

**School of Media, Culture, and Creative Arts
Department of Communication and Cultural Studies**

**Techno-Historical Limits of the Interface:
the Performance of Interactive Narrative Experiences**

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Declaration

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

This thesis contains no material that has been accepted for the award of any other degree or diploma in any university.

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Abstract

This thesis takes the position that current analyses of digitally mediated interactive experiences that include narrative elements often lack adequate consideration of the technical and historical contexts of their production.

From this position, this thesis asks the question: how is the reader/player/user's participation in interactive narrative experiences (such as hypertext fiction, interactive fiction, computer games, and electronic art) influenced by the technical and historical limitations of the interface?

In order to investigate this question, this thesis develops a single methodology from relevant media and narrative theory, in order to facilitate a comparative analysis of well known exemplars from distinct categories of digitally mediated experiences. These exemplars are the interactive fiction Adventure, the interactive art work Osmose, the hypertext fiction Afternoon, a story, and the computer/video games Myst, Doom, Half Life and Everquest.

The main argument of this thesis is that the technical limits of new media experiences cause significant 'gaps' in the reader's experience of them, and that the cause of these gaps is the lack of a dedicated technology for new media, which instead 'borrows' technology from other fields. These gaps are overcome by a greater dependence upon the reader's cognitive abilities than other media forms. This greater dependence can be described as a 'performance' by the reader/player/user, utilising Eco's definition of an 'open' work (Eco 21).

This thesis further argues that the 'mimetic' and 'immersive' ambitions of current new media practice can increase these gaps, rather than overcoming them. The thesis also presents the case that these 'gaps' are often not caused by technical limits

in the present, but are oversights by the author/designers that have arisen as the product of a craft culture that has been subject to significant technical limitations in the past. Compromises that originally existed to overcome technical limits have become conventions of the reader/player/user's interactive literacy, even though these conventions impinge on the experience, and are no longer necessary because of subsequent technical advances. As a result, current new media users and designers now think of these limitations as natural.

This thesis concludes the argument by redefining 'immersion' as the investment the reader makes to overcome the gaps in an experience, and suggests that this investment is an important aspect of their performance of the work.

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Chapter Seven was published as “The Natural Languages of Immersion”. Sixth International Digital Arts and Culture Conference – Digital Experience, Design, Aesthetics, Practice. Ed. L. Klatrup, S. Tosca, R. Koskima and H. Sorensen. IT University of Copenhagen, 2005.

Introduction

Background and Motivation

In 1992, I made the transition from a career working exclusively in the field of practical production in the ‘old’ media of film and television to that of digital ‘new’ media. I bought a computer, learned a lot of software, and found myself in great commercial demand as a designer and programmer. CD-ROM was new, exciting, and difficult, and nobody except computer enthusiasts had even heard of the Internet. Every day was an exciting discovery of new techniques and applications for ‘interactive digital multimedia’ technologies in education and marketing. In 1996, sensing that the industry was stabilising and becoming less challenging, I took a job teaching and researching at a university. Almost immediately, I became involved in the production of an experimental interactive narrative, entitled Juvenate, with a principal funding grant from the Australian Film Commission, Australia's leading screen culture funding body. The project's main objective was to create a narrative experience that was ‘open’ in the sense described by Umberto Eco (Eco 21). In Eco's view, the ‘open work’ is one that needs the reader to make interpretations of their own to fulfil the meaning. The Juvenate project's ambition to create an ‘open’ work, and the realisations that resulted from it, ultimately led me to undertake this thesis.

Formally completed in February of 2001, Juvenate received significant exposure in fourteen international exhibitions, attracted critical acclaim in academic and craft journals (Esdaile), (Acevedo), and gained one national, and two international awards (‘Awards’). It has also been discussed by Marie-Laure Ryan in two publications: (Avatar of Story and Second Person: Role-Playing and Story in Games and Playable Media). While this recognition has been very satisfying for the members of the team, and it demonstrates that something about the project is appealing, it is not obvious exactly what the specific appeal of the project is. It was also clear from our direct observation of users’ experiences that the project has some significant problems engaging many individuals.

