this, he drew inspiration from Anderson's work. Like in *The Avatar*, *Ultima IV*'s background story is based on the idea of an ancient civilization having left magical portals scattered across space and time which are used by the player to move between worlds. *Ultima IV* was also the first computer game to use the term 'avatar', not yet to refer to the appearance of the player-character, but to designate a state of moral virtue which was to be attained by following a number of ethical principles in the game. As such, Garriot's conceptualization of 'avatar' lies closer to the Hindu idea of 'dharma' and ascension than to that of 'avatar' itself. The association between the word 'avatar' and a game protagonist had been instigated, however, and backed by its original meaning of godly embodiment and descent, it was ready to start taking its place in the public mind. The first game to use the term 'avatar' in its present-day meaning of 'embodiment of the player in the virtual world' was probably *Habitat* {Randy Farmer & Chip Morningstar 1987}, a prepersonal computer online environment in which people could meet using various appearances. From there the notion was picked up to be used in other multi-user environments and games and would be further popularized by its use in Neal Stephenson's description of the metaverse in the popular cyberpunk novel *Snow Crash* {1992}. Today, the notion of 'avatar' is used to designate any form of representation of a player or user in a virtual environment such as a computer game, a multi-user dungeon, a discussion forum and even in instant messaging. In many cases, it carries a connotation of customizability, that is, the possibility for the player to choose elements of her avatar's appearance such as facial features and clothes.

Avatarial introjection occurs when the player of a computer game is represented by a clearly delineated entity within the virtual world: a spaceship, a car, a human figure and so forth. When controlling an avatar, the player does not take an outside, singular, godly perspective, but directs her actions through one virtual identity. Like the Hindu god Vishnu who takes on the form of a finite and mortal being within the material world, a computer game player is subjected to virtual-world restrictions within the game. She has to accept her part and play along. During the game, the player descends into the virtual as a game character, an incarnation subject to the laws of the virtual environment like any other entity in the simulation. Just like Vishnu depends on his earthly incarnation, the computer game player depends upon her substitute and can only act through it. When the avatar has lost its life, the player-god loses her gateway to and her means of action in the virtual world and the game session is over (cf. Neitzel 2001: 66). On the other hand, the death of an avatar has little or no consequence for the deity who remains safe within the spiritual world. A new game session can be started and a new avatar is born, to die, and be born again, in a possibly endless cycle of rebirth. Only when the player, through her avatar, manages to finish the game and correct the wrong in the virtual world, she is relieved of her task. Only then, will she no longer be haunted by the urge to play again and again in order to try and submit the virtual world to her godly will.

CYBERSPACE RACE

The earliest avatars in the history of computer games were Needle and Wedge, two spaceships featuring in *Space War*. As mentioned before, Steve Russell started programming the game in 1962 at the height of the space race between the USA and the Soviet Union. Like so many other technical institutions and universities, the Massachusetts Institute of Technology, where Russell was working as a researcher in the artificial intelligence lab, was heavily involved in the space program. At the same time that Russell was developing his demonstration software for the newly bought DEC PDP 1 mainframe computer, other computer scientists were buried in the development of physical algorithms for different kinds of spatial applications. Hence Russell and his team's decision to create a computer game set in space was no coincidence. On the one hand, it was a practical consideration as several of the algorithms for the simulation of thrusting engines, rotation, and gravity emanation in space were floating around on the laboratory floor. On the other hand, it was also a creative decision motivated by the programmers' interests. Needle and Wedge are two spaceships circling around a central planet emanating gravity and threatening to swallow and destroy them. The aim of the game is to shoot down the enemy spaceship while avoiding running out of fuel or laser torpedoes. Interestingly, on a deeper, more subconscious level, *Space War* can also be seen as a reflection of the fear many people at the time had, that the space race would eventually lead to a catastrophic open conflict with the Soviets, a space war. Needle, the leaner ship could then be seen as the faster moving USA and Wedge, the larger one, would be the Soviet Union. The planet in the middle of the screen would be Earth and the game as a whole a symbolic representation of the battle between two contending world views, a struggle for domination over the world by controlling space and striving toward technological superiority.[74]

[74] Arguably, the very idea of there being a space within the computer – a matrix, a cyberspace, a virtual reality – may be indirectly derived from that first decision by Steve Russell and his team to make a computer game about battling spaceships. From computer games such as *Space War* the idea that a computer can create some sort of parallel, virtual universe slowly trickled into popular culture and via Dr. Who and *Tron* it eventually reached mainstream culture and triggered the now ubiquitous spatial metaphors surrounding computer and Internet technology.

The first generation of commercial computer games in the 1970s laid the foundations of several of the computer game genres which are still popular today. In many ways, the Atari age, as it is often referred to, was the most innovative period in the history of computer games. Not so when it comes to the design and marketing of game avatars however. *Pong* {Nolan Bushnell 1972}, Atari's first arcade success, was a rough imitation of a ping-pong game. As a player, you are introjected not avatarially but transcendentally (see also below); your identity within the game is not defined by the paddle but rather by the entire playing field and the position of the ball. Your task is to instruct the paddle so as to bounce back the ball rather than become it and think for it. In a way, you could say that *Pong* employs some sort of first person perspective, keeping the player largely out of the picture, trying to present a ping-pong simulation as closely to the player as possible, downplaying the modeling of the player's introjected alter ego as much as possible. This neutrality as to the identity of the player's role in the game remains a constant in the Atari age. Many of their greatest successes would employ a first-person cockpit point of view, like for example *Night Driver* {Ted Michon 1976}, *Battlezone* {Ed Rotberg 1980} or *Missile Command* {Dave Theurer 1980}. Moreover, even in sports or racing games which did represent the player by an avatar like *Football* {Steve Bristow 1978} or *Sprint 2* {Dennis Koble 1976}, the entities used as avatars are flat. There is no characterization whatsoever. In the 1970s, computer games were still thought of as sheer games or sports, they were not yet recognized as the narrative medium which they would become in subsequent decades.

WHEN STRIPES BECAME STARS

The first anthropomorphic computer game avatar appeared on the scene around 1980 with the pizza-shaped,[75] dot-eating maze-runner *Pacman* {Toru Iwatani 1980}, a name derived from the Japanese expression 'paku paku', meaning something like 'gobble gobble'. *Pacman* was an almost instant hit both in

[75] It is rumored that the idea to make *Pacman* was triggered whilst Iwatani was eating a slice of pizza and dreamily looking at his plate where the remains of the pizza formed a nicely round shape with one triangular part cut out and an olive just above its center. Pac was born and would for ever be associated with insatiable hunger.

gaming arcades and on the video system market. It managed to combine the dungeon-crawling motif, already present in table-top role-playing games and text-based computer games such as *Colossal Cave Adventure* {William Crowther & Donald Woods 1975}, with simple, yet highly addictive game play. Most of all, however *Pacman* succeeded in introducing a believable character into computer gaming, a protagonist at the same time human-like enough to foster identification and abstract enough not to look ridiculous due to technological limitations. "Pac-Man had a personality. Sure, it was the personality of a paramecium with only two behaviors – engorge or flee. But he had a certain prokaryotic flair. Women thought he was cute. But most importantly, he gave the player something to identify with. *Pacman* gave videogames a face" (Herz 1997: 131). One year later, Mr. Pacman was joined by Ms. Pacman, who was announced as the "queen of video games," wearing a large hairpin and keeping to a slightly more varied diet with fruit and pretzels added. As could be expected, marriage and children ensued and two years later, *Jr. Pacman* {1983} was old enough to feature in his own computer game with higher speed, larger mazes and more ghosts. Despite the fact that the possible variations on the Pacman theme were limited, it had set an important precedent. As Herz observes: "*Asteroids* [{Lyle Rains & Ed Logg 1979}] and *Pong* [{Nolan Bushnell 1972}] could make money. But Pac-Man could become a star, with the requisite merchandising bonanza" (Ibid.).

One year after *Pacman*, the first human avatar appeared on the game scene in *Donkey Kong* {Shigeru Miyamoto 1981}. After his girlfriend, Pauline, has been abducted by a giant ape named Kong, Mario, an otherwise ordinary plumber wearing working boots, overalls, a cap and a large mustache, decides to go and deliver her.[76] Like in *King Kong* {Delos Lovelace 1932}, the ape grabs Pauline and starts climbing a large building when the game starts, only in this case there are no tanks or fighter planes attacking the monster, only poor Mario who has to climb one level after the other via extremely awkwardly placed emergency ladders while avoiding the barrels thrown down by Kong in order to trip him.

[76] Apparently, Mario was named after Mario Segali, the landlord of the Nintendo US headquarters, who accidentally walked into a meeting where the English names were being chosen for the characters in *Donkey Kong*.

Donkey Kong became a tremendous success and with earlier successful Japanese games like *Space Invaders* and *Pacman*, it signaled the coming shift of balance in the gaming industry. Two years after *Donkey Kong*, *Mario Bros* {1983} appeared, introducing Mario's brother Luigi and also for the first time making Mario and Luigi perform plumbing duties, i.e. clean the sewers from vermin in a one-screen platform game. However, it would only be with *Super Mario Bros* {1985}, the first scrolling platform game, that Nintendo would truly pull their weight and use Mario as an ace to push their Entertainment System, pull Atari off the computer game throne, and become predominant on the gaming market. From then on, Mario would be an integral part of Nintendo's strategy, who has him appear not just in platform and adventure games, but also in sports and racing games. Despite or maybe because his chubby and unsexy appearance, Mario and platform games, the game genre he popularized, would dominate computer game culture for at least a decade until Sony and three-dimensional simulation began to play a more important role.

Nonetheless, even for avatars like Mario or Kong, J.C Herz (1997) observes that, as compared to popular icons from other media, they still lack an outspoken personality. Despite their name and fame they still display a remarkable flatness of character. For this, Herz puts forward three explanations: one technical, one cultural and one narratological. The first, technological explanation is the best known, but in my opinion also the weakest. Early computer game systems had nowhere near the computing power of today's units and therefore designers were tied hands and feet to their limitations. Game characters were represented by so-called sprites, flat animated bitmaps consisting of only a few pixels and only two or three different images for simulating motion: walking and jumping for example. Mario's appearance, for example, with his hat, large mustache, vertical ears or whiskers (your choice), and slightly protruding belly can largely be ascribed to technological constraints. It was much easier to draw a hat and a mustache in a few pixels than a convincing haircut and mouth. Herz's second, cultural explanation refers to the fact that early game characters such as Pacman and Mario have their roots in Japanese popular culture, more specifically in Manga and Anime. Hence, Japanese game characters tend to feature what Herz describes as a "preternatural cuteness and almost freakish baby-like quality which takes the form of oversized heads, tiny noses, and saucer-like, impossibly liquid eyes" (162). Third and finally, there is a possible narratological reason for the flatness of game avatars, i.e. the fact that they must present an acceptable role for the player to fill in. Referring to Scott McCloud's work in *Understanding Comics* (1993), Herz observes that abstract characterization tends to foster identification. "It is only because an animated character is abstract and cartoony that we can project our own expressions onto him. We can't really map ourselves onto truly realistic characters – we see them as objects, separated from us by their details" (162).

LEISURE SUIT LARA

Arguably the most significant and most studied computer game avatar of the 1990s is Lara Croft, the main protagonist of the *Tomb Raider* series {Toby Gard 1996-}. Lara is an adventurer-archaeologist annex gorgeous young athletic serial killer who is hired to retrieve the Atlantean Scion, an ancient magical amulet. For this, she has to travel to various places across the world, most notably the tomb of Qualopec in Peru which she is to enter and explore. The background story to *Tomb Raider* is rather conventional using elements from popular pseudo-historical fantasy combined with the dungeon-crawling Leitmotiv. The basis for its success, however, is not its story, neither was it its theme, but Lara herself. Whilst deriving characteristics from previous adventurous archaeologists such as Indiana Jones, she is first and foremost a so-called fighter chick (cf. Holmes 2003), who, just like Gibson's Molly[77] has at her disposal extreme physical abilities, a profound knowledge of how to handle weapons and a devastating hermaphroditic yet at the same time girlish sexiness. Just like Case accessing Molly's thoughts through his SimStim, the player has access to Lara's experience and thoughts guiding her to the heart of the tomb while imagining being her closest friend and lover. Several observers have noted, however, that Lara has retained a significant portion of her predecessors' abstractedness.[78]

[77] Molly who, in turn, is styled after earlier Manga girl warriors.

[78] Despite Lara Croft's alleged 'openness' as a vessel character, Stephen Poole notes that feedback from the Japanese audience suggested that she should be more 'mangafied', conform more to manga convention (2000: 141).

"Lara Croft is an abstraction, an animated conglomeration of sexual and attitudinal signs (breasts, hotpants, shades, thigh holsters) whose very blankness encourages the (male or female) player's psychological projection and is exactly why she has enjoyed such remarkable success as a cultural icon" (Poole 2000: 153). "[She] is a partially formed character; she is in essence a cartoon who serves as an avatar onto which the player is meant to project her — or more often, his — own interpretation. It is important that the character is incomplete, because if the character is too developed there is nothing compelling for the player to contribute" (Pearce 2004). Bob Rehak, finally, describes the same phenomenon from a semiotic perspective as Lara's " polysemous perversity, her ability to endlessly resignify. In this sense, she merely extends the essential emptiness of the avatar, a semiotic vessel intended to be worn glovelike by players" (2003a: 481).[79]

To conclude, it should be noted that many games resort to the technique of avatar customization in order to overcome possible elements which could hamper identification between player and puppet. Again, of course, computer games were not the first form to present the player at the beginning of the game with the question whom she would want to be. In a sense, the very essence of board and card role-playing games is to experiment with identity and play with its different variables. Apart from computer role-playing games like *Dungeon Master* {Bruce Webster &Wayne Holder 1987} which obviously picked up the idea from their paper predecessors, sports and race games were the first to offer the player with a choice as to which type of vessel would suit her best. Advantages and disadvantages would be distributed according to the paper-scissors-rock technique: one avatar would be average in most tasks while others would excel in specific parameters and be weaker in others. A second class of

[79] One of the most remarkable and amusing analyses of Lara that I came across is that by Rebecca Tews who looks at her from a psychoanalytical perspective and describes her as a 'highly idealized anima form'. "She is novel to the male player because of her highly sexualized body, and the angles from which it is viewed during gameplay obscure the more intensely threatening possibility that she might turn her weapons on any man that tries to sexually dominate her. Through Lara, voyeurism is elevated to a new level, allowing the male player to hide once again behind a protective woman as he formerly hid behind his mother. For female players, on the other hand, Lara represents a powerful warrior icon that empowers them to express their strength and sensuality" (2001: 179).

games which enthusiastically picked up customization, was the so-called beat-'em-up scene in which ridiculously muscled bodybuilders could be pitched against tiny, but tremendously fast and precise Japanese kung-fu schoolgirls. At least since *Street Fighter* {Yoshiki Okamoto 1987}, the player would be presented with a series of avatars at the beginning of the game from which she could choose her temporary virtual identity. Later, shooters like *Unreal* {Tim Sweeney & Cliff Bleszinski 1998} would also adopt the technique and bring it to the popular 3D shooter scene. Finally, an extreme form of avatar customization can be found in so-called 'moddable' games which allow the player to change visual or other characteristics of game objects or even create new ones. Games like *Grand Theft Auto: Vice City* {Rockstar 2002} allow the player to scan her own face and have it fitted onto her avatar. Since then, an active community of fans and amateur designers have set up numerous sites where identities and modifications for dozens of games can be freely downloaded.[80]

INTERVENTIONIST GOD

The second type of introjection is what I have referred to as *transcendental introjection*. Whereas in the case of avatarial introjection, the player is represented within the simulation by a clearly identifiable entity which is a member of the game world, when introjected transcendentally, she is not associated with one distinct object or character. Rather she takes the position of a ghost moving freely across the game map, giving instructions to characters and entities. Most strategy and so-called simulation games such as *Simcity* use transcendental introjection, positioning the player not within a virtual body, but in a managerial role. This perspective can be associated with the Judaeo-Christian conception of an interventionist god, being neither a character as in Hindu belief nor the world as a whole as in pantheist beliefs, but rather an external identity, a shepherd watching and guiding his creation according to his personal will. "The title and the description of god-games generally underplay the dependence of the player on the game and refer to a Christian God as the Creator of the world

[80] One well-known example of an illegal modification is that of *Nude Raider* {unknown 1996}, which, as the name suggests, strips Lara of her every garment and sends her off to save the world wearing no more than boots, gloves and a pistol holster.

and its history" (Neitzel 2001: 66, author's translation from German). In most of these games, the role of the player is explained as that of 'mayor' as in *Simcity*; 'chief', 'warlord', 'prince', 'king', or 'emperor' in *Civilization* {Sid Meier 1991}; or 'business tycoon' in games like *Railroad Tycoon* {Sid Meier 1990}. As Ted Friedman observes, however, the position of the player is really that of a god or at least one of his angels keeping an eye on their part of His creation (1999). Not only can the player order swords to be forged and castles to be built, she can also move across the game map in a fraction of a second, give orders to her subordinates, or scrutinize dozens of real-time economical and demographical statistics. Unlike a mayor or even an emperor, she has direct access to what lies before her and it is her divine will that determines how the virtual world evolves.

In her contribution to the *Handbook of Computer Games Studies*, Britta Neitzel (2005) adopts Gérard Genette's (1980) distinction between intradiegetic and extradiegetic positioning and links it with 'point of action' referring to the position from which the player takes action in the game world. The intradiegetic point of action is associated with an active and personal role within the development of the game story and largely corresponds to my notion of introjective form. Both in games presenting an avatarial perspective and in those presenting a transcendental perspective, the player is an initiator of the action and is therefore part of the diegesis. Her description of extradiegetic point of action is more problematic however. According to her analysis, an extradiegetic point of action occurs when the player does not take a role within the story of the game. As examples she puts forward *Myst* {Robin & Rand Miller 1993} and *Tetris* arguing that the player of these games does not take the role of a character in the story and therefore remains outside the narrative framework. I disagree with this viewpoint, however, as both of these examples can be said to involve role-taking. In *Myst*, the player is explicitly assigned the task of delivering and saving the virtual worlds built by Atrus through his magical books. It is true that there is no visible avatar in the game, but the player *does* take part in the emerging story of the game from within the story world. The most difficult game to defend as being intradiegetic is undoubtedly *Tetris*, but I nonetheless tend to take that position. Indeed, it can be argued that there is no diegesis in Tetris, as does

Juul (2005) for example, but I see that as a literature-centered view on narrative. The story of *Tetris* is one of a struggle to keep on ordering blocks into a wall as they are falling. This may not qualify as a story worth reading or watching, but it does suffice to base a game on. The role of the player in this story is that of the struggler, the person desperately trying to keep up with the ever-continuing rain of blocks. Hence *Tetris* is no different from any other game, reserving a role for a player in an, albeit simple and abstract, game story.

Does that mean that there are no computer games employing an extradiegetic point of action? That they all reserve a role for the player to act from within the game world? I tend to take this position. One of the essential elements of a game and one of its most distinctive features vis-à-vis a plain story, is that the player mentally projects her self into her imagining. In Walton's terms, representations are artifacts meant to stir an imagining; they are to serve as props in a game of make-believe, a session of pretense during which images and ideas are what they in reality only refer to. Books, films, board and computer games can all be seen in this light. They are all artifacts produced to be used in games of imagining. The main difference between books and films on the one hand and games on the other is that, when reading a book or watching a film, there is no active role in shaping the artifact's contents from within the imagining whereas in a game there is. A reader or a spectator does not have a goal within her own imagining, at least not one she can work toward. She may identify with the good character and wish that she succeeds in attaining *her* goals, but she knows she cannot do anything about them. In a game, however, the tension is precisely built around selecting goals and subgoals within the imagining, experimenting with different scenarios and testing oneself against others in a safe environment. This active role, thriving on myriads of small and larger decisions, is also the main difference between a computer game and other interactive forms of entertainment such as hyperfiction or interactive cinema. The reader of a hypernovel or the watcher of an interactive film does have an active role not just in the imagining, but also in the material generation of its story. What she does not have, however, is a clear goal in selecting her reading or viewing path. She does not have an identity within the interactive book or film. Hence she retains an extradiegetic point of action. No introjection takes place.