The theme of Juvenate is memory, illness, and rejuvenation. An intentionally evocative and unusual audio-visual style is employed, challenging the user to investigate and inquire. Imagery is constructed from photos of real objects, but the perspective is unnatural. Heavily textured with supersaturated colours and enhanced sounds, and a non-linear structure, it seeks to convey a dreamlike feel that the seriously ill often experience. Dialogue and text have largely been avoided, to enable the work to cross language barriers, as well as to require the user to make cognitive connections for themselves. An alternative interaction mode is used, moving away from the 'point and click' behaviour ingrained in most computer users' expectations. Instead, feedback is provided using a deliberately indefinite 'incrementing proximity' technique.

In the paper design phase, we thought that we were creating a narrative experience roughly equivalent to reading a short story. However, as the project neared completion, it became apparent that the navigation and interaction possibilities, the novel interaction mode, and the non-verbal/non-textual rendering, had created an experience of high cognitive demand. Juvenate turned out to be much more complex and cognitively stressful for the average user than the design team anticipated or intended. In use in an exhibition context, automatic tracking software logged several users spending up to 40 minutes in the experience, but many others abandoned it in less than a minute. Anecdotal evidence and direct observations suggest this huge variation is probably because the interactive experience did not behave as many users expected it to, being neither game-like nor story-like.

This made clear to me that all such innovative or experimental works are made by real people who, in negotiating the problems of their own experience, motivation, skills and technological limitations, may make design choices without real awareness of, or control over, the effects. The Juvenate project, like all new media experiences, had the additional complexity of being dependant on digital technology for its creation, delivery and interactive character. This interactive aspect highlights the issue of the interface between the work and the reader, which all interaction requires.

In beginning this study, I hoped to shed more light on why our application of Eco's notion of the 'open' work had produced such unexpected and undesirable effects in Juvenate. The need to answer this question signalled the need for more detailed analysis of the practical workings of specific, designed interactive media experiences, particularly of those works that have narrative elements, and that offer some new interaction or interface development to the user. Thus, the overall Juvenate project experience posed the question that this thesis investigates: how is the reader/player/user's participation in interactive narrative experiences (such as hypertext fiction, interactive fiction, computer games, and electronic art) influenced by the technical limits of the interface with the experience?

Comparisons Across Categories

This thesis explicitly seeks to examine works from a broad range of 'new media' categories: hypertext fiction, interactive fiction, games and art. There are three immediate reasons for this.

Firstly, my own experience with the Juvenate project is an example of a work that is not a hypertext, nor a game, and certainly not a narrative by the standards of conventional literature. It is reasonable to expect that innovation and evolution will produce works that are outside any of these categories. To analyse interactive experiences only by narrow classification runs the risk that new forms will be unstudied. It seems very unwise to exclude experiments, deviations and new developments from consideration.

Secondly, many of the important works studied here do not fit into categories in a simple way. Indeed, in some cases, the definitions used to categorise them often did not exist at the time the work was created, and the work may sit comfortably inside several categories simultaneously, for example, Adventure. On the other hand, there can be vast differences between works inside a single category; for example, Myst and Doom are both games, and although they have many similarities, they also have great differences.

Thirdly, all of these works have in common the extremely important defining feature that they are all intended to provide a satisfying experience to their reader/player/users. In this respect they are directly comparable, regardless of ‘category’, and the comparison may be very revealing.

Why so many games?

Of the seven specific works analysed in detail in this thesis, four or five fall easily into the category of ‘games’, and there are three main reasons for this bias.

Firstly, the proportion of games reasonably reflects the prevalence of games in the current media landscape, relative to other digitally mediated experiences that include narrative aspects. Secondly, the implementation of games is extremely demanding in both a creative and technical sense, and games have therefore made a large impact on the craft traditions of new media. The third reason is that the very definition of games has been quite vague and broad, and this remains the case today, especially in regard to games that are innovative, or have an educational, political or artistic intention. Thus, the interactive media works deemed to be particularly useful for analysis in this study have often been chosen from the category of ‘games’.