HYBRID FORMS

To conclude this section, I would like to return to the distinction between avatarial and transcendental introjection. The concept of introjection refers to the fact that the player of a game, computer or other, projects part of her self into the fictional world. She takes an active role within the game environment. In the case of avatarial introjection, she is tied to a clearly delineated entity in the simulation – a virtual spaceship, a vehicle or a person and so forth – which is her avatar. In the case of transcendental introjection, she is similarly drawn into the fictional world but not to become just any member. Instead, she takes the role of a god, a military leader or a manager who guides and controls her subjects from an external above perspective. When introjected into an avatar, the player is restricted by the limitations applying to all members of the virtual world. She can only direct her actions through her persona. When introjected transcendentally, the role of the player is that of a god sitting upon his cloud whispering orders into the ears of his hard-working disciples. Avatarial introjection is the preferential setup for most action genres such as shoot-'em-ups, beat-'em-ups, sports games, racing games, platform games, first-person shooters and action adventures. Transcendental introjection is the default setup of most so-called god games: i.e. turn-based and real-time strategy, simulation and puzzle games. There are games, however, which do not readily fit in either category or show characteristics of both. In this subsection, I look at a number of these border cases.

When looking at two-dimensional avatarial action games such as *Space War*, *Pacman*, *Surround* {Alan Miller 1977}, *Combat* {Joe Decuir 1977} and so forth, a distinction can be made between avatar-relative and player-relative controls. In *Space War* and *Combat*, the player is given *avatar-relative controls*, that is, her actions are projected into the game world as if they were those of the spaceship's pilot or the tank's crew. When she pulls the handle left or right, the avatar turns around its axis and when pressed forward it moves in the direction it is currently pointing. Games like *Pacman* and *Surround*, on the other hand, present the player with absolute, directional or *player-relative controls*, that is, when she pulls her handle left, the avatar does not move around its axis, but immediately turn and go westward, and when she pushes her handle forward, the avatar turns and starts moving upward, toward the top of the screen. In other words, the movements of the player's joystick are not directly mapped upon those of the avatar but are interpreted and translated in function of the current game situation and its visual rendering on the computer screen. Hence it could be argued that, despite the fact that the player assumes the role of an avatar, she controls it from an outside perspective, that she does not take the point of action of the avatar itself, but that of a transcendental entity floating above it and giving instructions according to its own position. I do not follow this line of thought however. It is true that in the case of player-relative controls there is no direct correspondence between how the player moves her handle and how her avatar changes position within the virtual world, but this does not change the fact that it is the player's decisions that are introjected. Hence I tend to regard different types of controls more as a question of point of view than of point of action, which can be corroborated by the fact that some games offer a choice between avatar-relative and player-relative controls.

A second problematic category is constituted by games that present transcendental introjection, but at the same time foster identification between player and one or more game characters. In most simulation and strategy games, the inhabitants of the virtual world are no more than tools, means toward a goal. Virtual citizens are nameless entities that build houses, forge weapons and pay taxes. Military units are canon flesh and are sacrificed even if it yields only the smallest tactical advantage. If the player of a game like *Simcity* or *Civilization* can be said to identify with anything in the game, it is the city or state she is governing, not its inhabitants. Some games, however, emphasize rescue rather than construction, solidarity rather than combat. One example is the so-called save-'em-up *Lemmings* {Mike Dailly 1991} in which the player has to guide a group of up to one hundred lemming-like creatures past a number of obstacles into a portal. In order to achieve this, the player must give instructions to the lemmings, for example to block its fellow creatures, bash through a pile of debris or build a stairs toward a higher positioned platform. Despite the fact that the player takes a godly perspective, she also very much depends upon her group. When she has to sacrifice or leave a lemming behind, as is sometimes required to finish a puzzle, she experiences a feeling of disappointment and loss. This suggests a closeness and identification between player and lemmings which is rare in games using transcendental introjection. Again, I would not opt for recategorization however. It is true that *Lemmings* engenders a sense of togetherness and identification, but this is due to its game formula and clever design rather than to any deviation from the transcendental paradigm. The player's role in *Lemmings* is that of a godly savior, not that of a mortal lemming.

The third and final problematic category I would like to discuss here are puzzle and card games. In these game genres, the player has to solve a number of organizational problems so as to reach a goal state, after which a new game session begins with a new configuration. During this process, the player acts directly upon the puzzle pieces or cards using a mouse pointer without an intermediary instance like an avatar. Some game theorists such as Jesper Juul see this as a reason to make a radical distinction between puzzle games like *Tetris*, which are seen as real-world activities such as sports, and world-generating games like *Mortal Kombat* {John Tobias 1992}.[81] One can also argue, however, that a game like *Tetris* does involve the acceptance of a number of beliefs in order to become meaningful, and that it *does* appeal to the player's imagination for generating the required associations and for framing the activity. These beliefs include the idea that playing is pleasant, that earning a higher score is in some way desirable, that walls should be kept low and that tetraminoes need to be piled neatly. In a game like *Tetris*, the player takes a role, namely that of a contender but also that of an imaginer, a builder and a demolisher. Several researchers have observed that *Tetris*' popularity may well be due to its aptness to represent the everyday experience of coping, of organizing all the rubble in such a way that it disappears from the scene, but at the same time alluding to the absurdity

[81] One of Juul's main arguments to regard puzzle games as unfictional is his observation that the proposition "In *Tetris*, when you have covered an entire row, it disappears" is a statement about the real-world, not about a fictional entity (2005). This can also be said of the statement "In *Unreal*, when you move your view finder over the target and press the mouse button, you hear the noise of shots and see splashes of blood" however. As is also the case for other forms of representation, when you make a statement about a computer game, you can either target its material configuration, its signs if you like, or the imagining they generate. Thereby the first should be seen as referring to its real-world aspects and the second to the fictional world it generates. Hence, describing puzzle games as exclusively real-world activities would be to disregard their creative potential and their faculty to generate suspense.

of the activity as the rubble continues to come falling from the sky (cf. Herz 1997: 172; Murray 1997: 144;). As a game and simulation, *Tetris* is a representation of a human experience inviting the player to take part in its generation. Hence, despite its abstractedness, it qualifies as an introjective form encompassing the player with its generated universe placing her in a transcendental, commander-like slot.

3. POINT OF VIEW

In “Die Frage nach Gott” (2001) and “Narrativity in Computer Games” (2005), Britta Neitzel outlines a framework for the analysis of player perspective in computer games, which she divides into point of action (cf. previous section) and point of view. Her description of point of view is based on Gérard Genette's analysis of literary focalization in *Narrative Discourse* (1980). Genette distinguishes between three types: (a) *internal focalization*, whereby the fictional world is seen and described from the viewpoint of one the characters in the story; (b) *external focalization*, whereby one character is followed throughout the narrative, but the narrator retains an outside position, revealing nothing on the character's personal feelings or thoughts; and (c) *zero focalization*, whereby the story world is not described from the perspective of a character, but from that of an omniscient narrator, an instance that sees and knows all. Neitzel then transposes this narratological framework from literary to computer game analysis where the different categories become subjective, semi-subjective and objective perspective (2005: 238). The (a) *subjective perspective* is associated with a first-person point of view as in shooters like *Unreal* {Epic 1998}. The (b) *semi-subjective perspective* is linked with third-person point of view as in found in *Tomb Raider*, for example, in which the avatar is kept in view by a camera following from behind. The (c) *objective perspective*, finally, is Neitzel's residual category containing those computer games employing transcendental introjection and those avatarial games in which the avatar is seen from a fixed, external camera viewpoint as is the case in most early action games from *Space War* to *Donkey Kong*.

Genette's theory of focalization is primarily a framework devised for the analysis of literary fiction however. It describes the way in which fictitious events are mediated by a narrating instance in a book. This instance continuously manipulates and filters the information presented to the reader in order to produce different types of understanding and emotional response such as identification, suspense, fear, loathing, excitement etc. In the case of internal focalization, the narrator is allowed access to the protagonist's thoughts, seeing the fictional world through her eyes. In the case of external focalization, the narrator is denied allowed access to the character's thoughts themselves, but follows closely enough to observe her every response. Furthermore, in the case of zero focalization, the narrator is not so much tied to one character, but overtly generates, oversees and controls the fictional world. However, as discussed in the previous section, computer games generally do not employ a narrator-listener deep structure, but reserve a role for the player within the virtual world itself where she takes part in the ongoing events. Hence, despite the merits of Neitzel's analysis, one must recognize that transposing Genette's framework for analyzing literary fiction to computer simulation is problematic and can be said to suffer somewhat from the 'have theory, will travel' syndrom. In this section, I propose a number of adjustments and additions to Neitzel's analytical framework, which, I believe, makes it more precise and robust when applied to computer simulation and games. The model I present makes a rough distinction between three levels of description: the virtual world (spatial simulation), the virtual self, and the virtual camera. My underlying claim is that each of these layers play an essential role in shaping the player experience and should therefore be taken into account when describing her point of view.

Modeling a World

The simplest and oldest form of simulated space in computer games is that representing two dimensions. In these simulations, entities are represented by bitmap images, often referred to as 'sprites', upon a static background image. Movement of the entity is suggested by redrawing it at a different location on the screen, often accompanied by a short animation of walking, for example. One of the problems early computer game programmers were faced with, was what to do when objects approach the edge of the screen. For computer-controlled entities, this was not such a problem as they could simply be made to disappear. Not so for the player's avatar, however, as it would no longer be controllable when out of view. Single- screen computer games came up with two solutions to this problem. The simplest and most straightforward solution was to block the avatar's movement when it approached the edge of the screen. In a game like *Combat*, for example when an avatar tank hits the border of the playing area, it comes to a standstill and it will only be able to move again when it turns around and takes a different direction. Yet, blocking access is not the oldest solution to the screen dilemma. Steve Russell's *Space War*, for example, used so-called 'wraparound space'. When Needle or Wedge reach the edge of the screen, they disappear and instantly reappear on the opposite side. This creates the impression that the edges of the playing area are in some way connected, wrapped around at the back of the screen, as if the viewing area were a projection of the surface of a spherical object, like a map of the world. Until the development of scrolling, or 'rolling' as it was often referred to, this curving or wrapping of computer space remained a popular solution for games set in space, allowing the representation of a space which was at the same time unbounded, which avoided breaking the spatial illusion, and finite, limiting the need for computing power and memory (cf. Poole 2000: 117).

At the end of the 1970s, as microprocessors grew more powerful, game programmers started to come up with new solutions to the screen dilemma. The main driving force behind these innovations was a need for a larger and more diverse playing area. In other words, game designers needed a technique to allow the player to cross the dreaded screen border and explore that which lay behind it. The first and least demanding solution in terms of processing power was to divide the playing area in different screens. When an avatar reached the right-hand border, for example, the screen would be replaced by the next room and the avatar would be redrawn on the left side of the screen, as if it were entering from there. One of the first games to successfully implement this technique was *Adventure*, not Crowther and Woods' *Colossal Cave* {1972} which was a text-based game, but the 1978 Atari video game classic designed by Warren Robinett. Like *Colossal Cave*, by which it was inspired, *Adventure* is primarily a dungeon-crawling game in which the player is to explore a large web of interconnected rooms, find her way out of labyrinths, collect valuables and weapons, fight monsters and eventually retrieve the chalice and return it to the gold castle. Within the virtual world, the player is represented by an avatar knight who is seen from above and who is really no more than a colored square dot which can move around, open doors and pick up objects. When it reaches the top of the screen, accessing a doorway for example, it is transported to the next room, which it enters from the bottom. Interestingly, in some cases, this sudden switch between rooms is used to create tension as monsters can be lying in ambush right behind the edge. In this case, what was initially a technological drawback has become a narrative technique, a way to generate suspense by manipulating the player's viewpoint.

Equally in 1978, an arcade game called (*Atari*) *Football* {Steve Bristow 1978} came out. It was an American football game which could be played with two or four players on a black and white football field seen from above. What made it remarkable, however, was how it solved the screen dilemma. Instead of representing the whole playing field at once, it only showed that part where the ball was and when the action moved closer to the border of the viewing area, the image would adjust dynamically so that the ball would not leave the screen. In this way, computer games introduced the concept of scrolling into the history of computing, which would quickly be picked up by other applications such as word processors and graphical user interfaces.[82] From the perspective of virtual representation, the discovery of scrolling algorithms introduced an incipient form of dynamic camera into computer simulation, definitively separating viewing and playing area and paving the path for later three-dimensional single-point perspective viewing. Horizontal scrolling allowed to create an illusion of depth using optical techniques such as parallax. Parallax scrolling, which is often said to be introduced by *Moon Patrol* {Irem 1982}, but which was also present in earlier games such as *Battlezone* {Ed Rotberg 1980}, is a technique which divides the screen into a number of layers so that, when the avatar moves sideward, the foreground plane scrolls faster than a middle-distance

[82] Mark Wolf reports in this respect that "Atari patented the scrolling technique and has won a number of lawsuits due to this patent, which has provided the company with more income than *Football* could ever have" (2001b: 58).

plane, which in turn moves faster than the background, usually mountain ranges and clouds near the horizon. This type of scrolling suggests that there is a distance between the different planes and creates an illusion of depth, announcing the upcoming shift from two-dimensional to three-dimensional spatial simulation.

A THIRD DIMENSION

When discussing perspective in computer games, it is often silently subsumed that three-dimensional simulation appeared only decades after its two-dimensional counterpart. This is not so however. Already in 1977, Larry Rosenthal designed an arcade gaming machine presenting an astoundingly realistic, three-dimensional wireframe simulation of a driving car. *Speed Freak*, as the arcade game was called, involved driving a car down a winding road while avoiding oncoming traffic and obstacles such as hitchhikers and cows. Its commercial success was limited, however, and only some 700 machines were built. The breakthrough of three-dimensional simulation into mainstream gaming occurred three years later with the appearance of the arcade game *Battlezone* {Ed Rotberg 1980}. In *Battlezone*, the player is positioned in the cockpit of a war tank which is being attacked by enemy tanks and in some versions also by aircraft. The aim of the game is to resist the enemy army for as long as possible by moving around the battlefield, seeking cover behind obstacles and by firing your cannon. *Battlezone* was a tremendous feat both in terms of software design and engineering: not only was it an engaging, almost addictive shoot-'em-up with fear-inducing sound-effects, it was also an incredibly realistic tank simulation built of three-dimensional vector wireframes employing linear point of view. The player could turn her tank 360° and move freely around the virtual area which was put neatly into perspective against a background of mountain ranges, a waxing moon and the odd erupting volcano scrolling by in parallax fashion. No wonder that, when US army officials were confronted with the game, they realized its potential and commissioned Atari to build an upgraded version for combat training. This presented *Battlezone* with the doubtful honor of being the game that established the association between the military and the gaming industry which would last for decades.

Meanwhile, home computer and console games remained largely two-dimensional due to the limited computing power home systems provided in comparison to arcade machines. But even in the 1980s, when microprocessors became cheaper and grew more powerful, and home consoles became at least as powerful as the systems on which games like *Speed Freak* and *Battlezone* were run, they largely remained in the 2D sphere.[83] This was partly due to the often-quoted gaming industry's conservatism and 'never change a winning team'-adage, but it was also because of the consumer's preference for solid and colorful graphics as opposed to abstract wireframes. The combination of immersive polygonal 3D and real-time solidly colored or texture-mapped side-planes was still well out of reach for contemporary processors however. Hence real-time 3D would not play a role of significance on the 1980s gaming stage. What did play an important role, however, was pseudo-3D simulation, sometimes also referred to as 2.5D. Pseudo-3D refers to a collection of 2D techniques for tricking the player into believing that she is moving her avatar in a three-dimensional environment. *King's Quest* {Roberta Williams 1984}, for example, is often referred to as the first adventure game combining text commands with three-dimensional avatar movement instead of static stills. What *King's Quest* does, however, is not calculating the position of three-dimensional objects, but creating an impression of a third dimension by using a three-dimensional linear-perspective background image and by allowing the player's avatar to move up and down the screen as if it were walking upon this three dimensional scenery. Occasionally, an object like a tree would be placed on a front layer so that, when the player's avatar is higher on the screen, it would move behind it, adding to the emulated sense of a third dimension. Later, this technique would also be used in beat-'em-up games such as *Double Dragon* {Yoshihisa Kishimoto 1986},

[83] One exception was the Vectrex, a console developed and marketed by General Consumer Electric in 1982. Contrary to most technologies at the time, the Vectrex did not use raster but vector graphics on its built-in monitor. This allowed to bring several of the early wireframe three-dimensional arcade games to the living room. The Vectrex turned out a commercial flop, however, and was taken off the market only two years after it had come out. Today, the Vectrex has become a collector's item and an icon of the retro-gaming subculture.

in which all action takes place on the x-axis, but which allows limited movement on the y-axis, and role-playing games like *Dungeon Master*, which would also use the technique of shrinking the 2D bitmaps of distant objects and enlarging them when they are up close so that objects further away appeared smaller and the illusion of depth was further supported.

Yet another type of three-dimensional simulation, i.e. isometric 3D, appeared in 1982 with Sega's release of *Zaxxon*, a fairly conventional shoot-'em-up if it was not for the player's perspective. Most shooters at the time were two-dimensional, either vertical scrolling and seen from above such as *Space Invaders*, or horizontal scrolling and seen from the side such as *Moon Patrol. Zaxxon*, however placed the player in a diagonal position slightly above and behind her spaceship which would be moving toward the right upper corner of the screen. The playing area itself was drawn in 3D isometric projection, which literally means 'equal measures' and is generated by a geometrical technique whereby the horizontal lines of projection are drawn at an angle of thirty degrees instead of forty-five, as is usual for single-point perspective, relative to the bottom of the screen. Consequently, parallel lines no longer converge as they recede into the distance; there is no vanishing point as in single-point perspective. Equal emphasis is given to all sides of an object and distant objects appear not just using the same proportions, but having the exact same size as objects nearer to the bottom of the screen. Moreover, isometric projection has the advantage of being less processor-intensive than 'real 3D' due to the player's fixed point of view. Like a football commentator, she sits fixed high in a corner of the playing field and cannot move independently relative to the ongoing action. This also turned out to be one of isometrics' weaker points, however, and after *Zaxxon*, its success in action games has been limited. Other genres such as puzzle games, however, e.g. *Pacman*-inspired *Crystal Castles* {Franz Lanzinger 1983}, adopted the technique and further refined it into a format allowing for the construction of highly complex and engaging three-dimensional puzzles. Today, isometric projection remains popular with game genres such as real-time strategy and simulation, which depend on the player being able to overview and control various units and buildings in a large virtual area.

Real-time single-point three-dimensional simulation with texture-filled planes began to appear on the market in the early 1990s as personal computers further increased in graphical processing power. *Hovertank 3D* {John Romero & John Carmack 1991} was an early, modest example of a three-dimensional shooter based on John Carmack's graphical engine. In subsequent years, his programming would form the driving force behind the shift toward real-time three-dimensional simulation with first-person shooters such as *Wolfenstein 3D* {1992} and particularly the horror-themed *Doom* {1993}, which popularized the genre on a global scale. Interestingly, the development and popularity of three-dimensional simulation would later in turn form the main driving force behind the development of special-purpose 3D hardware such as graphical processing units and hard-coded 3D acceleration. As a form of representation, three-dimensional simulation is a reflection of a particular view on reality and how it can be represented in algorithmic simulation. Linear point of view, which is induced by the fact that our two eyes register a slightly different image of our surroundings, is mimicked on a two-dimensional surface by real-time generative geometrical algorithms. Then, these algorithms, reflecting their own human-centered view on reality, are translated into graphical ROM units meant to perform the number-crunching for the simulation. In this way, computer simulation as a tool devised by man to imitate specific aspects of reality such as form, movement and dynamic behavior exerts its influence at the most basic computing level, namely hardware and chip design. In the next subsection, I go deeper into how the role of the player is coded into virtual simulation and how this can be incorporated into a discussion of point of view in computer games.