Narrative

The thesis question also specifically addresses ‘narrative experiences’. My own production experience demonstrates to me that designers of new media often intended to produce a specific narrative experience, or utilise narrative aspects (character, actions, settings, sequence). Of course, the presence of narrative elements does not necessarily mean a specific storyline with beginning, middle and end is to be found, and even if it is, it may not be the main pleasure the designer of the experience intends, or that the user takes from the experience. However, it is acknowledged that many interactive experiences have explicit aspects of narrative (Ryan, ‘Beyond Myth’).

A long running point of debate in the area of interactive media design and analysis is that of the apparent conflict between narrative on one hand, and interactivity on the other (Heide Smith, ‘Stories’ 11). With reference to games specifically, this was manifested in the ‘game vs narrative’ debate, with ludologists (those whose approach

is predicated on the notion of games as ‘play’) on one side and narratologists (for whom new media works are presumed to contain a discernable narrative structure) on the other.

Narratology is an obvious method of analysis for works containing narrative elements, as long as over-simplifications such as categorising works as either narrative or non-narrative, placing them on a sliding scale between these two extremes, or simply de-constructing them and categorising the components, are resisted. To dismiss narrative approaches to the analysis of a work because a clear plot line is absent, or because the particular example of a work is in that loose category called ‘games’, is to miss the opportunity to explore and compare.

Indeed, the ‘game vs narrative’ debate, while having had the attention of many notable scholars (for example: Aarseth, Eskelinen, Heide Smith, Zimmerman) is of less significance to actual game designers and players, for whom there is no conflict between game and narrative. Many games include a variety of narrative and play elements in a range of functioning (if not always perfectly harmonious) combinations.

Value of this Research

The ‘digital 1990s’ saw the very widespread emergence of ‘new media’ production and consumption. This was particularly obvious in spectacular film and television special effects. However, the explosion in personal, interactive media has arguably been much more significant.

Perhaps the two most obvious examples of interactive new media are the Internet (and its various uses), and computer/video games. Video games have been a serious business since the 1970s, and prominent examples are Pong (1972), Space Invaders (1978) and Pacman (1979). However, it was the development of ever more powerful arcade and console game systems during the 1980s and 90s that propelled games to become a massive global industry. Titles such as Mario Bros (1983) and Sonic the Hedgehog (1991) gained the attention of both the popular press and academic

theorists. This interest was accelerated from the mid 1990s by the widespread use of powerful personal computers, especially in conjunction with the Internet.

New media experiences are already of enormous importance to modern society, in both economic and cultural terms. By 2004, the economic size of the computer games industry had reportedly come to rival, or even overtake, the box office take of first release movies (Yi) (Hill), not to mention that there is an increasingly obvious and rapid exchange of specific intellectual property and overall aesthetics between the 'old' and 'new' media, for example, Tomb Raider. The Internet has also become an extremely important economic and social/cultural forum, with 5-10% of all advertising revenues on-line by 2007 (Allen). An estimated one hundred million people regularly use a 'social networking' tool of some kind (Freiert), and approximately 1.3 billion people daily use e-mail and web browsers (InternetWorldStats). Since the mid 1990s, a significant proportion of games activity has also become Internet dependant.

Because the area of digitally manifested media has developed so rapidly, and the history of games is now significantly long (Järvinen) (Kent, Ultimate History) (Curran), there is a real danger that the technical limitations of earlier and current experiences might be overlooked by some scholars. The issue of the technical limits of a game have been noted by authors in the area (Newman 84), and descriptions of the techno-historical implications of new media systems from a scholarly perspective do exist (Bogost and Montfort). However, those who are not familiar with the difficult practical aspects of interactive media creation, or who have not studied/had first hand experience of earlier examples, may be unaware of this important context. In particular, scholars with backgrounds in more generalised cultural/media studies, film and television, and art, may not have this critical perspective. The rationale for such a detailed understanding of the technical craft history of new media has already been made (Montfort, 'Combat').

This knowledge is important for appropriate and successful practical development, and also for theorists, scholars and critics to have a meaningful understanding of what they are studying. This thesis attempts a contribution to fulfilling this need.