MODELING A SELF

The second level in the description of point of view in computer games is the role that is ascribed to the player: the way in which she is embedded in the game's algorithmic and simulational setup. As discussed above, one of the main differences between what is generally referred to as a 'story' on the one hand and what we call a 'game' on the other is the way in which the imagined events relate to the I-persona. When a story is communicated through written words, by a narrator in person or through images, fixed or moving, the I-persona is confronted with events that happened somewhere, some time, to someone. By analyzing and interpreting various clues, the receiver tries to determine who the people in the narrative are and where and when they supposedly lived or still do. Then, through various mechanisms, which are as much bound to technique as to cultural and personal factors, the receiver (listener, reader, viewer) identifies with a character in the story and mentally place herself in the character's position. What she usually will not do, however, is imagine herself to be an actor in the represented events. She may imagine what she would do if she were in the shoes of someone in the story, but she will not be able to maintain her own illusion that she is an actor in the fictional world for the simple fact that she is not and that all events in the narrative are fixed. In a game, on the other hand, the different entities and story elements are conceived in such a way that an active role is reserved for the player so that the illusion of being an autonomous actor within the virtual world can be created and maintained. When playing a game, identification mechanisms are only part of what is happening, a player does not just put herself in the place of a fictional character, she imagines herself to step into the fictional world and take part in the ongoing action. I have referred to this phenomenon as introjection, being thrown into the fictional universe, and have proposed the compound introjective form for cultural practices such as computer gaming which apply to introjection.

As described in the previous section, when looking at computer games, a distinction can be made between two prototypical forms of introjection, two types of roles that can be reserved for the player within a gaming simulation. The first type of introjection is *avatarial introjection*, whereby the player is cast into the virtual game world as an entity among entities, as a clearly defined object or character. In a game like *Pacman*, for example, the player is cast into the role of an inhabitant of the virtual world who lives in a maze and who is desperate to eat as many crumbs as possible without getting caught by one of the spooks. Within the game world, the player *is* Pacman and the actions she is able to perform are Pacman's. He is her avatar, her godly representative in the netherworld of the game. In the case of *transcendental introjection*, on the other hand, the role of the player within the game world is carved out rather differently. Instead of being one visible, clearly-delineated virtual entity, she is a collection of commands which she can exert directly upon the virtual environment and its inhabitants. In a game like *Age of Empires*, for example, the player assumes the role of a great past leader such as Jeanne D'Arc or Genghis Khan, but in reality she is not a virtual mortal tied to the restrictions of her character. She is an entity hovering the playing field as if she were a god on her little cloud, looking around and decreeing orders, alternately helping and encouraging or punishing her subjects. Whereas in the case of avatarial introjection, the player is cast right into the middle of the action, attempting to figure out a way to keep her virtual body intact, in the case of transcendental introjection she is projected into the game world in a managerial role, building and governing a third-party world, but for her own greater honor and glory.

First-Person Point of View

Within avatarial introjection, an additional distinction can be made with regard to how the player is positioned vis-à-vis her avatar. The oldest and best-known paradigm is the so-called third-person point of view. Like in earlier board games such as *Monopoly*, in *Space War*, the player is represented by an entity within the simulation, i.e. a spaceship circling a centralized gravity-emanating planet, which she observes from an outside perspective. It is as if there is, within *Space War*'s tiny galactic universe a small cabin hanging from the sky in which the player is sitting and guiding her avatar ship toward victory as if it were a radio controlled model car. In Neitzel's terms (2005), the player takes the point of action of either Needle or Wedge, but she does not take their point of view. Rather she takes a third-person perspective, a viewpoint not from within the cockpit of the ship, but from a safe and vantage position. In the case of first-person avatarial introjection, on the other hand, the player does not take a third-person vantage point, but rather looks at the virtual world through the eyes of her avatar. She is not just embodied in the sense that she is represented by a virtual body, but she is visually embedded within that body. When she moves left or right, she does not watch an avatar move its nose while the virtual world remains fixed. Rather the whole virtual universe pirouettes around her. She is not just forced to rely on her avatar's abilities to act, but also to perceive.

The first computer game to make use of a first-person perspective was the racing arcade game machine *Night Driver* {Ted Michon 1976}. In *Night Driver*, the player takes the point of view of the pilot of a sports car which must be driven along a winding road without crashing into other vehicles and without hitting the sidewalk. Interestingly, the front of the car, which is visible at the bottom of the screen and which forms the main indication of where the car is driving, is not drawn digitally, but is actually a plastic insert that is fixed upon the screen. The simulated car remains in exactly the same position relative to the player and it is the road that shifts horizontally as she steers her vehicle past sharp bends and approaching cars. For the first time, in *Night Driver* it was not just the avatar that tried to find its way under the guidance of the player, but rather the player herself using the avatar as a mere vehicle. Several researchers such as Mark Wolf (2001b: 66), Alison McMahan (2003: 70) and Bob Rehak (2003b: 115) do not see *Night Driver* as the founding father of first-person perspective, but refer to the 1980 tank simulator *Battlezone*, which, additional to the fixed position of player and avatar vehicle also offers free 360° movement. Even if we take this as a basic criterion for first-person perspective, however, there is at least one console game that came out before *Battlezone* and offered free 360° movement. Like so many other shoot-'em-ups, *Star Raiders* {Douglas Neubauer 1979} was set in a space battle, but whereas most of them presented an outside perspective on the ongoing action, *Star Raiders* places the player perspective directly within the cockpit of a spaceship in a pseudo-three-dimensional environment. In this way, *Star Raiders* not only laid the groundwork for the combat flight simulator genre, but also contributed greatly to the development of first-person simulation.

To conclude this discussion of how the role of the player is shaped, I would like to point to the complexity of the object under scrutiny and stress that the categories I have presented are generalizations or prototypical forms rather than absolute distinctions. First of all there is the fact that many primarily third-person games allow the player to switch to third-person point of view and vice versa. *Tomb Raider*, for example, which is often quoted as the third-person action adventure par excellence, allows the player to shift her viewing position from a camera following Lara to a personal viewpoint through her eyes. First-person games such as the point-'n'-click mystery adventure game *The Last Express* {Jordan Mechner 1997}, on the other hand present the player with a first-person viewpoint as she is wandering through the virtual setting of the game and digging for clues whilst discussing with other passengers on the train. From time to time, however, the game is interrupted by fighting scenes or cinematic sequences in which the player no longer has control over her avatar and in which the viewpoint switches to third-person (cf. Taylor 2003). Moreover, beside introjection and perspective, there are many other variables which can play an equally or more important role in determining the player's experience of the game universe and particularly of her assumed role. Some games, for example, both action and strategy, implement some form of artificial intelligence in the computer characters controlled by the player. When given an order by the player, these characters will carry it out, but when not, they will not remain stationary, but do as they please or rather as their behavioral model indicates. This semi-autonomy of computer characters very much turns the role of the player from a controller to a voice in their head. Finally, there are also idiosyncratic games which experiment with the mechanism of introjection in order to achieve a certain result. In the puzzle game *Head over Heels*, for example, two avatar dog creatures Head and Heels have to work together in order to be able to make progress in the game. This creates an atmosphere of loyalty and affection (cf. Van Looy 2002).

MODELING A CAMERA

Aside from the simulation of a virtual world and that of the player's role, there is a third element to consider when describing point of view in computer games, i.e. the camera viewpoint. Arguably, every graphical computer game involves a simulation of some form of recording and playback. In early computer games, like in early silent movies, cameras were fixed and used as mere virtual recording devices. In *Space War*, for example, the camera is placed at a distance from the two-dimensional playing scene so that the player has a nice overview of the battle area and can steer her avatar toward the required goal most proficiently. The problem with a fixed camera viewpoint, however, was that the virtual environment could not move relative to the camera point and that therefore the entire game was to take place upon one screen. As discussed earlier in the subsection on two-dimensional space, one of the first solutions to break out of the one-screen paradigm was simply to redraw the entire screen when the avatar had reached its border and replace it with a next room. In filmic terms, this technique is the equivalent of placing one camera in every room of the game and switch from one to the other. In a sense, these games employ the metaphor of a security hub whereby the player is sitting in the guardian's cabin switching from one security camera to another. The camera viewpoints themselves, however, remain fixed. It was only with the invention of scrolling in the 1978 game *Atari Football*, that the camera was taken off its tripod and placed into the hands of a virtual cameraman who would make it follow the ongoing action on the playing field.

When we look at the direction in which the virtual camera is pointed in two-dimensional games, we can roughly distinguish between two positions: i.e. top-down and side view. In *Space War*, the direction from which the action is recorded is still impossible to make out. Needle and Wedge are perfectly symmetrical spaceships which can move in all directions and of course there is no absolute above or below in space. One of the first games to fix the player's viewpoint vis-à-vis the playing field was *Pong* {1972} which lays out a playing area like a Ping-Pong table seen from above in which the player has to handle a paddle to defend the area behind her which functions as a goal. Many early Atari games such as *Adventure*, *Combat*, and *Surround* would adopt *Pong's* top-down perspective which allowed to add a strategic dimension of evasion and seeking cover behind computer-generated obstacles. Later, top-down perspective would also become standard practice in what was arguably the first truly popular computer game genre, i.e. the shoot-'em-up. In shoot-'em-ups, which appeared on the scene in 1978 with *Space Invaders*, the player controls a laser canon or a spaceship which can move left and right – and later also forward and back – and which is to shoot down army after army of alien attackers in order to protect the world which lies behind it. Although strictly speaking *Space Invaders* employs a side perspective – as a player you control a laser cannon mounted on the earth's surface – the graphics are highly abstract and the impression is that of a moving spaceship in top-down perspective. In many later shoot-'em-ups such as *Galaxian* {Hurashi Nagumo 1979}, top-down perspective would be combined with vertical scrolling whereby the player is given a sense of moving forward and the camera is made to follow the spaceship.

Side view, whereby the camera is placed on the ground on a small distance from the object, also made its entry in the first half of the 1970s with the non-commercial mainframe game *Lunar Lander* {Jack Burness 1973}. In *Lunar Lander* or *Moonlander*, as it would also sometimes be called, the player is to descend and land a spaceship on a rocky and uneven moon surface. This surface is drawn at the bottom of the screen and the spaceship descends from the top left from where it is constantly being pulled downward by the moon's gravity. By turning around its axis and thrusting its engines, however, it is able to steer toward an appropriate landing spot. The aim of the game is to choose a landing spot – whereby the smaller and further away ones would yield higher scores – and land the ship at minimal speed without running out of fuel. Despite the success of *Lunar Lander*, which became a large hit in computer science departments all over the world, side-perspective was used only sparsely on the 1970s console game scene, *Circus Atari* {Mike Lorenzen 1978} and *Missile Command* {Dave Theurer 1980} being two notable exceptions. The game which can be seen to announce the upcoming popularity of side-perspective was *Pacman* {1980}, which is set in a maze viewed from above, but in which both Pacman and the spooks are drawn in side view. With *Donkey Kong*, which appeared one year later, side view was consolidated as the perspective of choice of what was arguably the second truly popular computer game genre: the platform game. In platform games like *Mario Bros*, the player controls a puppet seen from the side which is to collect objects by moving left and right and by jumping on platforms while avoiding guarding monsters. Contrary to shoot-'em-ups, the platform genre is associated with horizontal scrolling, mostly from left to right.[84]

[84] Why the popularity shift from top to side-view occurred is difficult to make out, but one important factor was the influence of the Japanese gaming industry which, with Manga tradition in the background, placed a lot more emphasis on character development than strategy. Side view allowed characters such as Mario to be drawn human-like rather than just as a square seen

Mobile Cams

In the early 1990s, as personal computers acquired an increasing amount of graphical processing power and real-time three-dimensional simulation came within reach, the question arose as to where to place the camera. Logically, in two-dimensional games, the camera position had always been either fixed or restricted to sideward action-tracking. If it had moved in any other direction, it would have exposed the two-dimensional nature of the depicted environment just like looking at a painting from the side exposes the artificiality of its representation. With real-time 3D, however, it became possible to introduce a truly mobile camera into simulated environments extending its grammar of rudimentary tracking and cutting with cinematographic techniques such as panning, zooming and tilting. Stephen Poole, for example, distinguishes a number of types of virtual camera standpoints that have become popular since then (2000: 79) such as a 'follow cam', which is often used in driving and flying simulators and in which the camera is fixed in a position behind and slightly above the vehicle controlled by the player. This is often combined with a possibility to switch to a 'cockpit cam' whereby the player takes a first person point of view and sits right at the vehicle's controls. A third camera position that is sometimes featured is that of an 'aerial cam' which looks down upon the ongoing action from great height and which can help to analyze the strategic position of the different units. The 'shoulder cam', finally, which became popular with Lara Croft in *Tomb Raider*, is one of the most dynamic instances of a simulated camera. It presents a third-person viewpoint, but not that of a neutral recording instance. Rather it simulates the role of a voyeuristic cameraman hired to capture that which happens in front of Lara, but who at the same time secretly enjoys looking at her shapely behind. Interestingly, Lara's face is hardly ever in the picture. It is only when she stands in a corner, her back to the wall, that the cameraman is forced to relinquish his interest in her pony tale and share a glimpse of her deep brown eyes.

---

from above. Later in the 1980s, side view would also allow the staging of martial arts, another important topic in Japanese popular culture at the time, in what could be seen as a third popular game genre: i.e. the beat-'em-up.

With the introduction of the mobile camera into computer game screenplay, an extra layer was added between player and virtual world and the power balance between representation and identification was shifted slightly. Film theorist Christian Metz (1982) observes that there are at least two processes of identification at work when watching a film. The primary, ongoing identification is that between viewer and camera whereby the former imagines and immediately forgets that she takes the position of a bystander, a third party quietly and passively yet knowingly registering what happens in the filmic universe. It is only in a secondary, intermittent process that the viewer identifies with the human actors that appear within her field of vision. Sacha Howells notes that, with the introduction of a simulated mobile camera, a similar, dualist form of identification makes its entry into the computer game narratological grammar. "While players control on-screen characters, they also control the camera, sometimes overtly, sometimes less so" (2002: 117). In strategy games, for example, the player moves across the playing map at her own will sending the camera back and forth while giving orders to her subjects. In action games, she controls the avatar and the camera becomes a robotic extension of her simulated self mediating between player and avatar and at the same time negotiating its position between virtual body and virtual environment. Again there are exceptions and cross-breeds however. One example of a strange mixture of avatarial introjection and camera identification is *Gabriel Knight III: Blood of the Sacred, Blood of the Damned* {Jane Jensen 1999}. In this three-dimensional point 'n' click adventure game, the player does not directly control Gabriel, the main protagonist, but looks around independently, instructing the virtual cameraman. When she has found an object worthy of Gabriel's interest, she can click on it and Gabriel walks over and examine it. Like in strategy, this technique tends to bestow a sense of ghostly presence upon the virtual environment. In *Gabriel Knight III*, you do not just control the camera and play the character Gabriel Knight. Rather you play the camera and Gabriel is some sort of an assistant to the director, a quiet, submissive partner in crime.

Embrace and Extend

To conclude this discussion of camera viewpoints in three-dimensional simulation, it should be noted that computer gaming has in the past few decades not just imitated or copied cinema's grammar of representation, but also played an important role in extending it. As computer processing grew increasingly powerful in the late 1980s and 1990s, more and more physical phenomena, or rather their effect on human perception, came within reach of algorithmic simulation. Seamless three-dimensional movement, texture-filling, shadows, reflections, the flickering of flames, the rippling of water and so forth were all captured and controlled within arrays of variables and algorithmic constructions. Interestingly, these mathematical techniques did not just reproduce the visual phenomenon, but at the same time presented a quantitative analysis of it, an interpretation composed of variables and dependent on human perception for its decoding. Changing these variables could be used to alter the circumstances in which the phenomenon would occur. Say, one variable could be defined to imitate the effect of wind on rippling water and incrementing it would cause it to form small waves. However, nothing prevented the programmers from going outside of the confines of the realistically possible. They were free to experiment with whatever variable they desired to alter or extend. In this way several effects were augmented to increase suspense, but in many cases, the effect was more than an increase or an augmentation. It became a reinterpretation of reality itself and our perception of it.

One example of this is the special effect generally referred to as 'bullet time', whereby the motion is slowed down to the extent that bullets can be seen floating in the air while the camera moves at regular speed, as if the whole scene were a three-dimensional still composed of slowly moving statues. With the development of virtual three-dimensional camera recording, programmers became aware of the fact that physical simulation and its representation could be processed by separate programs running independently. In other words, the simulation of movement in the virtual world did not necessarily need to coincide with the movement of the virtual camera. For example, a computer character performing a martial arts sequence could be put on hold in mid-air while the virtual camera program continued to calculate its movement around it. While all action in the simulated world had stopped, the recording would continue and the viewer would be able to explore the moment in time from different camera perspectives. In this way, an additional layer of abstraction was constructed between camera and virtual world. Just like, first with *Atari Football* and later with real-time three-dimensional simulation, the camera had been taken off its tripod and had started to move independently from its environment, it had now been cut loose from its very presence in *time* and could move independently not just in three, but in four dimensions. It acquired the ability to move independently from how time evolved in the simulated environment, freezing the moment as if it were a statue to explore from all sides. After the realization of this effect in computer-generated imaging, it made its way back to filmic special effects. In *The Matrix*, for example, Keanu Reeves' evasive movements were simultaneously filmed from all directions, after which the recorded images were imported into specialized computer software which combined them and filled in intermediary frames in order to imitate computer animation's independent camera movement. In this way, computer graphics ceased to just imitate its cinematographic master and started to feed it back with new ways of understanding and representing reality.

Concluding Remarks

To conclude this section on point of view, I would like to make two remarks about the analytical framework I have put forward. First of all, I have attempted to present a 'layered' analysis. I have tried to lay out three levels in the description of simulated point of view: i.e. the simulation of space, that of the player's role and that of the camera. Strictly speaking, however, this separation is a fallacy, an impossible dream and should be seen as a descriptive aid and not as a methodological axiom. In reality, the three levels are heavily intertwined, interdependent and in some cases indistinguishable. Two-dimensional computer games, for example do not just present a two-dimensional perspective or point of view upon a three-dimensional virtual reality. They *are* two-dimensional entities, not just perceptively, but also ontologically. Their variables only take into account two axes when calculating positions and their graphics are paper thin. Viewing an early version of Mario from the side would yield no more than a vertical line. Hence, speaking of a camera in two-dimensional virtual environments is highly problematic as it implies that there is a difference between the images the camera records and the events within the game world, that another way of recording had been possible. This is not the case however. In two-dimensional games, the images are the world and the world is the images. In fact, the three-layered setup which I have employed in my analysis is that of three-dimensional gaming, as it exists since the early 1990s, imposed also upon its two-dimensional predecessors. Possibly, in future forms of simulation, additional layers of abstraction will be put in place and the analytical levels will become four or five, straitjacketing not 2D, but also 3D gaming in the categories of that which came after it.

Finally, while I have presented my analysis as a comment and partial rejection of Neitzel's narratological framework, it should by no means be interpreted as a definitive reinterpretation. In fact, most analyses that exist in game studies today and on which this analysis is partly based are fragmentary and incidental rather than methodical, partial and incomplete rather than based on a scientifically delineated corpus. My analysis is no different in this respect and should therefore be seen as an extended illustration of my analytical framework and a plea for further research into computer games as a cultural form. Computer simulation has been developing since the 1960s and, in this process, it has developed its own way of looking at the world through an array of digital tools and techniques. These are not just objective strategies for dealing with the limitations and constraints of digital technology. They are reflections of the thoughts and ideas of the people who created them. They are witnesses of how they, as cultural beings, programmers and children of their time saw themselves and their place in reality. They are mirrors of their interests and preoccupations. It is based on these observations, that I would like to plead for a more continued and more methodical interest in computer simulation as a form of representation. Computer games are not just artifacts for creating pleasant experiences, they also present a partial attempt to make sense of the world by using a newly arrived form of information technology. Hence a systematic study of the object's intricacies could not just lead to more understanding of the object itself or digital culture as a whole. It could also shed light on how culture and technology interact in the creation of a (post-)modern world view and help to explain and illustrate how man sees his own place in such a world.

V

The Purpose of Play

Nothing reveals humanity so well as the games it plays.

David Hartley, *Observations on Man*, 1749

In "Hearts, Clubs, Diamonds, Spades: Players Who Suit Muds" (2001), an amusing and highly elucidating discussion of the types of players one finds in online multi-user dungeons (MUDs), Richard Bartle distinguishes between four chief motivations people cite for playing MUDs: achievement, exploration, socialization and imposition.

(1) Players citing *achievement* typically set themselves game-related goals such as the acquisition of virtual strength, currency, power or another signifier of success such as a high character level or numerical score. Once set, achievers work toward this goal directly and methodically allowing for as little distraction as possible. Making quick progress in the game is often only possible by vigorously chasing mobiles, computer characters roaming the virtual land, and by ac-

cumulating and selling large quantities of treasure and weapons. Other players may consider hours of running around, killing, looting and selling a tedious and sad occupation, but achievers do not. They focus on the higher goal and see everything else only as a means to work towards that goal. For them, playing is trying to win a competition, a way of measuring their performance and eventually proving that they are more successful than others.

(2) Players primarily interested in *exploration* do not attach themselves to any specific in-game objectives like achievers do, but rather take a meta-interest in the game. Whatever happens, whichever monster they kill or level they reach, to them, it is only a means towards *their* higher goal which is to better understand the MUD at hand, and, if possible, extract some knowledge about Multi-User Dungeons or fantasy fiction in general. When an explorer accesses a MUD, his primary aim is to find out as much as he can about the virtual world. Initially, this involves mapping the game's topology, exploring the MUD's breadth as Bartle calls it, and later advance to experimentating with its physics programming, explore its depth. Arguably, explorer-types are the more 'geeky' type of player, accessing the simulation not primarily for the reflections it generates nor for the competition, but for the system itself. They want to explore in order to understand in order to control the system and safely hide behind their understanding.[85]

(3) A third group of MUDders, the socializers, is not so much interested in winning or losing the game and neither do they want to understand its technical intricacies. Rather they access MUDs for the other players who are to them subjects to socialize with in an atmosphere of solidarity. The competition within the game world and the role-playing in the context of the virtual world's background story are to them only a pretext to converse and interact with their fellow players. Socializers are typically perceived as the more feminine type of player, cuddling together in safe havens to talk about the happenings in the virtual but equally often the real world. Whereas the other player-types regard the virtual as a means to escape reality and do things they are not allowed to or are not capable of in the real world, socializers want to do exactly as they do in real-

[85] Without much doubt, the present author would be classified as belonging to this second category.

ity: meet people and converse. MUDs are to them merely a way of diversifying partners and setting.

(4) The fourth and final category in Bartle's classification is that of *killers* who access MUDs in order to impose themselves on other players so that they attract their attention by annoying them. The easiest way to achieve this is to attack other players' avatars and kill them for no apparent reason. If killers have a general goal, it lies in the negative social sphere. With socializers, killers share the interest in other players whose attention they crave, and with achievers and explorers they share the fact that MUDs are an outlet, a way of escaping everyday reality and carry out certain acts that they are denied or disallowed in real life. Playing a game is to them a sort of blind revenge, the virtual carrying out of a judgment against the world. Again stereotypically speaking, killers are the more frustrated type of player who sees MUDs as a way to relieve that frustration, although this motivation is often implicit and unconscious. When asked about their playing style, killers more often than not simply put forward fun as an explanation of their behavior.

Bartle's aim in categorizing players is not just to provide helpful denominations, but also to help administrators of MUDs to understand and guide the unfolding dynamics when large numbers of players with different motivations access their virtual world. Important thereby are not just the actions by one group within the game, but also the way in which they regard the other groups and their actions. If Bartle's primary categorization sounds familiar and at least faintly recalls real-world intuitions about categorizing people, his account of their mutual opinions about one another does even more so.[86] *Achievers* tend to

[86] Significantly Bartle's classification of players into explorers, socializers and achievers is reflected in empirical studies of players' motivations and choice of games. Vorderer, Hartmann and Klimmt (2003), for example, make a distinction between players according to their 'social value orientation' which can be individualistic, cooperative or competitive. An individualistic orientation reflects a tendency to maximize one's own benefits (ego=max) which corresponds to the explorer's personal interest in mastering the simulation. A cooperative orientation means that the person cares about one's own as well as the benefits of others (ego + other = max) which can be found in the socializer's desire to be part of a group. A competitive orientation, finally, means that you attempt to maximize your own benefits in relation to those obtained by others (ego - other = max). This orientation is reflected in the achiever's desire to beat all competition, preferably by a large sum. In their analysis, Vorderer, Hartmann and Klimmt do not point to any orientation which could correspond to Bartle's killers. This may be due, however, to the fact that their research was largely based on single-player games and that, to a killer, imposing

regard other achievers as competition to be beaten and as one of the principal factors in making the MUD interesting. Other, more successful achievers are treated with respect, not disdain and their success is a motivation for attempting to achieve even more, not for trying to kill them or turn away from the game. Typically, losing achievers will cite bad luck or lack of time as reasons for not being as far advanced as others. Achievers generally regard explorers as losers, players who have resorted to tinkering with the game mechanics because they cannot cut it as a regular player. Exceptionally skilled explorers may be elevated to the level of eccentric: what they do is pointless but knowledge of how they do it may come in useful for furthering the achiever's own cause. Socializers are seen as a source of information by achievers but are otherwise uninteresting. Bartle reports that, occasionally, so-called flame wars break out between socializers and achievers and that these can be highly persistent as "achievers don't want to lose the argument, and the socialisers don't want to stop talking!" Killers, finally, are feared by achievers, who like to fight, but only when they are more or less certain from the outset that they will win. Killers are usually highly trained in what they do. Hence achievers try to avoid them.

Explorers see other explorers as like-minded individuals who are also on a quest to understand and control the virtual universe. What actually happens in the universe is largely uninteresting but how it came about is all the more. Like in other online communities such as the open source movement, knowledge about the simulation is freely shared among the explorer-population and is used as a measure against which to compare one's own understanding. Reputation is not built on power or social status, but on the knowledge you are willing to share. Explorers see achievers as nascent explorers who have not yet realized that scratching the surface of a simulation for days or weeks in order to earn points or character levels is a meaningless strategy in the long run. Explorers believe that, eventually, achievers will come to realize that the game itself is only a series of states in a finite state machine and that it is the machine one should attempt to master, not the states. Explorers consider socializers as people whom they can impress and who can help them in establishing a reputation, but

upon a computer character is not nearly as satisfying as annoying a human player.

who are otherwise uninteresting. If they do not appreciate the explorer's talents and understanding, they are not really worth spending time with. Killers, finally, are equally uninteresting. Since explorers are not really interested in the game events themselves, but rather in the simulation generating them, they do not particularly care if they are attacked and will only truly defend themselves when they can experiment with or demonstrate some kind of new hack they recently discovered.

Socializers visit MUDs to meet other socializers and socialize. Whilst wandering about in the virtual environment, their main aim is to meet the characters of people they know or people they can get to know and have a chat. Without other members of their own kind, they will quickly relinquish interest in the MUD and go some place else. Socializers like achievers, not so much as persons but as subjects of conversation. The competition between the achievers within the virtual world forms a continuous soap opera which the socializers can use to open up or sustain conversation. Significantly, they do not particularly enjoy talking *to* achievers as the latter usually has no time for conversation and will quickly move on to achieve more; they do, however, enjoy talking *about* them. Bartle notes that a "cynic might suggest that the relationship between socialisers and achievers is similar to that between women and men..." (2001). Socializers generally regard explorers as sad characters who are desperately in need of a life. Both groups enjoy talking, but not about the same subjects, and when they do talk, the explorer usually tries to impress the socializer with his knowledge and the socializer has nothing better to do at the time. The most problematic relation between player types is that between socializers and killers for whom they bear a deep hatred. What socializers seek in the online environment is a sense of togetherness and when a killer goes after them and removes their character from the MUD for no apparent reason, their anger usually knows no bounds.

Killers, finally, avoid their own kind, except in organized challenges. They do not have a particular aim to strive for or to compete for with other killers. Their enjoyment in attacking other players is of an ad hoc nature rather than part of a competitive scheme. Hence they maintain an implicit agreement to leave one another alone so that neither risks their reputation. More or less the same goes for explorers, whom killers similarly tend to leave alone. Not only are explorers often formidable fighters with many obscure, unexpected tactics at their disposal, they also often do not care when they are attacked and killed, which is most killers' primary aim in attacking in the first place. Achievers, on the other hand, are seen by killers as their natural prey. They have advanced personae with high character levels and powerful weapons, yet they are generally not as specialized in fighting as killers are because they acquired their skills by spending large amounts of time killing computer characters and collecting loot. Also, achievers hate being attacked as it diverts them from their grand scheme which is to beat other achievers at achieving. In some cases, the achiever may become so annoyed by getting killed that he makes revenge his next character's life pursuit and relentlessly devotes himself to hunting the hunter and destroy his reputation. Finally, the grudge born by socializers against killers is happily returned by the latter. Generally, killers "go out of their way to rid MUDs of namby-pamby socialisers who wouldn't know a weapon if one came up and hit them (an activity that killers are only too happy to demonstrate), and they will generally hassle socialisers at every opportunity simply because it's so easy to get them annoyed" (Bartle 2001).

One important question Bartle leaves blank, however, does not deal with that which separates achievers, explorers, socializers and killers, but with that which brings them together. Why do people with motivations as diverse as being regarded as successful, mastering the system, meeting new people, and annoying them, decide to connect to one and the same virtual world and engage in pretense play? What is it that binds male and female, young and old, highly educated and less so, to be attracted to something that at the same time imitates and distorts parts of the world surrounding them? What is their common ground for wanting to participate in a competition in the guise of another, virtual character? Why is it that they desire to be immersed in their imagination, escape to a different reality and imagine themselves and others performing actions staging some sort of second life? Why is it that people like to play? In this last chapter of my study of the cultural implications of computer simulation and games, I formulate a tentative answer to this question. Of course, research into the concept and forms of play is not new and predates the appearance of computer games by at least half a century. Therefore I start my discussion by looking at how a number of psychologists describe play as a means for the child or the grown-up to cope and come to terms with reality. By accessing a mental realm evoked through representation or daydreaming, man unconsciously seeks to create a reality of his own making where he can explore emotional bottlenecks and act out that which is denied to him in real life. In the second, final section, I attempt to link this idea of coping to my main claim that computer simulation is a cultural form reflecting ideas and preoccupations of the society in which it functions and claim that computer games can be seen at least partly as a way of coping with the system-oriented, competitive society in which we live today.

1. Playing as Coping with Reality

The concept of 'play' carries a long and complex history with different interpretations across time periods and cultures. The way in which we, today, in our Western society, understand what it is to play, goes back at least to some four centuries before the beginning of our time-reckoning. In the second book of *The Laws* (c. 360 BC), Plato describes a dialog between Cleinias and an anonymous Athenian who describes the notion of 'playfulness' as that "which is neither useful, truthful or representative, nor harmful, but which exists only for the pleasure it affords." 'Play' is a label assigned to those activities we perform automatically for the pleasure they provide, but which do not serve any external purpose, or do any harm. This notion of 'play' as something trivial but harmless became dominant in later philosophical thought and nested itself in most Western European languages as its prototypical meaning. When we look at the characteristics of play provided by Roger Caillois (1958: 9), for example, we note that they almost without exception refer to the fact that play is intrinsically motivated, autopoietic (self-generating) and autotelic (self-motivating), and that it does not serve any direct real-world cause. For Caillois, 'play' is an activity which is essentially free (not obligatory), separate (limited in space and time), uncertain (variable, with unknown outcome), unproductive (creating neither goods nor wealth), governed by rules (conventions temporarily replacing ordinary law) and make-believe (accompanied by an acute awareness of a second reality different from real life).

However, despite our intuitions regarding what it is 'to play' and what it is not, and a vague idea of why that is so, it seems impossible to formulate a definition covering all of its everyday uses. In his *Philosophical Investigations* (1953), Ludwig Wittgenstein notes that a definition of 'play' based on any of its characteristics is bound to either exclude playful activities by being too specific or include non-playful ones by being too general (65). Whether we base our definition on the notion of 'amusement', 'competition' or 'rules', there will always be games that are outside of its scope. Whereas earlier philosophers, leading all the way back to Plato, believed in the possibility of uncovering an essence of every object and idea in existence, Wittgenstein notes that it is impossible to give a final and essential definition of what is a game and what is not. It is impossible to discover any one or a number of characteristics which separate a playful from a non-playful activity, and what is even more notable is that apparently we do not need such a definition in order to use the notion correctly. Our intuitions function regardless. Wittgenstein proposes the idea of 'family resemblance' as a more suitable framework for semantic description than the idea of a definition based on sufficient and necessary conditions. Language is a dynamic system for attributing meaning to the world and conceptual definitions are forms which emerge from the society and culture in which they function. Rather than seeing language as an essential pre-given, it should be seen as a complex network of similarities, overlapping and criss-crossing (66).

CULTURAL SELECTION

Whilst Wittgenstein set out to find a definition of 'play' as a way of describing the functioning of language and the generation of meaning, some play theorists have taken his observations in a different direction and have seen in the multitude of types of play one of its fundamental characteristics. In his influential meta-study, *The Ambiguity of Play* (1997), Brian Sutton-Smith notes that "[i]n looking for what is common to child and adult forms of play, to animal and human forms, to dreams, daydreams, play, games, sports and festivals, it is not hard to reach the conclusion that what they have in common, even cross-culturally, is their amazing diversity and variability" (221). But what could be the purpose of a mechanism generating different types of behavior without an obvious, direct goal? Why is it that a small minority of species – mammals, birds, and a few fish and reptiles – engage in seemingly useless activity for which they devise complex codes both for prompting and entertaining the behavior? As a thought experiment, Sutton-Smith proposes to explore the idea that play as a mechanism for generating variable behavior is in some way linked to natural variation and selection. In Darwinian terms, natural selection refers to the mechanism generating changes in gene frequencies due to the different ability of organisms to survive and reproduce in a specific environment. Because some organisms are better adapted to specific circumstances or – for the purpose of this thought experiment more significant – are able to deal with a broader range of circumstances, natural selection results in an unequal rate of survival and reproduction among the various genotypes present in a species population. According to Darwinism, natural selection, acting on the genetic variations produced by mutation, is the most important force inducing evolutionary change.

Sutton-Smith's suggestion now is that an organism's ability to display different types of behavior in different situations is an important factor in its adaptability and that play should be seen as a mechanism functioning as a device for generating 'behavioral mutation'. Typically, play is a way of organizing virtual interaction with specific aspects of one's environment in order to learn about them, and to try and single out the most interesting and profitable strategies available in various circumstances. It is a way of dealing with one's environment without the danger of causing irreversible changes. Starting a game is creating a safe environment, stepping into it and taking with you only those aspects of reality which you need and leaving behind everything that could cloud your judgment or hamper your imagination in any other way. Within this environment, a problem is virtually staged and the player is free to explore its intricacies, experiment with different strategies of solving it, roll-back the virtual world when the imaginary result is unsatisfactory, and try out a different strategy. In this way, variations are generated, explored and selected, which may later serve in dealing with the actual world. Hence, it is precisely the aimlessness and seeming unproductiveness which provides playful behavior with the freedom and detachment needed to generate satisfactory solutions to complex problems. According to Sutton-Smith, play can hence be seen as a model of natural selection processes, a cultural counterpart of the crude and cruel mechanism of genetic variation and selection (229). It could even be argued that play in its broadest sense lies at the very basis of cultural development (cf. Huizinga 1939), driving man to generate theories about the world and producing codes such as language and various forms of representation for sharing that knowledge.

REHEARSAL AND NEGOTIATION

The idea that play creates a neutral ground where the individual can learn to deal with reality is not new. Around the turn of the nineteenth century, philosopher and psychologist Karl Groos observed that playful behavior has an important role in the development and training of skills both in young animals and children. In the early stages of animal development, game play is focused on motor skills and the exploration of the environment. At a certain age, this type of play begins to exhibit more and more elements of adult behavior. Whereas earlier play was ad hoc and directionless, now it is developed as variations on the themes of hunting and fighting, rivalry and cooperation. A well-known example is the chasing games young dogs play together. When two dogs meet, they familiarize with one another until one of them prompts the idea of playing, usually by making a series of overenthusiastic, evasive movements, flattening his ears while focusing his eyes on those of the other dog. If the latter accepts to take part in the game, he in turn makes a number of these movements after which the game can commence, usually consisting of running after one another and pretense fighting with lots of noise and great waste of power and energy. In a similar way, many games children play, not just in sensorimotor, but also competitive and role-play can be linked with activities which they will be needing in their later life. Themes like playing house, construction, hide and seek, soldier and even more abstract sports like football/soccer and racing (chase) or tennis (defense), but also hobbies like collecting stamps (gathering) can be related to skills adults, at least in the past, needed to provide for their family and fill in the role they were expected to play in later life.

When looking at the possible explanations for the existence of playful behavior, there is, apart from the functionalist, evolutionary hypothesis of 'play as rehearsal' also a more psychoanalytical theory of 'play as negotiation' between self and world. Around 350 BC, Aristotle wrote in his *Poetics* (VI) that a proper tragedy should not just be a staging of a significant, serious and complete event, presented in poetic language, but that it should also aim to stir an emotional response in the viewer and cleanse her of negative emotions. By staging violent action, the spectator will experience fear, and by staging characters who suffer a terrible fate, she will experience pity. This confronts her with her own 'condition humaine', the anxiety and pain of being mortal, ultimately alone and unable to control her own existence. The identification with a tragic character stirs strong aversive and empathic emotions, but it also brings a certain peace. Her own fate and finiteness takes on a more definite shape and become less threatening. At the end of the play, when she returns to her everyday life and is again confronted with her own day to day problems, the recent experience of the possibility of a far worse destiny makes her aware of their relativity and effect a release of emotional tension, a so-called *cathartic* response. By engaging the viewer in fictitious aversion and grief, she is delivered from these emotions in real life; she can find peace with her own role in reality and her appetite for life can be reinforced.

Aristotle's idea of emotional cleansing inspired Sigmund Freud in his 1908 essay "Der Dichter und das Phantasieren" ("The poet and his fantasy") to formulate his catharsis hypothesis for fiction and play, stating that fantasy functions as a valve for the release of emotional tension. The central idea of the psychoanalytic theory of play (cf. also Waelder 1933) is the assumption that it allows for the creation of an alternate reality, which, unlike physical and social reality, allows the child to deal with problems with which it cannot deal in the actual world. Play provides a way of escaping the harsh restrictions of the reality principle and find refuge in the safe and controllable realm of an imagined parareality where she can freely act out forbidden fantasies and aggressive impulses. In this way, the child can learn to cope with reality and emotionally compensate problems, unfulfillable desires and social pressure. By repeated indulgence in playful behavior representing forbidden impulses or past problems, the child's negative feelings become more definite and less threatening and her fears and anxieties towards them diminish. As in psychotherapy, where patients are asked to give expression to their deepest emotions so as to relive traumatic events and learn to cope with them, play allows children to explore and negotiate between their 'other' self and the laws of reality.

WIELDING THE WORLD

In "Spiel als Lebensbewältigung," ("Play as Coping with Life", 2000), developmental psychologist Rolf Oerter presents a theory of play based on earlier work by Sigmund Freud, Lev Vygotsky and Jean Piaget. He describes play as a means for the child to effect the 'Bewältigung' of reality, a notion that is difficult to translate into English without losing an important part of its meaning. 'Bewältigung', which is related to German 'walten' (to reign) and to English 'to wield' covers at the same time the idea of 'dealing with' as learning to control, and 'coping with' as learning to accept. Hence it is highly suited for the description of the process of negotiation which alternately involves learning about reality so as to be able to control it, and adjusting expectations so as to learn to accept the limitations of being in the world and not be paralyzed by them. Play as a cognitive and social tool allows the child to generate an alternate reality, an 'air lock' between its own fantasies and the harsh reality of the world in which it is still unable to fulfill its desires and wishes. The child can introduce its own interpretation of reality and explore it on its own terms. In the world of play, piloting airplanes does not require any knowledge about aerodynamics or flight panels while it does permit to explore the idea of leaving the ground, of flying through clouds or of discovering far-away continents. Moreover, it allows the child temporarily *to be* a pilot and try to feel what that would be like. It helps the child to satiate its desire to take its place in the world and responds to its claims on reality. Play is the learning area par excellence, a place where the child is free to develop its skills and explore its fears, anxieties and desires.

Early child play is concerned with the gaining of control over their environment.[87] When a toddler has discovered the link between cause and effect, between his or her own actions and the results they yield, he will repeat these actions again and again, enjoying the recognition and control he or she can exert over the repetitive movement. This type of play is generally referred to as *mastery play* because of the importance for the child to feel in control over action and effect. It can also be seen as the first example of a 'flow experience' which Csikszentmihalyi (1997) describes as a state in which important achievement is combined with a feeling of ease and control, the seeming disappearance of effort and difficulty (Oerter 2000: 49). Similarly, simple motoric play such as the continuous turning over of the child is also a way of learning to deal with their environment as they will enjoy the successful movement and the control they can exert over his own body in the same way that the smaller child enjoys the experience of an effect caused by their own actions (50). Thirdly, playing with amorphous materials such as sand and water is a way of exploring the interface between self and environment, the observation that oneself is part of physical reality. The enjoyment the child experiences when they are handling these substances is directly related to the experience of being in a close relation to their surroundings. Water allows the hand and body to be completely immersed. Sand and clay show more resistance, but allow to be kneaded and molded into various shapes. The more the child is interested in forming and shaping when dealing with these materials, the more important the moment of control over their environment becomes, expressing the desire to change their environment after their own image and likeness (Ibid.).

LET'S PRETEND...

In kindergarten and early primary school, different forms of pretense play move to the foreground. In pretense play – also referred to as fantasy, pretense or 'as if' play – the actual world is reshaped so that it corresponds more to the desires and wishes of the child. Objects, other players, actions and places now all ac-

[87] Since 1966, when Mark Rosenzweig discovered that rats growing up in a visually enriched environment which stimulates playful behavior, develop a larger and heavier cerebral cortex, the interest in the earliest stages of child education grown significantly (Papoušek et al. 2000: 21).

quire meanings as if they were something else. The table and cloth become the roof and walls of a school, teddy bear and little brother become schoolchildren and the older child their teacher. When the telephone rings in the living room, the school bell rings and the children go to class where they are handed invisible test papers and given tasks. Significantly, in this type of play, the objects and actions themselves are not the primary focus of the game, but rather what they represent. Table, teddy bear, little brother and bag are part of the game, but at the same time they are not. In pretense play, the actual objects used for the game are no more than props, sometimes also functioning as prompters of the fantasy, as the telephone example suggests. What the child is aiming to cope with is not its direct environment, but their own interiorized experiences and preoccupations. Hence, pretense play is highly imitative, often consisting of scenes depicting experiences which the child leading the game recently came across, reflecting their interpretation of the situation and using them to generate variations based on circumstantial inspiration.

Like mastery play, pretense play reflects the child's desire to exert control over and lay claim on reality, and increasingly they will also become an expression of their desire to be grown-up. Boys will imagine they are driving a car or handling an excavator; girls will care for their puppets, but also reproach and punish them; and both genders will imagine they construct their own house (Oerter 2000: 50). An important theme in play will also be to create a separation between the world of play and the immediate environment. Children will hide away in a corner, behind the sofa or under the table, imagining they are living in a house or traveling alone on a ship. Both the tendency toward active control and power acquisition and the theme of separation and aloneness are ways for the child to experience their own identity and individuality (51). Furthermore, as play becomes a site for negotiation between desired and actual reality, it also increasingly functions as a means of coping with traumatic experiences such as illness or punishment. These experiences will be incorporated in play and reshaped according to the child's desires and goals. By regenerating reality in such a way and by repeating the painful scene, this time with a happy ending, the trauma becomes less painful and easier to deal with psychologically. One horrifying, yet at the same time enlightening example of the role of play in coping with reality is that given by Opie and Opie (1969: 331). During the Second World War, children in Auschwitz, who had begun to realize what happened in the camp and what their own fate would probably turn out to be, are reported to have played a game called 'Going to the Gas Chamber' in an attempt to cope with their ordeal (1969: 331).

Oerter also notes that playing behavior, particularly pretense play, does not disappear when humans reach adulthood. First of all, it can be argued that the development of play continues into activities we increasingly designate as work. As long as work is at the same time play it conserves its positive characteristics: it will not only save energy and help to avoid stress, it will also make the occupation meaningful and instill a feeling of control over the activity and life in general (54). Secondly, like Kendall Walton (see chapter 3 on mimesis), Oerter sees the practice of art creation and reception as a transformation of the play dynamic with the aim of coping with life as a common interpretive background. From the earliest examples of cave drawings, the desire to create representations has been first and foremost a way of coping with the difficulties and anxieties of everyday existence (53). By interpreting reality and committing this interpretation to a form of representation such as language or pictorial art, it can not only be used as study material or as a way of sharing knowledge, it will also integrate understanding and help to cope with reality. Thirdly and finally, Oerter notes that the appearance of religious practices can, at least from a scientific point of view, be attributed to man's attempt to cope with the knowledge of future death. Like children's play, religion creates a second, alternate reality in which man is able to attribute meaning to his life and thus cope with the knowledge that one day they will no longer be here (53).[88]

[88] As an afterthought to his discussion of religion as a continuation of the practice of play, Oerter observes that, whereas children are generally able to make a clear distinction between actual and played reality, adults often less so. The growing religious fundamentalism, for example, can be interpreted as an attempt to impose religious principles upon socio-cultural reality. This is, according to Oerter, an area in which adults can learn from children (54).

2. Gaming as Coping with Competition

In *Man, Play and Games* (1958), Roger Caillois makes a distinction between two types of play which he sees as extremes on a continuous scale rather than a discrete oppositional pair. On one side, there is the notion of 'paidia', which is best translated into English as 'play' or 'playfulness' and which refers to "an almost indivisible principle, common to diversion, turbulence, free improvisation, and carefree gaiety" (13). At the opposite extreme, there is the principle of 'ludus', best translated as 'game' or 'gaming principle', referring to the rule-based nature of institutionalized games which bind playfulness with "arbitrary, imperative, and purposely tedious conventions" (Ibid.). At first sight, the principle of ludus is impractical and even seems to obstruct the more general principle of playful paidia. This is not entirely true however. By arbitrating competition, rule-based ludus plays an important role in the generation and maintenance of conflictual tension guaranteeing each playing party its rightful place within the realm of the game. In this section, I explore the idea that game rules serve as a means for the creation of a para-reality in which the player can come to terms with the increasing competition in everyday life. First, I look at the principle of conflict and how it manifests itself in game play. Then I analyze game reality as a place which serves as a refuge from the competitiveness of the real, but at the same time presents a safe, controlled environment for exploring it. Finally, I briefly return to the main thesis of this study and assert that computer games are a cultural form and can be seen as a response to our twenty-first century competitive society.

Narrative Conflict

In his *Cours de la Linguistique Générale*, published posthumously in 1916, Swiss linguist Ferdinand de Saussure presents a general theory of representation as a system of oppositions. Whereas earlier research in linguistics and the cultural sciences had focused on the description of language as it occurs in actual use, such as in poetry or prose, Saussure proposes a radical departure from this approach. To him, language is not primarily a historically grown body of loosely connected elements, but surface manifestations of a deeper structure, which he compares to a game of chess, a system at all time functioning as the reference point both in the production of signs and the attribution of meaning, a structure of inseparable tokens and semantic values, signifiers and signifieds, a cultural device at the same time differentiating between various aspects of reality and supplying the representative forms for communicating them. By looking at the deeper oppositional structure which various sign systems project upon the world and upon their representational form, the observer can describe how this meta-system permits its users to analyze and make sense of the world. For Saussure, there is no objective reality in representation, only a structural interface between man and world, a system of functional distinctions in an otherwise continuous, chaotic and possibly inapprehensible reality. Representation is never neutral, it is always based on a deeper, cultural construct, carving out a specific problematics by opposing it to similar notions, projecting a raster of distinctions upon the world.

Inspired by Saussure's work in linguistics, that of Claude Lévi-Strauss in anthropology and that of Vladimir Propp on folk tales, narratologist Algirdas Greimas proposes in his *Sémantique Structurale* (1966) to analyze narrative as a macroscopic sign system based on semantic oppositions. Following the structuralist axiom that representation is based on signs and that signs are arbitrary, existing only in relation to other signs, Greimas postulates that there must be a deep structure common to all forms of storytelling and that, like microscopic semantic elements such as words, this structure must derive its meaning from an internal system of oppositions rather than from any external pattern. Moreover these oppositions are not situated on the surface-level of the representation, but rather function between deeper, structural slots. Hence Greimas makes a radical distinction between actors, characters in a story, say Sherlock Holmes and Watson, and actants, structural roles which make out the basic semantic system of storytelling. These actants function on two axes, the axis of desire and that of opposition. Essentially, every story presents a subject, say a prince, who desires an object, say a princess, but the situation obstructs instant gratification, say the princess has been kidnapped by an evil knight. In other words, an obstacle has arisen on the axis of desire. In order to overcome this obstacle, the subject must engage the oppositional axis and defy his antagonist actant, attack the evil knight and deliver the princess for example. Of course my mini-story is a simplified example. In most cases, both the axis of desire and that of opposition feature subplots and deal with preliminary objects of desire, say a magic sword to fight the evil knight and helper actants, say a wizard who reveals the way to the sword. All this is of lesser importance however. The point I wish to make is that opposition and conflict lie at the very basis of how we interpret and represent the world. By distinguishing not just between categories of objects, but also between oppositional roles, we negotiate our position vis-à-vis reality.

LUDIC CONFLICT

Like narrative, game play can be described as an internal system of oppositions generating conflict and suspense. This oppositional system can then in turn be seen as the main ground for game play's intrinsic motivation, the fact that it does not need to serve any external goal to be meaningful to the player. In associative play, paidia rather than ludus, the oppositions drawn within the game world are not fixed. Rather, it is the very creation and exploration of differences between objects and strategies which makes game play worthwhile. A child playing in a sandbox, for example, may see a bucket prompting the desire to build a sandcastle by filling it and turning it over. This may trigger a medieval theme turning the shovel into a knight riding toward the castle. He is attacked by a rake and a pick, or rather two bandits waiting for him in the thicket. The shovel, that is the knight, is very brave, however, draws his magical sword, kills the brigands but then collapses on the road due to blood loss where he is found by... the bucket, the beautiful princess who will have him transported to the castle and who will mend his wounds. As children are playing, new themes and ideas emerge from the playing activity and by steering their imaginary construction toward the fulfillment of their desire, game play allows the child to explore various facets of being and to cope with elements of fear and desire. By generating oppositions, between the heroic knight and the thieves, for example, but also between prince and princess, children create different actants out of their imagination, whose interaction, sword-fighting and falling in love can then be staged and acted out. When the child has made enough castles, fought enough battles, and has fallen in love with enough princesses, they will be satisfied and move on to a different type of game.

In fixed, rule-governed, competitive gaming, ludus rather than paidia, in sports or board games for example, the oppositional structure is even more obvious. At the beginning of the game a number of actants are introduced, the main competitors usually being human players, but sometimes also game- or computer-generated characters. Apart from these main actants, a number of 'subplot-level' actants will enter the game, heaps of cards, pieces, a ball etc. often representing imaginary objects which will feature in the creation of preliminary goals. In ludic play, the attainment of various goal-states is not a matter of free imagining or association as in paidia, but is determined by a rigid set of rules. Essentially, playing a competitive game involves jointly generating an initial state (dealing cards, organizing a board), determining a final state (winning a number of tricks, reaching a specific square on the board) and agreeing upon a number of rules to move from one state to the next. Significantly, the goal state will differ from one actant to the next relative to their own role in the game. In other words, each player will want to see his own introjected self in the winning position when the final state is reached. The dynamics unfolding due to the continuous interaction between actants working toward their own goal state is essentially competitive game play. Eventually, a final state will be reached, usually because one actant has reached his goal state. The game ends, a winner is nominated and a new game can be initialized with more or less the same (chess) or a different initial state (card game), a new opponent (tournament) or a different goal state.[89]

Like narrative representation, the essential layout of both paidia and ludus can be fitted into Greimas' actant scheme working on an axis of desire and one of opposition. In paidiic associative play, desires and oppositional instances are continuously regenerated, changing course as the interests of the players evolve. In rule-governed, competitive play, desires are translated into goal states, op-

[89] In a sense, my argument is circular. I started with de Sausure's observation that representation functions like a game to arrive at the claim that games are a form of representation. This does not undermine my main argument however, which is that opposition as a cognitive strategy lies at the basis of both.

position into competition and play into rule-governed, conventional changing of game states. In essence, however, it is the same oppositional scheme that buttresses both narrative and play. It is the same interpretative structure projected upon an imaginary setting which generates suspense by making the outcome of the conflict uncertain and by promising to resolve it. As argued in the previous chapter, the main difference between narrative and play is the role of the receiver in his own or a collective imagining. Whereas narrative conflict is a product of objective imagining, evoking a fictional world and presenting it to a reader or viewer in a sort of third-person outside perspective, ludic conflict allows for the introjection of the receiver who automatically becomes a player in her own subjective imagining. Whereas narrative conflict, by being materially fixed or static, allows for the generation of highly complex and refined conflict resolutions, game play draws the player into its configuration and gives her a crude and unambiguous role not so much aiming for refinement and understanding than for pure imagination and arousal.[90]

In conclusion, it is important to note that ludic and narrative conflict are not mutually exclusive and that there are cultural forms in which they reinforce one another. In most games, for example, be they board, book or computer, an imaginary setting is introduced by some form of background story in which different actants are presented, including the player's role, and their various goals are explained. In this way, the introjection of the player into the fictional environment is prepared and guided, allowing her to identify with her in-game identity even before the initial state has been set. Hence one could say, that in these games, narrative conflict functions as a catalyzer to the ludic conflict, not really changing the process of identification, but accelerating it. In a similar way, ludic conflict may be used to reinforce narrative conflict. In a whodunit novel or television series, for example, at the beginning of an episode, a murder takes place.

[90] Again, it should be noted that narrative and ludic conflict are deep-structural patterns, not discursive or thematic elements. If one were to write an engaging story or create a game about, say, giving flowers, they would still be intrinsically motivated by opposition. The story could deal with the question of whom to give flowers to and whom not and the game could be set on Saint Valentine's Day on which, as a player, you have to give flowers to as many girls as possible. The essential structure would always be one of opposition however. In the story it would be about differentiating between people and in the game it would be about determining one's own position vis-à-vis other contestants, playfully exploring the fantasy of wooing all the girls.

After that, the main protagonist, usually a detective or police officer, is introduced, who will attempt to solve the mystery. In the course of the investigation the actant determines various subgoals (forensic examinations, witness interrogation, etc.), gathers clues and eventually puts the puzzle together and unveils the perpetrator. This story, driven by the narrative opposition between protagonist and killer, would not nearly be as engaging, however, if it were not for the ludic conflict supporting it. Central to a typical whodunit is that the reader or spectator does not know who is the perpetrator until the end of the episode and that she can follow the main protagonist in his effort to find him. In this way, implicitly, a whodunit organizes a challenge for the receiver to find out before the detective does, a competition which is not set between narrative actants, but between story and receiver catalyzing narrative suspense.

The Perfect Mirror

Initially developed for the Manhattan Project as a device for calculating the impact of atomic bombardments, the digital computer is essentially a giant calculator, an extremely fast and powerful electronic switch capable of instantly addressing millions of memory spaces, jumping between any of a finite number of different states. As such, a computer is the oppositional machine par excellence. Also during the Second World War, the danger of the enemy intercepting radio transmissions between troops drove both sides to develop ever more complex forms of cryptography, methods for code translation and ways of breaking the enemy's schemes. Increasingly complex algorithms were developed for masking information until it could no longer be processed by pen and paper and machines were built to take over the tedious yet work-intensive task of translating symbols from one form into the next. This made researchers realize that state machines could do much more than just manipulate numbers. Any kind of information that is quantifiable or that can be represented in symbols can be stored and processed by a computing device when it is powerful enough. In a sense, the computer is the ultimate affirmation of Saussure's claim that representation functions through opposition, that any piece of information can be understood as a series of discrete signs deriving their status and meaning from a process of differentiation. To explain his theory of language, Saussure used the metaphor of a game of chess referring to the fact that each piece derives its value from the position of all other pieces rather than from any intrinsic quality. In a sense, the computer is an electronic reconstruction of that metaphor, a giant switchboard filled with pieces which are able to take two positions: zero and one.

As discussed in the second chapter, being a discrete state machine, a computer is highly suited for the representation of discrete phenomena yet much less so for that of continuous processes. As in chess, in order to move from one state to the next, the computer uses instructions describing which pieces may move and which may not. These instructions are strictly rule-based. They determine exactly which values may change and which may not. There is no room for vagueness. Either it is zero or it is one. There is no in-between. The reason that computers have come nowhere near passing the Turing Test is not due to lack of power or speed, but rather to their strict rule-based character. When people are having a conversation, they do not follow a finite set of rules. Rather they move from one subject to the next, following a loose associative scheme based on personal interest, a current preoccupation and the anticipation of the conversation partner's reactions. A computer is extremely bad at anything loose and associative. The only way for a state machine to achieve anything like continuity is to mimic it, to change states at such short intervals that these intervals become imperceivable or acceptably small for the purpose of the simulation. This is one of the main reasons why computer games are so little associative in their basic design, integrating only sparse paidiic elements in an environment determined by ludus.

In his groundbreaking 1991 essay "Play It Again, Pac-Man," Charles Bernstein argues that, from the start, man has been afraid that computers may one day become superior to him, that he will be made irrelevant by his own creation's incontestable logic. A computer never makes mistakes. Unlike man, in the logical realm, it is fast, powerful and precise. Moreover, being a perfect machine, it can never be held accountable when something goes wrong. When a bug surfaces or the system stalls, the computer cannot be held responsible. It only carries out instructions so the breakage must be due to human error on some level. Even worse, when something goes wrong, this will be another occasion on which the computer can show man how imperfect he is, how he will never be able to master logic like the computer does. Hence, the relation between man and computer has, from the beginning, been determined by anxiety and suspicion. Suspicion towards the fact that a computer can perform calculations which man cannot and anxiety for the fact that a day might come when computers will no longer need any operators or programmers, when they will be able to program themselves, making abstraction of any particular human needs, erasing man's current privileged position in the world. These fears have created an adamant human desire to control the system, to penetrate its core and reprogram it from the inside. Computer games are a way of coping with this desire, a way of staging a symbolic battle between man and machine, of acting out the most symbolic struggle of all, that between a creator and his prodigy.

Mastering the Matrix

Somewhat paradoxically, however, one of the main attractions of computer simulation, both in a scientific and an entertainment context is their promise of being controllable, of being based on principles that are clear and unambiguous. Because of its discrete, mathematical nature, computer programming must deal with explicit, quantitative rules describing every aspect of a virtual environment. When some particular element has not been programmed, say air and respiration, it does not exist within the simulation. And when it has been programmed, it is based on sound mathematical principle. All variables are there, perfectly controllable. There are no gray zones, no moral questions, no semantic ambiguities. Computed reality is a rule-based reality descendant from the dice-throwing and hitpoint counting reality of the table-top *Dungeons and Dragons* {Gary Gygax 1974} role-playing fantasy worlds. Arguably, the computer rule-book is thick but somewhere deep in the machine lies perfection, absolute control. There are random factors generated by specialized algorithms making it reasonably sure that every run of the simulation differs between any of a finite number of possible runs. This randomness, however, is fully encapsulated, kept within strict bounds and will never touch the fundamental rules driving the simulation. Hence any uncertainty can be controlled by making probability calculations. "When I attack him with my wizard's Fireball spell power 12, even if he manages to boost his Ice Queen to eight, he will not be able to save his rogue." Whereas actual reality is chaotic and incomprehensible, computer environments hold a promise of perfection, of answering to a limited set of rules. There are few unknowns, even fewer uncertainties and even they hold a promise of being understood and controlled eventually.

A second promise held by rule-based systems is that, when the rules apply to everyone equally, everyone is equal. When a game is set up, cards are dealt, pieces are set on the table, a whistle blows, every contestant has, at least theoretically, an equal chance of winning. From that moment onward, it is her skill, in most cases complemented by elements of chance, that will determine whether she is successful or not, not her social background, skin color, beauty, education or gender. Roger Caillois observes that, despite their apparent oppositional nature, skill and chance "obey the same law – the creation for the players of conditions of pure equality denied them in real life. For nothing in life is clear, since everything is confused from the very beginning, luck and merit too. Play, whether agôn or alea, is thus an attempt to substitute perfect situations for the normal confusion of contemporary life" (Caillois 1958: 19). In this context, an additional promise made by computer games is that of concealment. Not only is the game environment fully determined by quantification and rules, as an opponent, the computer sees and knows nothing outside of these rules and the way in which the player interacts with them. A computer is a dumb yet at the same time an honest machine, unable to make judgments based on anything outside of the input it is provided with, unable to infer anything outside of the rules it is built to apply. In her pioneering study *The Second Self* (1984), Sherry Turkle gives the example of fourteen year old Jimmy who likes to play *Space Invaders* for hours on end and who has found in the computer the perfect playing partner, someone who will not judge him on the basis of his physical appearance which has been marred by a birth defect (88). Or as Bernstein formulates it: "[i]n the Saturday Night Fever of Computer Wizardry, achievement with your joystick is the only thing that counts; success is solitary, objectively measured, undeniable (1991: 7).

A third and final promise held by games is that of repeatability. First of all, like any fictional form, computer games generously offer the safety and seclusion of a fantasy environment. When exploring various strategies in a virtual environment, this is as much done in the player's imagination as it happens in reality. Technically speaking, when performing actions in a computer game, the only material consequences that are attached to one's decisions are the switching of bits and bytes and perhaps a change in the table of high-scores. Everything is perfectly safe. Nothing irrevocable can happen. State machines can be reset, discs wiped, software reinstalled. Moreover, the rule-based nature of computer games allows for the recreation of almost exactly similar situations in consecutive playing sessions or when saving and reloading. "In the social world of our everyday lives, repetition is near impossible if often promised. (...) With video games, as with all computers, you can return to the site of the same problem, the same anxiety, the same blockage and get exactly the same effect in response to the same set of actions" (Bernstein 1991: 50). In a simulated environment, if you act the same in similar circumstances, the same result will be produced. This gives the player a sense of control, an illusion of power. Within the realm of the virtual, man can imagine himself to be a god, evoking and revoking worlds, inventing and reinventing himself, delegating his avatar to carry out his instructions within the bounds of his own creation. Power and control are are two of the main attractions of computer games, a taste of omnipotence their additional reward.

ANXIETY AND CONTROL

But what is it that players of competitive games seek to control so much? What is it that underlies their desire for a perfect environment where they can test themselves on equal bases without having to fear any of the consequences? For Bernstein the answer is clear: it is their own anxiety that they seek to inhibit, their own uncertainty. "The dark side of uniformity and control is an intense fear of failure, of crashing, of disaster, of down time. Of not getting it right, of getting lost, of losing control" (1991: 47). Games evoke fantasies about fearful situations, harsh competition, brutal yet honest conflict. Moreover, they do this without exposing the player to any actual danger, and provide an opportunity to overcome that fear. You may feel as if you are being followed by ghosts while sneaking to the bathroom during the night. In a computer game, however, you can wait for them to approach you, eat the right pellet and go after them. Games are a test bed, a place where players can cast themselves into situations they will never experience in real life: driving a formula one, flying a fighter jet, fighting an army of orcs etc. At the same time, however, play is more than a place of rehearsal; it is a place where reality itself is negotiable, a place where one can act out and cope with one's darkest fantasies and existential anxieties. Brian Sutton-Smith notes that, while play can take many different forms, it is never thematically neutral. "All creatures, animal and human, live with some degree of existential angst, and most of them spend some portion of their existence attempting to secure themselves from this angst by controlling their circumstances. All creatures live in a world of strong feelings and are dominated by those feelings. We constantly seek to manage the variable contingencies of our lives for success over failure, for life over death. Play itself may be a model of just this everyday existentialism" (1997: 228).

If computer games are on their way to becoming as important a pastime as books and television, not just for children, but also for adolescents and adults, there must be something in the format that appeals to all these categories and that somehow provides them with something meaningful, not just within the gaming environment, but also to their life outside of it. Authors like Brian Sutton-Smith, Rolf Oerter, Torben Grodal, Janet Murray and Charles Bernstein agree that playing games, like dealing with representations such as books and films, apart from communicating information about their subject, primarily have a psychological function. They are an outlet, a mechanism for coping with reality, for coming to terms with everyday worries, pressure, anxiety and conflict. "Clearly the primary motive of players is the stylized performance of existential themes that mimic or mock the uncertainties and risks of survival and, in so doing, engage the propensities of mind, body, and cells in exciting forms of arousal" (Sutton-Smith 1997: 231). Like other forms of representation, game play allows us to symbolically represent elements of real life and thereby deal with our mental preoccupations, widen emotional bottlenecks and help us control our emotions. Additionally, it allows for the introjection of our own self into the process. "In games, therefore, we have a chance to enact our most basic relationship to the world – our desire to prevail over adversity, to survive our inevitable defeats, to shape our environment, to master complexity, and to make our lives fit together like the pieces of a jigsaw puzzle (...). Like the religious ceremonies of passage by which we mark birth, coming of age, marriage, and death, games are ritual actions allowing us to symbolically enact the patterns that give meaning to our lives" (Murray 1997: 143).

VICARIOUS THRILLS

Until this point, I have largely avoided dealing with the topic of violence in computer games. The main reason is that it is a sensitive one. Mere mentioning of the matter tends to stir a deeply emotional debate, more often than not fueled by bias, prejudice and misinformation, and altogether blurring the collective view from other, more interesting aspects of the form. Perhaps now, however, at the end of this inquiry, is the time to make some room for the issue. Thereby, it is not my aim to take an ethical stance vis-à-vis the purported violent nature of computer games. It is not my mission to judge, but to observe and to try to explain. As discussed previously, a first possible explanation for the conflictual nature of computer games is technical in nature. Symbolic systems of representation operate on discrete signs functioning within a network of semantic and semiotic oppositions, every sign deriving the larger part of its meaning from the differentiation between itself and other signs. In a similar way, narratological structures as forms of representation can be described in terms of oppositions between actants working upon axes of desire and opposition. Computer simulation and games are a fictional form driven by logical structures running on the symbol-processing machine par excellence: the computer. Hence it should be no surprise that they represent the world in oppositional terms, in order to generate suspense, but also because of the symbolic nature of their underlying logic. Computers are much better adapted for dealing with discrete data, for analyzing the world in terms of opposition, than for analyzing it in terms of continuity, of psychological association. Therefore it can be argued that their basic operational structure as a state machine is more apt to represent conflict than harmony, competition than compromise, violence than peacefulness.

A second, more powerful explanation, however, is, again, the coping argument. The player of violent computer games seeks a safe realm in which she can cope with aggressive feelings and come to terms with desires and fantasies which she cannot satiate in real life. When applied to computer game violence, two variants of the coping argument can be distinguished: one cognitivist reminiscing the idea of play as rehearsal and one psychoanalytical referring to play as a process of negotiation. The first, cognitivist variant claims that the player subconsciously engages in violent representations in order to experience arousal, which she can then learn to label and control. As Torben Grodal (2000: 201) explains, emotions should be seen as modes of relational action-readiness determining how we relate to our surroundings. In order to be able to cope with dangerous situations, man needs a way of learning to control his feelings in such a way that he will not be paralyzed whenever he needs to rely on them in actual reality. Competitive, conflictual and violent games allow us to do exactly that. Of course, modern man no longer hunts and fights on a daily basis. Hence an often heard argument is that these emotions should therefore not be stimulated. There is a valid counterargument, however, i.e. that the absence of a means to express aggressive feelings will not make them disappear and could result in frustration which in turn could lead to uncontrolled actual aggression. Finally, Grodal notes that even in a modern society not all is harmony and sweetness and that competitive spirit and emotional control can "serve possible beneficial mental mechanisms; for instance, assertiveness, need-persistence, and emotional control in confrontation with aversive stimuli" (200).

The second, psychoanalytical variant of the coping argument takes a different point of departure. Whereas the cognitivist claim presupposes the existence of a need for practice, for rehearsal, the cathartic theory of coping falls back on the more fundamental relationship between subject and object, between a person and his environment, and sees play as a way of negotiating between the two. By invoking a fantasy environment, projecting partial representations of carefully chosen elements from reality, and by introjecting oneself into a role within this environment, man enables himself to act out fearful situations without suffering or causing any actual harm. By repeatedly indulging in playful behavior representing forbidden impulses and desires, the player's feelings of anxiety and their concomitant aggression will take a more definite shape, become controllable and be experienced as less threatening. Violent representations serve as an outlet for aggressive thoughts and feelings, a way of releasing the valve. Henry Jenkins (1999) notes that man has and always will have a need for releasing negative energy and that eradicating reflections of this need will not prevent aggression from existing. When people are cut off from symbols of aggression, there will be less room for them to express themselves which will create frustration. In a similar vein, some parents object to violent themes of fairy tales. Children do have antisocial and aggressive feelings, however, and if they live in a world of total sweetness where they cannot find a place for these feelings, they may come to see themselves as monsters (Ibid.).

COPING IN CULTURE

To conclude this chapter and this study, I would like to return for a moment to its main thesis, i.e. that computer simulation and games are more than products of technology, that they are cultural forms, human creations developed as an answer to human desires and needs, and that, hence, they reflect certain elements from the culture in which they came about. A first such element I propose to look at is the growth topos, the idea that numerical increment, usually in economic terms but also in other sectors of society, is for some reason fundamentally right and that it should therefore be a goal in itself. This theorem, which, in my view, is typical for post-war Western, particularly American, culture and which may have been brought about by the Cold War competition with the U.S.S.R. and its consequent arms race, is reflected in most, if not all, computer game genres. As a player, you have fallen into terrible danger, evil forces are conspiring against you and you will only be able to overcome your predicament by prevailing, by becoming more powerful than your adversaries.

Whether it is the acquisition of ever higher numbers of magic points to cast more powerful spells, larger firearms to kill more dangerous monsters or a higher technology level to build more powerful military units, the player is always placed in a situation where she is in danger and will only be able to survive by becoming more efficient and by acquiring more powerful technology. As the Cold War raged and both sides were desperately trying to outdo the other in terms of technological and military might, the pressure to perform became overwhelming. This may have instilled a desire for a realm where that pressure is virtualized, where reality is understandable and controllable, where not taking the right decisions does not have any definitive consequences, and where success is always within reach. Computer games are a cultural response to the human need to cope with competition, a response to the desire for a lieu where one can negotiate one's place in an all too competitive society.

Furthermore, also the conflictual nature of computer simulation and games can be seen in a cultural light. The twentieth century has been one of rapid technological change, of tremendous growth but also unprecedented destruction. Rational organization and systemic principle have penetrated more and more sectors of Western society, in many cases pushing aside other, religious or humanist paradigms of thought and working against such principles as loyalty and solidarity. More and more decision-making is based on systemic data – quantitative analysis, statistics, computer simulation etc. – and sometimes it seems that there is no more room for human intuition, that our capacities are bound to become irrelevant, replaced by mathematical modeling. This has evoked in man a deep suspicion, a fear of losing control, of being fully subjected to principles which are not his own. Man creates systems and rules in order to exercise control over himself and his fellow man, yet he fears to lose control to these rules; he is afraid that his own creations will eventually turn themselves against him. He is anxious that the balance in society will shift from technology existing in a man's world to man existing in a world of and for technology. Ostensibly a thinking machine, the computer has become a symbol of this conglomerate of fears, a personification of the anxiety of being entirely subjected to systemic principle. Computer games offer a way of coping with this anxiety. By symbolically staging a battle between man and machine, a struggle for control over a rule-based reality, man is able to act out and externalize his fears and come to terms with them.[91]

I believe that this fear is unjust, however, an emotion brought about by the misconception that technological change is a linear, teleological process and that its course is in some way determined by higher principle. At least since the 1960s, when Marshall McLuhan proclaimed that the medium is the message, media studies have been dominated by a discourse of progression, not of change or even improvement, but of fundamental, linear moving forward toward a specific point both in time and form. This idea of technology as a power of deliverance is closely related to the idea of predestination. Everything in the world is on its course either to salvation or damnation and technology as a product of change is alternately seen as a guiding force and an angel of doom. From a scientific point of view, however, this predestined path is an illusion. As constructivist studies have pointed out, technological change is an all but linear, predetermined process; it is a broad social movement whereby many actors work in many more different directions and whereby complex combinations of factors – technological, economic, social and ad hoc – determine which course is followed. Technology is not something alien to human culture: it is one of its creations, as are art, literature, politics, medicine, sports etc., something devised by man in order to help him cope with his problems and desires. As such, technology is to serve man and not the other way around and its course is to be guided by human principle, not blind faith. Technology is neither something to be worshiped nor feared, it is something to be used appropriately. Computer simulation and games do not herald a fundamentally new era and neither are they a dangerous source of perversion. They are no more and no less than a powerful new form of representation, a new way for man to negotiate his place in the world.

[91] Some theorists make a radical distinction between single- and multi-player games claiming that it is only the first group that is concerned with the struggle between man and machine. I do not make this distinction, however, as, even when you play against human opponents, the goal of playing is still to master the system to such an extent that the chances of losing diminish. Even in multi-player games, the most basic conflict is that between player and system.

Media Cited

2001: A Space Odyssey. Film, science fiction. Stanley Kubrick, 1968.

24 hours with someone you know.... Hypertext fiction, tree fiction. Philippa J. Burne. *Modern Adventure*, 1996. <http://www.glasswings.com.au/modern/24hours/>

Avatar, The. Novel, science fiction. Poul Anderson, 1978.

Addventure. Hypertext fiction, tree fiction. Allen S. Firstenberg, 1994. <http://www.addventure.com/addventure/>.

Advanced Dungeons & Dragons. Live role-playing game, fantasy. Gary Gygax & David Arneson. Tactical Studies Rules, 1977.

Adventure. Computer game, adventure. Warren Robinett. Atari, 1978.

Afternoon: A Story. Hypertext fiction, rhizome. Michael Joyce. Watertown, Massachusetts: Eastgate Systems, 1990.

Age of Empires. Computer game, real-time strategy. Ensemble Studios: Rick Goodman. Microsoft, 1997.

A.I.: Artificial Intelligence. Film, science fiction. Steven Spielberg, 2001.

America's Army. Computer game, online multiplayer 1st person shooter. Michael Zyda. United States Army, 2002.

Analytical Engine. Apparatus, mechanical calculator. Charles Babbage, 1833-1842.

Aspen Movie Map. Virtual reality system. Andrew Lippman. Massachusetts Institute of Technology, 1977.

Asteroids. Computer game, shoot 'em up. Lyle Rains & Ed Logg. Atari, 1979.

Barbie. Toy, doll. Ruth Handler. Mattel 1959.

Battlestar Galactica. Television series (remake), science fiction. Ronald Moore, 2003.

Battlezone. Arcade game machine, 3D tank simulation. Ed Rotberg. Atari, 1980.

Big Brother. Television program, reality show. John de Mol. Endemol 1999.

Birth of a Nation, The. Film. David Griffith, 1915.

Black and White. Computer game, strategy. Peter Molyneux. Electronic Arts, 2000.

Blade Runner. Film, science fiction. Ridley Scott, 1982.

Brave New World. Novel, dystopian science fiction. Aldous Huxley, 1932. Available at Project Gutenberg.

Cent Mille Milliards de Poèmes (Eng. *A Hundred Thousand Billion Poems*). Poetry, sonnet machine in book form. Raymond Queneau. Paris: Gallimard, 1961.

Circus Atari. Computer game, pong-like. Mike Lorenzen. Atari 1978.

Civilization. Computer game, strategy. Sid Meier. Microprose, 1991.

Civilization II. Computer game, strategy. Sid Meier. Microprose, 1996.

Civilization III. Computer game, strategy. Sid Meier. Firaxis Games, 2001.

Clockwork Orange, A. Film, science fiction. Stanley Kubrick, 1971.

Club Caribe. Computer game, multi-player online environment. Lucasfilm Games: Randy Farmer; Chip Morningstar. Quantum Link, 1988.

Colossal Cave Adventure. Computer game, text adventure. William Crowther & Donald Woods. Cambridge: Massachusetts Institute of Technology, 1972.

Combat. Computer game, two-player tank shooter. Joe Decuir & Larry Wagner. Atari, 1977.

Computer Space. Computer game, space shooter. Nolan Bushnell. Nutting Associates, 1971.

Crystal Castles. Computer game, isometric puzzle. Franz Lanzinger. Atari, 1983.
Dance Dance Revolution. Computer game, live action. Konami, 1998.
Defender. Arcade game, base defense shooter. Eugene Jarvis. Williams Electronics, 1980.
Defender of the Crown. Computer game, strategy. Kellyn Beck. Cinemaware, 1986.
Deus Ex: Invisible War. Computer game, action adventure. Warren Specter & Harvey Smith. Eidos/Ion Storm, 1999.
Do Androids Dream of Electric Sheep? Novel, science fiction. Philip K. Dick, 1968.
Doctor Who, The Deadly Assassin. television series, science fiction. Robert Holmes, season 14, episode 88, 1975.
Donkey Kong. Computer game, Platform. Shigeru Miyamoto. Nintendo, 1981.
Doom. Computer game, 1st person shooter. John Romero & John Carmack. Activision/id Software/Gray Matter Studios, 1993.
Double Dragon. Computer game, beat 'em up. Technos: Yoshihisa Kishimoto. Taito, 1986.
Dungeon Master. Computer game, role-playing. Bruce Webster and Wayne Holder. FTL Games 1987.
Dungeons & Dragons. Live role-playing game, fantasy. Gary Gygax & David Arneson. Tactical Studies Rules, 1974.
ENIAC, *Electronic Numerical Integrator and Computer*. First electronic computer. John Presper Eckert; John William Mauchly. University of Pennsylvania, 1945.
El jardin de senderos que se bifurcan. Short Story, novella. Jorge Luis Borges. Buenos Aires: Sur, 1941.
Eliza. Software, chatterbot. Joseph Weizenbaum. Cambridge: Massachusetts Institute of Technology, 1966.
Ethnic Cleansing. Computer game, first-person shooter. Resistance Records, 2003.
Everquest. Computer game, multi-player online role-playing. Verant Interactive: Brad McQuaid; Steve Clover; Bill Trost. Sony Online Entertainment, 1999.
EyeToy. Input device, camera. Sony, 2003.
Final Fantasy. Computer game, adventure. Hironobu Sakaguchi. Square, 1987.
Food Force. Computer game, action & sim. United Nations World Food Programme, 2005.
Football. Arcade machine, American football. Steve Bristow. Atari, 1978.
Gabriel Knight III: Blood of the Sacred, Blood of the Damned. Computer game, point 'n' click adventure. Jane Jensen. Sierra 1999.
Galaxian. Arcade game machine, shoot 'em up. Namco: Hurashi Nagumo & Akira Takundai. Galaxian, 1979.
Gaming Open Market. Web site, auctioning of virtual items. <http://www.gamingopenmarket.com>
Gold Rush. Film. Charles Chaplin, 1925.
Gran Turismo 4. Computer game, racing. Kazunori Yamauchi. SCEA, 2004.
Grand Theft Auto: Vice City. Computer game, action adventure. David Jones. Rockstar Games/ Rockstar North, 2002.
Grand Theft Auto. Computer game, action adventure. David Jones. Rockstar Games/DMA Design, 1997.
Great Train Robbery, The. Film. Edwin Porter, 1903.
Guernica, The. Painting, cubist. Pablo Picasso, 1937.

Habitat. Computer game, multi-player online environment. Lucasfilm Games: Randy Farmer; Chip Morningstar. Quantum Link, 1987.
Hamlet. Theatrical play, tragedy. William Shakespeare, 1602.
Ham(m)urabi/Kingdom. Computer game, strategy. David Ahl, 1970.
Head over Heels. Computer game, isometric puzzle. John Ritman & Bernie Drummond. Ocean Software, 1987.
High Noon. Film. Fred Zinnemann, 1952.
Hunt the Wumpus. Computer game, role-playing. Gregory Yob, 1972.
Hypercard. Software, hypertext system. Bill Atkinson. Apple, 1987.
Indiana Jones and the Last Crusade. Film, adventure. Steven Spielberg, 1989.
Internet Gaming Entertainment. Web site, trading virtual items. <http://www.ige.com>
Jazz Singer, The. Film. Al Jolson, 1927.
Jr. Pacman. Computer game, maze action. Namco: Toru Iwatani. Midway Games, 1983.
Kabul Kaboom. Computer game, action. Gonzalo Frasca, http://ludology.org/games/kabulkaboom.html
King Kong. Novel, fantasy. Delos Lovelace, 1932.
King's Quest. Computer game, adventure. Roberta Williams. Sierra, 1984.
Kubla Khan. Poem. Samuel Taylor Coleridge, 1816
KZ-Rattenjagd ('Concentration Camp Rat Hunt'). Computer game, action. NSDAP/AO, 2000.
Last Express, The. Computer game, point-'n'-click mystery adventure. Smoking Car Productions: Jordan Mechner. Brøderbund, 1997.
Lemmings. Computer game, save 'em up. DMA design: Mike Dailly, Dave Jones, Gary Timmons. Psygnosis, 1991.
Life (The Game of). Software, simulation. John Horton Conway, 1970.
Lineage. Computer game, multi-player online role-playing. Jake Song. NCSoft, 1998.
Lord of the Rings. Novels, fantasy. J.R.R. Tolkien's, 1954-1955.
Lunar Lander. Computer game, flight simulator. Jack Burness, 1973.
Madden NFL. Computer game, American football. Electronic Arts Tiburon/EA Sports, 2003.
MapleStory. Computer game, multi-player online persistent world. Wizet. Corporation. South Korea 2002.
Mario Bros. Computer game, platform. Shigeru Miyamoto. Nintendo, 1983.
Matchbox. Toy, model cars. Lesney Toys, 1952.
Matrix, The. Film, science fiction. Andy Wachowski & Larry Wachowski, 1999.
Maze War. Computer game, simple 3rd-person network shooter. Steve Colley; Howard Palmer; Greg Thompson. California: NASA Ames Research Center, 1974.
Memex. Apparatus, proof of concept. Vannevar Bush, 1945.
Meridian 59. Computer game, multi-player online role-playing. Terra Nova Interactive: Steve Sellers; Mike Sellers. 3DO Studios, 1996.
Missile Command. Computer game, fixed shooter. Dave Theurer. Atari, 1980.
Monopoly. Board game, sim. Charles Darrow. Parker Brothers, 1935
Moon Patrol. Arcade game machine, horizontal shoot 'em up. Irem. Williams Electronics, 1982.
Mortal Kombat. Computer game, fighting. John Tobias & Ed Boon. Midway, 1992.

Mosaic. Software, web browser. NCSA, 1993.
Ms. Pacman. Computer game, maze action. Namco: Toru Iwatani. Midway Games, 1981.
Multi-User Dungeon. Computer game, multi-player online text adventure. Roy Trubshaw & Richard Bartle. Essex University, 1978.
Myst. Computer game, point 'n' click adventure. Cyan Inc: Robin Miller & Rand Miller. Brøderbund, 1993.
Netscape Navigator. Software, web browser. Marc Andreessen. Netscape Inc., 1994.
Neuromancer. Novel, science fiction. William Gibson. New York: Ace, 1984.
Neverwinter Nights. Computer game, multi-player online role-playing. Stormfront Studios: Don Daglow; Cathryn Mataga. America OnLine, 1991.
New York Defender. Computer game, shooter. Stef & Phil. Uzinagaz, 2002.
Nexus: The Kingdom of the Winds. Computer game, multi-player online roleplaying. Jake Song. NCSoft, 1996.
Night Driver. Computer game, racing. Ted Michon. Atari, 1976.
Nineteen Eighty-Four. Novel, science fiction. George Orwell, 1949.
Noughts and Crosses. Computer game, puzzle. Alexander Douglas. Cambridge, England: Cambridge University, 1952.
Nude Raider. Game patch for *Tomb Raider*, adult. Unknown, 1996.
Odyssey. Epic poem, mythology. Homer, 8th century BC.
Pacman. Computer game, maze action. Toru Iwatani. Midway Games/Namco, 1980
Pied Piper, The. Folk tale. Written down by the Brothers Grimm. Originally 13th Century, Written down around 1816.
Pinball / Bally Hoo. Arcade game. Raymond Maloney. Bally Corporation, 1931
Pong. Computer game, paddle. Nolan Bushnell & Alan Alcorn. Atari, 1972.
Project Entropia. Computer game, online persistent virtual world. MindArk, 2003.
Quake. Computer game, 1st person shooter. John Carmack & John Romero. id Software, 1996.
Railroad Tycoon. Computer game, management simulation. Sid Meier. MicroProse, 1990.
Rayuela (Eng. *Hopscotch*). Novel, hypertext fiction in codex form. Julio Cortázar. Buenos Aires: Editorial Sudamericana, 1963.
Red on Maroon. Painting, abstract. Mark Rothko, 1959.
Return to Castle Wolfenstein. Computer game, 1st person shooter. John Romero & John Carmack. Activision/id Software, 2001.
Risk. Board game, strategy. Albert Lamorisse; Michael I. Levin. France 1957; USA: Hasbro/Parker Brothers, 1959.
Rogue. Computer game, adventure. Michael Toy & Glenn Wichman & Ken Arnold. Epyx 1980.
Second Life. Computer game, online persistent virtual world. Linden Lab, 2003.
Shadowbane: Chronicle of Strife. Computer game, online persistent fantasy. Ubisoft/Wolfpack Studios, 2003.
Shoot the Blacks. Computer game, shooter. Kawaman, Bulten, Tor. ASA productions 2000.
SimAnt. Computer game, real-time simulation. Will Wright. Maxis 1991.
SimCity. Computer game, real-time simulation. Will Wright. Maxis 1989.
Sims Online, The. Computer game, online persistent simulation. Maxis: Will Wright. Electronic Arts, 2002.

Sims, The. Computer game, social simulation. Will Wright. Maxis, 2000.
Smurfs, The. Comic Strip, fantasy. Peyo (Pierre Culliford). *Le Journal de Spirou*, Editions Dupuis, 1958.
Space Invaders. Arcade game machine, shoot 'em up. Toshihiro Nishikado. Taito, 1978.
Space War. Computer game, space shooter. Steve Russell. Cambridge: Massachusetts Institute of Technology, 1962.
Special Force. Computer game, first-person shooter. Hizbullah, 2003.
Speed Freak. Arcade game machine, racing. Vectorbeam: Larry Rosenthal. Cinematronics 1977.
Splinter Cell: Pandora Tomorrow. Computer game, third person stealth. Tom Clancy. Ubisoft, 2004.
Sprint 2. Computer game, racing. Dennis Koble. Atari, 1976.
Star Raider(s). Computer game, first-person shoot 'em up. Douglas Neubauer. Atari 1979.
Star Trek: The Next Generation. Television series, science fiction. Gene Roddenberry, 1987-1994.
Storyspace. Software, hypertext system. Mark Bernstein. Eastgate, 1987.
Stratego. Board game, strategy. Milton Bradley. Milton Bradley Company, 1961.
Street Fighter. Computer game, fighting. Yoshiki Okamoto. Capcom, 1987
Super Breakout. Computer game, paddle. Steve Wozniak. Atari, 1978.
Super Mario Bros. Computer game, platform. Shigeru Miyamoto. Nintendo, 1985.
Surround. Computer game, two-player action. Alan Miller. Atari, 1977.
Tale-Spin. Software, story generator. James R. Meehan. Reddy, R. *Proceedings of the 5th International Joint Conference on Artificial Intelligence*. Cambridge, Massachusetts: The MIT Press 1977.
Tamagotchi. Electronic toy. Aki Maita. Bandai, 1996.
Tennis for Two. Computer game, sports. Willy Higinbotham. New York: Brookhaven National Laboratory, 1958.
Terminator, The. Film, science fiction. James Cameron, 1984.
Tetris. Computer game, puzzle. Alexey Pajitnov. Moscow: 1985.
There. Computer game, online persistent virtual world. Will Harvey & Jeffrey Ventrella, 1998.
Tomb Raider. Computer game, action adventure. Toby Gard. Eidos, 1996.
Tron. Film, science fiction. Steven Lisberger, 1982.
True Crime: Streets of LA. Computer game, action adventure. Activision / Luxoflux, 2003.
Ultima I: The First Age of Darkness. Richard Garriot. California Pacific Computer Co., 1981.
Ultima IV: Quest of the Avatar. Richard Garriot. Origin Systems, 1985.
Ultima Online. Computer game, online persistent world. Origin Systems: Raph Coster. Electronic Arts, 1997.
Under Ash. Computer game, first-person shooter. Radwan Kasmiya. Dar Al-Fikr, 2001.
Unreal. Computer game, 1st person shooter. Tim Sweeney & Cliff Bleszinski. Epic Games, 1998
Ur, The Royal Game of. Board game, strategy. Unknown. Mesopotamia: Ur, 2500 BC.
Victory Garden. Hypertext fiction. Stuart Moulthrop. Watertown, Massachusetts: Eastgate Systems, 1991.
War of the Worlds, The. Novel, science fiction. Herbert George Wells. England, 1898.

War of the Worlds, The. Radio play, science fiction. Orson Welles. Columbia Broadcasting System, 30 October 1938.

WarGames. Film, science fiction. John Badham, 1983.

Watch out behind you hunter. Computer game, shooter. Uzinagaz.

Waste Land, The. Poem, modernist. T.S. Elliot, 1922.

Wolfenstein 3D. Computer game, 1st person shooter. John Romero & John Carmack. id Software, 1992.

World of Warcraft. Computer game, multi-player online role-playing. Blizzard Entertainment. Vivendi Universal, 2004.

WorldWide Web. Software, hypertext system. Tim Berners-Lee. Conseil Européen pour la Recherche Nucléaire, 1989.

Xanadu. Software, hypertext system. Theodore Nelson, 1967-1999.

Zapper. Input device, lightgun. Nintendo, 1985.

Zaxxon Arcade Game Machine, isometric shoot 'em up. Sega, 1982.

Zork. Computer game, text adventure. Tim Anderson; Marc Blank; Bruce Daniels; Dave Lebling. Infocom, 1980.

Publications Cited

Aarseth, Espen (1997). *Cybertext: Perspectives on Ergodic Literature*. Baltimore, London: The Johns Hopkins University Press.

Aarseth, Espen (1999). "Aporia and Epiphany in *Doom* and *The Speaking Clock*: The Temporality of Ergodic Art" in Marie-Laure Ryan (ed.) *Cyberspace Textuality: Computer Technology and Literary Theory*. Bloomington: Indiana University Press, 31-41.

Aarseth, Espen (2001a). "Allegorien des Raums: Raümlichkeit in Computerspielen"in *Zeitschrift für Semiotik* Band 23, Heft 3-4 (2001), 301-318.

Aarseth, Espen (2001b). "Computer Game Studies, Year One" in *Game Studies* volume 1 issue 1.

Aarseth, Espen (2003). "Playing Research: methodological approaches to game analysis" in *Proceedings of the Digital Arts and Culture Conference*, Melbourne 2003.

Aarseth, Espen (2004a). "Genre Trouble: Narrativism and the Art of Simulation" in Noah Wardrip-Fruin and Pat Harrigan (eds.) *First Person: New Media as Story, Performance, and Game*. Cambridge, Massachusetts & London: The MIT Press, 2004, 45-55.

Aarseth, Espen (2004b). "Quest Games as Post-Narrative Discourse" in Marie-Laure Ryan, *Narrative across Media: Languages of Storytelling*. Lincoln, Nebraska: University of Nebraska Press, 361-376.

Anderson, Craig A. (2002). "Violent Video Games and Aggressive Thoughts, Feelings, and Behaviors" in Sandra L. Calvert, Amy B. Jordan, Rodney R. Cocking (eds.). *Children in the Digital Age: Influences of Electronic Media on Development*. Westport (Connecticut) & London: Praeger.

Anderson, Craig A. & Bushman, Brad J. (2001). "Effects of Violent Video Games on Aggressive Behavior, Aggressive Cognition, Aggressive Affect, Physiological Arousal, and Prosocial Behavior: A Meta-Analytic Review of the Scientific Literature" in *Psychological Science* Vol. 12, No. 5, September 2001.

Anderson, Craig A. & Bushman, Brad J. (2002). "The Effects of Media Violence on Society" in *Science* 00368075, 3/29/2002, Vol 295, Issue 5564.

Aristotle (ca. 350 BC). *Poetics*. Translated by Samuel Henry Butcher.

Ball, Howard G. (1978). "Telegames Teach More Than You Think" in *Audiovisual Instruction* 23, 5, 24-6, May 1978.

Bartle, Richard (2001). "Hearts, Clubs, Diamonds, Spades: Players Who Suit Muds". July 2001. http://www.mud.co.uk/richard/hcds.htm

Baudrillard, Jean (1988). "Simulacra and Simulations" in Mark Poster (ed.) *Jean Baudrillard, Selected Writings*. Stanford: Stanford University Press, 166-184.

Baudrillard, Jean (1993). *Symbolic Exchange and Death*. London: Sage.

BBC (2002). "Inflation threatens EverQuest economy " in *BBC News*. 21 October 2002.

BBC (2005). "UN video game makes hunger point" in *BBC News*. 14 April 2005.

Benjamin, Walter (1938). *Das Kunstwerk im Zeitalter seiner technischen Reproduzierbarkeit*. Frankfurt am Main: Suhrkamp.

Bernstein, Charles (1991). "Play It Again, Pac-Man" in Postmodern Culture v.2 n.1, September.

Bijker, Wiebe E.; John Law eds. (1992). *Shaping Technology / Building Society*. Cambridge, Massachusetts & London: The MIT Press.

Binkley, Timothy (1993). "Refiguring Culture" in *Future Visions: New Technologies of the Screen*, eds. Philip Hayward and Tana Wollen, London: British Film Institute, 90-122.

Binkley, Timothy (1997). "The Vitality of Digital Creation" in *Journal of Aesthetics and Art Criticism* 55(2) 107-116. Spring 1997.

Bolter, Jay David & Grusin, Richard (1999). *Remediation: Understanding New Media*. Cambridge, Massachusetts: The MIT Press.

Bush, Vannevar (1945). "As We May Think" in *The Atlantic Monthly* July 1945 Volume 176, No1; pages 101-108. Boston: The Atlantic Monthly Group.

Caillois, Roger (1958, edition 2001). *Man, Play and Games*. Urbana and Chicago: University of Illinois Press.

Castronova, Edward (2001). "Virtual Worlds: A First-Hand Account of Market and Society on the Cyberian Frontier" in CESifo Working Paper Series No. 618. December 2001.

Castronova, Edward (2003). "On Virtual Economies" in *Game Studies* volume 3, issue 2, december 2003.

Crawford, Chris (1984). *The Art of Computer Game Design*. McGraw-Hill: Glencoe Division Macmillian.

Csikszentmihalyi, Mihaly (1997). "Finding Flow" in *Psychology Today* July/August 1997.

De Aguilera, Miguel & Méndiz, Alfonso (2003). "Video Games and Education (Education in the Face of a "Parallel School") in *ACM Computers in Entertainment*, Vol. 1, No. 1, October 2003, Article 01.

Delio, Michelle (2003). "Hackers Put 'Bane' in Shadowbane" in *Wired News*. 30 May 2003.

de Mul, Jos (2002). *Cyberspace Odyssee*. Kampen: Klement.

Divila, Amy (2002). "Cultural Logic in Cyberspace: Web Art & Postmodernism" in *Nmediac: the Journal of New Media & Culture*. Summer 2002.

Douglas, Alexander Shafto (1954). *Some Computations on Theoretical Physics*. PhD. dissertation. University of Cambridge.

Dreyfus, Hubert (1972). *What Computers Can't Do: A Critique of Artificial Reason*. New York: Harper & Row.

Dreyfus, Hubert (1992). *What Computers "Still" Can't Do: A Critique of Artificial Reason*. Cambridge, Massachusetts & London: The MIT Press.

Nematoddity (2004). "take two, damn it," posting on *Livejournal.com*. 8 September 2004.

Feshbach, Seymour (1955). "The Drive-Reducing Function of Fantasy Behaviour." *Journal of Abnormal and Social Psychology* 50, 3-11.

Frasca, Gonzalo (1999). "Ludology meets narratology: Similitude and differences between (video)games and narrative" in *www.ludology.org*, Finnish version originally published in *Parnasso*#3, Helsinki, 1999.

Frasca, Gonzalo (2001). "Simulation 101: Simulation versus Representation" in *Ludology.org*.

Freud, Sigmund (1908). *Der Dichter und das Phantasieren*. Frankfurt am Main: Fischer. Bd. 10, S. 169-179.

Friedman, Ted (1999). "Semiotics of Simcity" in *firstmonday* 4.4, April 1999.

Gaggi, Silvio (1997). *Decentering the Subject in Fiction, Film, the Visual Arts, and Electronic Media.* University of Pennsylvania Press.

Galloway, Alexander R. (2004). "Social Realism in Gaming" in *Game Studies* volume 4, issue1, November 2004.

Genette, Gérard (1980). *Narrative Discourse*. Oxford: Basil Blackwell.

Greimas, Algirdas (1966). *Sémantique Structurale*. Paris: Larousse, 1966

Grodal, Torben (2000). "Video Games and the Pleasures of Control", in Zillman, Dolf & Vorderer, Peter (Eds.) *Media Entertainment: the Psychology of* Its *Appeal*, Mahwah, NJ: Lawrence Erlbaum Ass.

Groos, Karl (1896). *Die Spiele der Tiere*. Jena: G. Fischer.

Groos, Karl (1899). *Die Spiele der Menschen*. Jena: G. Fischer.

Hartley, David (1749). *Observations on Man, his Frame, his Duty, and his Expectations*.

Held, Richard and Hein, Alan (1963). "Movement produced stimulation in the development of visually guided behaviour." *Journal of Comparative and Physiological Psychology* 56, 872-76.

Herz, J. C. (1997). *Joystick Nation. How Videogames Ate Our Quarters, Won Our Hearts, and Rewired Our Minds*. Boston, New York, Toronto, London: Little, Brown, and Company.

Holmes, Tiffany (2003). "Arcade Classics Spawn Art? Current Trends in the Art Game Genre" in *Proceedings of Digital Art and Culture Conference,* Melbourne.

Howells, Sacha A.(2002). "Watching A Game, Playing A Movie: When Media Collide" in Geoff King & Tanya Krzywinska, *Screenplay: Cinema/Videogames/Interfaces*. London and New York: Wallflower Press, 110-121.

Huizinga, Johan (1938; trans. 1949). *Homo Ludens: a Study of the Play Element in Culture*. Boston: The Beacon Press.

Huxley, Aldous (1932). *Brave New World*. London: Flamingo Modern Classic.

IJseling, Samuel (1990). *Mimesis: Over schijn en zijn*. Ambo/Baarn.

Iser, Wolfgang (1970). *Die Appellstruktur der Texte. Unbestimmheit als Wirkungsbedingung literarischer Prosa*. Konstanz: University of Konstanz Press.

Järvinen, Aki (2003). "The Elements of Simulation in Digital Games: System, Representation and Interface in *Grand Theft Auto: Vice City* in *Dichtung-Digital - Journal für digitale Ästhetik,* Ausgabe 4/2003, 5.Jg. / Nr. 30.

Jenkins, Henry (1999). "Mind Games", interview with Henry Jenkins in *Context Magazine*, November/December 1999.

Jenkins, Henry (2004). "Game Design as Narrative Architecture" in Noah Wardrip-Fruin and Pat Harrigan (eds.) *First Person: New Media as Story, Performance, and Game*. Cambridge, Massachusetts & London: The MIT Press, 2004, 118-130.

Jenkins, Henry & Squire Kurt (2002). "The Art of Contested Spaces" in Lucian King and Conrad Bain (Eds.), *Game On*. London: Barbican, 2002.

Johnson, Steven (2001). *Emergence*. London: Penguin Books.

Juul, Jesper (1998). "A Clash Between Games and Narrative" Paper presented at the Digital Arts and Culture Conference, Bergen, November 1998.

Juul, Jesper (2001). "Games Telling stories? A brief note on games and narratives" in *Game Studies* 1/1, July 2001.

Juul, Jesper (2005). *Half-Real: Video Games Between Real Rules and Fictional Worlds*. Cambridge, Massachusetts & London: The MIT Press.

Kabay, Michel E. (2003). "Computer-Aided Thematic Analysis: Useful Technique for Analyzing Non-Quantitative Data" in *Ubiquity* Volume 4, Issue 24, August 5 - 11 2003.

Kramer, Wolfgang (2001). "Was macht ein Spiel zu einem Spiel? Erfahrungen und Ansichten eines Spieleautors"in *Zeitschrift für Semiotik* Band 23, Heft 3-4 (2001), 285-300.

Kücklich, Julian (2003). "Perspectives of Computer Game Philology" in *Game Studies* volume 3, issue 1, may 2003.

Kücklich, Julian (2004). "Modding, Cheating und Skinning: Konfigurative Praktiken in Computer- und Videospielen" in *Dichtung-Digital - Journal für digitale Ästhetik,* Ausgabe 2/2004, 6.Jg. / Nr. 32.

Le Diberder, Alain & Le Diberder, Frédéric (1993). *Qui a peur des jeux vidéo?* Paris: Editions La Découverte.

Lee, Kwan Min (2004a). "Presence, Explicated" in *Communication Theory* volume 14, issue 1, February 2004, 27-50.

Lee, Kwan Min (2004b). "Why Presence Occurs: Evolutionary Psychology, Media Equation, and Presence" in *Presence: Teleoperators and Virtual Environments*, 13, 494-505.

Lee, Shuen-shing (2003). "'I lose, Therefore I Think': A Search for Contemplation amid Wars of Push-Button Glare" in *Game Studies* volume 3, issue 2, December 2003.

Lee, James (2005). "From sweatshops to stateside corporations, some people are profiting off of MMO gold " in *1UP.com*. 7 May 2005.

Lévy, Pierre (1998). *Qu'est-ce que le virtuel?* Paris: La Découverte.

Lewis, David (1978) "Truth in Fiction" in *American Philosophical Quarterly*, 1, 37-46.

Loftus, Geoffrey R. & Loftus, Elizabeth F. (1983). *Mind at Play: the Psychology of Video Games*. New York: Basic Books.

Lunenfeld, Peter (2004). "The Myths of Interactive Cinema" in Marie-Laure Ryan, *Narrative across Media: Languages of Storytelling*. Lincoln, Nebraska: University of Nebraska Press, 377-390.

MacKenzie, Donald & Wajcman, Judy (eds.) (1985). *The Social Shaping of Technology: How the Refrigerator Got Its Hum*. Milton Keynes: Open University Press.

Manovich, Lev (2001). *The Language of New Media*. Cambridge, Massachusetts & London: The MIT Press.

Manjoo, Farhad (2003). "Raking Muck in *The Sims Online*" in *Salon.com Technology*. December 12, 2003.

McCloud, Scott (1993). *Understanding Comics*. Kitchen Sink Press.

McLuhan, Marshall (1964, 1997 edition). *Understanding Media*. Cambridge, Massachusetts & London: The MIT Press.

McLuhan, Marshall; Bruce B. Powers (1989). *The Global Village: Transformations in World Life and Media in the 21st Century*. New York: Oxford University Press.

McMahan, Alison (2003). "Immersion, Engagement, and Presence: A Method for Analyzing 3-D Video Games" in Mark J.P. Wolf & Bernard Perron (eds.) *The Video Game Theory Reader*. New York & London: Routledge (Taylor & Francis Group), 67-86.

Metz, Christian (1982). *The Imaginary Signifier: Psychoanalysis and the Cinema*. Bloomington: Indiana University Press.

Minsky, Marvin (1980). "Telepresence", in *Omni*, 2, June 1980, 45-51.

Montfort, Nick (2003). *Twisty Little Passages: An Approach to Interactive Fiction*. Cambridge, Massachusetts & London: The MIT Press.

Morris, Sue (2003). "The Computer Game Moral Panic", presented at the *From Space War! to Ivory Tower* seminar at the University of Queensland, Brisbane, Australia, 26th May, 2003; available at *Game Culture: Thinking about Computer Games*.

Moulthrop, Stuart (2004). "From Work to Play: Molecular Culture in the Time of Deadly Games" in Noah Wardrip-Fruin and Pat Harrigan (eds.) *First Person: New Media as Story, Performance, and Game*. Cambridge, Massachusetts & London: The MIT Press, 2004, 56-69.

Murphy, Sheila C. (2004). "'Live in Your World, Play in Ours': The Spaces of Video Game Identity" in *Journal of Visual Culture* Vol 3 (2): 223-238.

Murray, Janet H. (1997). *Hamlet on the Holodeck: The Future of Narrative in Cyberspace*. Cambridge, Massachusetts & London: The MIT Press.

Myers, David (1992). "Simulating the self" in *Play & Culture*, 5 (4), 420-440.

Neitzel Britta (2001). "Die Frage nach Gott oder Warum spielen wir eigentlich so gerne Computerspiele" in *Ästhetik & Kommunikation* Heft 115, 32. Jahrgang, Winter 2001/2, 61 – 68.

Neitzel, Britta (2005). "Narrativity in Computer Games" in J. Goldstein and J. Raessens, *Handbook of Computer Games Studies*. Cambridge, Massachusetts & London: The MIT Press, 227-245.

Nelson, Theodor Holm (1965). "A File Structure for the Complex, the Changing, and the Indeterminate." In *Proceedings of the 20th National Conference*, 84-100. New York: Association for Computing Machinery.

Nelson, Theodor Holm (1981) *Literary Machines*. Swarthmore, PA.

Nutt, Diane & Railton, Diane (2003). *"The Sims*: Real Life as Genre*"* in *Information, Communication & Society* 6:4, 2003, 577-592.

Oerter, Rolf (1997). "Lebensthematik und ComputerSpiel" in Jürgen Fritz & Wolfgang Fehr, *Handbuch Medien: Computerspiele*. Bonn: Bundeszentrale für politische Bildung, 59-65.

Oerter, Rolf (2000). "Spiel als Lebensbewältigung" in Siegfried Hoppe-Graff & Rolf Oerter (ed.), *Spielen und Fernsehen: Über die Zusammenhänge von Spiel und Medien in der Welt des Kindes*. Weinheim & München: Juventa Verlag, 47-58.

Oppy, Graham & David Dowe (2003). "The Turing Test" in *Stanford Encyclopedia of Philosophy*.

Papoušek, Hanus; Papoušek, Mechthild; Bornstein, Marc H. (2000). "Spiel und biologische Anpassung" in Siegfried Hoppe-Graff & Rolf Oerter (ed.), *Spielen und Fernsehen: Über die Zusammenhänge von Spiel und Medien in der Welt des Kindes*. Weinheim & München: Juventa Verlag, 21-45.

Pavel, Thomas G. (1986) *Fictional Worlds.* Cambridge, Massachusetts: Harvard University Press.

Pearce, Celia (2004). "Towards a Game Theory of Game" in Noah Wardrip-Fruin and Pat Harrigan (eds.) *First Person: New Media as Story, Performance, and Game*. Cambridge, Massachusetts & London: The MIT Press, 2004, 143-153.

Pinch, Trevor J. & Bijker, Wiebe E (1987). "The Social Construction of Facts and Artifacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other" in Bijker, Wiebe E.; Hughes, Thomas P.; Pinch, Trevor (eds.) *The Social Construction of Technological Systems. New Directions in the Sociology and History of Technology*. Cambridge, Massachusetts & London: The MIT Press, 17-50.

Plato (c. 360 BC). *The Laws*. Translated by Benjamin Jowett.

Plato (c. 360 BC). *The Republic*. Translated by Benjamin Jowett.

Plato (c. 360 BC). *Timaeus*. Translated by Benjamin Jowett.

Poblocki, Kacper (2002). "Becoming-State: The Bio-Cultural Imperialism of Sid Meier's Civilization" in *Focaal – European Journal of Anthropology*, No. 39, 2002: pp. 163-177.

Poole, Steven (2000). *Trigger Happy: The Inner Life of Videogames*. London: Fourth Estate.

Postman, Neil (1992). *Technopoly: The Surrender of Culture to Technology*. New York: Knopf.

Poulsen, Kevin (2005). "Sims 2 hacks spread like viruses" in *SecurityFocus*. 6 January 2005.

Queen, Tiger (2005). "The Maple Market Crash — The Effects Of Hacking On A Virtual Economy" in *RPG Realm*.

Rehak, Bob (2003a). "Mapping the Bit Girl: Lara Croft and New Media Fandom" in *Information, Communication & Society* 6:4, 2003, 477-496.

Rehak, Bob (2003b). "Playing at Being: Psychoanalysis and the Avatar" in Mark J.P. Wolf & Bernard Perron (eds.) *The Video Game Theory Reader*. New York & London: Routledge (Taylor & Francis Group), 103-127.

Rheingold, Howard (1991). *Virtual Reality*. New York: Simon & Schuster.

Russel, Bertrand (1928). "Machines and the Emotions" in *Sceptical Essays*. New York & London: Routledge (Taylor & Francis Group).

Ryan, Marie-Laure (1991). *Possible Worlds, Artificial Intelligence, and Narrative Theory*. Bloomington: Indiana UP.

Ryan, Marie-Laure (1999). "Cyberspace, Virtuality, and the Text" in Marie-Laure Ryan (ed.) *Cyberspace Textuality: Computer Technology and Literary Theory*. Bloomington: Indiana University Press, 78-107.

Ryan, Marie-Laure (2001a). *Narrative as Virtual Reality: Immersion and Interactivity in Literature and Electronic Media*. Baltimore and London: The John Hopkins University Press.

Ryan, Marie-Laure (2001b). "Beyond Myth and Metaphor -The Case of Narrative in Digital Media" in *Game Studies* 1/1, July 2001.

Ryan, Marie-Laure (2003). "On Defining Narrative Media" in *Image [&] Narrative* 6.

Ryan, Marie-Laure (2004a). "Introduction" in Marie-Laure Ryan, *Narrative across Media: Languages of Storytelling*. Lincoln, Nebraska: University of Nebraska Press, 1-40.

Ryan, Marie-Laure (2004b). "Will New Media Produce New Narratives?" in Marie-Laure Ryan, *Narrative across Media: Languages of Storytelling*. Lincoln, Nebraska: University of Nebraska Press, 337-359.

Saussure, Ferdinand de (1916). *Cours de la Linguistique Générale*.

Scheeres, Julia (2002). "Games Elevate Hate to Next Level" in *Wired*, 20 February 2002.

Schiller, Friedrich (1795). *Über die ästhetische Erziehung des Menschen*, 15th letter.

Schneider, Steven (2002). "The Paradox of Fiction" in *The Internet Encyclopedia of Philosophy*.

Sheridan, Thomas B. (1992). "Musings on Telepresence and Virtual Presence" in *Presence: Teleoperators and Virtual Environments* Volume 1, Issue 1, Winter 1992.

Skow, John (1982). "Games That Play People" in *Time*. January 18, 1982, 51-58.

Smith, Roger (1999). "Simulation: The Engine Behind The Virtual World" in *Simulation 2000* series. http://www.modelbenders.com/papers/sim2000/SimulationEngine.PDF

Squire, Kurt (2002). "Cultural Framing of Computer/Video Games" in *Game Studies* Volume 2, Issue 1, July 2002.

Sutton-Smith, Brian (1997). *The Ambiguity of Play*. Cambridge, Massachusetts & London, England: 1997.

Tamborini, Ron (2000). "The Experience of Telepresence in Violent Video Games", paper presented at the 86th annual convention of the National Communication Association, Seattle, WA, November 8-12, 2000.

Taylor, Frederick (1911). *The Principles of Scientific Management*. New York: Harper and Bros.

Taylor, Laurie (2003). "When Seams Fall Apart: Video Game Space and the Player" in *Game Studies* volume 3, issue 2, December 2003.

Terdiman, Daniel (2004). "Virtual Trader Barely Misses Goal" in *Wired News*. 16 April 2004.

Tews, Rebecca R. (2001). "Archetypes on Acid: Video Games and Culture" in Mark J.P. Wolf (ed), *The Medium of the Video Game*, Austin: University of Texas Press, 169-182.

Theall, Donald (1971). "The Medium is the Rear View Mirror" in *Understanding McLuhan*. Montreal & London: McGill-Queen's University Press.

Turkle, Sherry (1984). *The Second Self: Computers and the Human Spirit*. New York: Simon and Schuster.

Turkle, Sherry (1995). *Life on the Screen: Identity in the Age of the Internet*. New York: Simon & Schuster.

Van Looy, Jan (2002). "Uneasy lies the head that wears a crown: interactivity and signification in Head Over Heels" in *Game Studies* volume 3, issue 2.

Van Looy, Jan (2004). "Jan Van Looy Responds to Simon Penny" in *Electronic Book Review*, June 2004.

Van Looy, Jan (2005). "Virtual Recentering: Computer Games and Possible Worlds Theory" in *Image [&] Narrative* 12, August 2005.

Van Looy, Jan & Baetens, Jan (2003). "Introduction: Close Reading Electronic Literature", in: Jan Van Looy & Jan Baetens (eds), *Close Reading New Media: Analyzing Electronic Literature*. Leuven: Universitaire Pers, 7-24.

Vorderer, Peter & Hartmann, Tilo & Klimmt, Cristoph (2003). "Explaining the Enjoyment of Playing Video Games. The Role of Competition" in *Proceedings of the second international conference on Entertainment computing.*

Waelder, Robert. (1933). "The psychoanalytic theory of play." *Psychoanalytic Quarterly* 2: 208-222.

Walton, Kendall L (1990). *Mimesis as Make-Believe: On the Foundations of the Representational Arts*. Cambridge, Massachusetts & London, England: Harvard University Press.

Weizenbaum, Joseph (1976). *Computer Power and Human Reason: From Judgement to Calculation*. San Francisco: W. H. Freeman.

Wessely, Christian. *Von Star Wars, Ultima und Doom: Mythologische verschleierte Gewaltmechanismen im kommerziellen Film und in Computerrollenspielen*. Frankfurt am Main: Lang, 1997.

Wiener, Norbert (1948). *Cybernetics; or, Control and Communication in the Animal and the Machine*. New York: Technology Press.

Williams, Dmitri (2003). "The Video Game Lightning Rod: Constructions of a New Media Technology, 1970-2000" in *Information, Communication & Society* 6:4, 523-550.

Williams, Raymond (1958). *Culture and Society 1780-1950 . London: Chatto & Windus.*

Williams, Raymond (1974). *Television: Technology and Cultural Form*. London: Fontana/Collins.

Williams, Robin & Edge, David (1996). "The social shaping of technology" in Research Policy 25 (1996), 865-899.

Winston, Brian (1986). *Misunderstanding Media*. London & New York: Routledge & Kegan Paul.

Wittgenstein, Ludwig; transl. by G. E. M. Anscombe (1953). *Philosophical Investigations*. Oxford: Blackwell.

WND (2003). "Trouble in the Holy Land" in *WorldNetDaily*. 3 march 2003.
Wolf, Mark J.P. (2001a). "The Video Game as a Medium" in Mark J.P. Wolf (ed), *The Medium of the Video Game*, Austin: University of Texas Press, 13-33.
Wolf, Mark J.P. (2001b). "Space in the Video Game" in Mark J.P. Wolf (ed), *The Medium of the Video Game*, Austin: University of Texas Press, 51-75.
Wright, Will (2005). "Interview with Will Wright by Keith Phipps" in *The Onion A.V. Club*.

Appendix: Full List of Contents

Contents.....3
Introduction.....7
Home Together.....9
The Pied Piper.....12
The Artful Dodger.....15
Objectives.....17
Method.....19
Overview.....20
I. Culture and Technology.....25
1. Computer Games as Interactive Text.....29
Interactivity.....31
Participation.....33
Hypertext.....35
Cybertext.....37
Ergodics.....41
2. Computer Games as New Media.....44
Remediation.....44
Lingua Media.....46
3. Computer Games as Cultural Form.....49
Technology Giveth and Technology Taketh Away.....53
Resistance Is Futile.....54
A Constructivist Alternative.....56
Media Determinism.....59
Media Constructivism.....60
Constructivist Game Studies.....61
Cultural Context.....64
Mirror, Mirror, on the Wall.....66
II. Computer Simulation.....69
1. Mathematical Modeling.....72
Definition.....74
Mechanics.....75
Application.....77
Design.....79
Emergent Play.....82
Emergent Narrative.....85
2. Modeling Thought.....88
The Imitation Game.....89
The Chinese Room.....90
Emergent Intelligence.....92
Deus ex machina.....95
3. Modeling and Interpretation.....98

Fictional Simulation....100
Message in a Throttle....101
War is Peace....104
A Material World....106
Playing Propaganda....108
4. Modeling and Culture....111
Measuring the World....113
The Prison House of Quantification....116
Hyperreality....118
III. VIRTUAL ONTOLOGY....123
1. Analyzing the Virtual....125
Becoming Virtual....127
Persistent Worlds....129
The Quest for Growth....130
Land of Milk and Honey....133
2. The Virtual as a Possible World....136
Fiction as Possibility....138
Have Theory, Will Travel....141
Simulation as Possibility....143
Multiplicity and Introjection....144
Contagion....146
Cheating and Hacking....148
3. The Virtual as Mimesis....151
Mimesis and Play....153
Props, Prompters and Objects of Imagining....154
Associations, Conventions and Rules....157
Mimesis and Truth....160
Fiction and Non-Fiction....163
Imagining as Coping with Reality....167
Subjective Imagining as Coping with the Self....168
Mimetic Economy....170
IV. SIMULATING A SELF....173
Role-playing and Representation....181
Transcendental Unity....183
2. Playing God....186
If God Was One of Us....188
Cyberspace Race....191
When Stripes Became Stars....192
Leisure Suit Lara....195
Interventionist God....197
Hybrid Forms....200
3. Point of View....203
Modeling a World....204

A Third Dimension....207
Modeling a Self....210
First-Person Point of View....212
Modeling a Camera....214
Mobile Cams....217
Embrace and Extend....219
Concluding Remarks....220
V. The Purpose of Play....223
1. Playing as Coping with Reality....229
Cultural Selection....230
Rehearsal and Negotiation....232
Wielding the World....234
Let's Pretend....235
2. Gaming as Coping with Competition....238
Narrative Conflict....238
Ludic Conflict....240
The Perfect Mirror....243
Mastering the Matrix....245
Anxiety and Control....247
Vicarious Thrills....249
Coping in Culture....251
Media Cited....255
Publications Cited....261
Appendix: Full List of Contents....269