Methodology

This thesis utilises an approach that:

- Establishes the practical problems that have shaped the nature of interactive media experiences.
- Does not value one type of application/experience over another, for example, games over literature.
- Can accurately identify narrative aspects, without reducing the sum of the experience to merely its component parts.
- Can address very different types of interactive experiences, for example, a game and an artwork, at the same time, and make a useful comparison of them.

I have chosen to utilise the narratological approach of Mieke Bal (Bal, ‘Visual Narrative’). Bal’s work shows the value of applying narratological analysis to constructed artefacts of any kind that do not appear to have any obvious narrative aspects. Bal’s approach is modified for the purposes of this thesis with the introduction of ideas from Marshall McLuhan, Brenda Laurel, Espen Aarseth, Nathan Shredroff, and Marie-Laure Ryan. The specific detail of the development of this theoretical combination, and the practical application of it, are discussed in Chapter Two: Methods.

Definitions

Because this thesis deliberately sets out to compare cultural artefacts that are currently considered different from one another, and because this thesis also uses a methodology that draws on various theoretical approaches, particular care has been taken in the way key terms are defined and deployed.

Experience – This term is used to describe an individual’s cumulative intellectual, emotional and physical perspective on their encounter with a specific work. This is distinct from the designer’s intention for the work, or the physical or audio-visual manifestation of the work. This definition is drawn from the work of Nathan Shredroff, especially as described in the book Experience Design.

Immersion – Immersion is a state in which a reader/player/user is pre-occupied with their current experience to the exclusion of other thoughts – a definition drawn from Ryan (Ryan, Narrative), Laurel (Laurel, Computers), and others.

Interactive - As has been observed (Aarseth, Cybertexts 103), this is a word that is used in so many different ways as to almost be meaningless. When used in this thesis, it will have a very simple meaning: that the reader must make some choice or other input to progress the experience, and must then implement this choice by a physical gesture, however large or small. Aarseth adopts the term ‘ergodic’ to describe texts which are interactive in this way (Aarseth, Cybertexts 1). Thus, reading a book is not ‘interactive’, since while the reader must turn the pages, they are not choosing the order or otherwise affecting the way in which the experience occurs for them. Watching a movie is also not interactive for the purposes of this thesis, since the viewer is neither making choices, nor physically involved. It is accepted, of course, that much is going on inside the reader’s head while reading a book or watching a movie, and this aspect of interactivity is covered in the definition of ‘Performance’.

Mimetic – This thesis uses the term ‘mimetic’ to describe the extent to which a virtual world resembles a real one. This is adopted from the most basic definition of ‘mimetic’: ‘to copy or imitate closely, to resemble closely’ (Hughes, Michell and Ramson 716). This characteristic is discussed in detail in Chapter Six, in relation to notions of immersion.

Narrative – A ‘narrative’ work in this thesis is one in which there is the potential for a story line to occur, or even for an experience to be recounted. This notion is derived from the work of Marie-Laure Ryan, and will be more fully discussed in Chapter Two. This definition allows almost any experience, such as a walk through a

building, to be described as a ‘narrative’. This is appropriate for the objectives of this study, since it specifically addresses works with highly varying narrative components.

Performance – One of the most obvious differences between old and new media is the aspect of the reader/player/user’s obvious physical, gestural interactivity with a work, or with the interface to the work. The term ‘performance’ will certainly encompass this physical, tactile aspect of the reader/player/user’s engagement, but will also be used to include the non-obvious, cognitive interaction that occurs, following Eco’s 1989 definition of an ‘open’ work, as one produced through ‘a personal performance’ (Eco 21).

Reader, Player and User – A number of terms have been proposed to reflect the more active role played by an individual in a new media experience, and many scholars have debated which of these is a preferable (Walker, ‘Fiction’ 16). I have adopted the general term ‘reader’ from cultural studies, since I am drawing upon much theoretical work from that field. I will also use the terms ‘user’, ‘player’, ‘gamer’, ‘audience’, ‘viewer’ and even ‘immersant’, when referring to specific works whose context already provides a specific term for the ‘reader’. I use the term ‘reader/player/user’ when describing diverse works together.

Techno-Historical – This term is coined by this thesis to describe the technical limits at the particular time of the creation of a specific ‘new media’ work. ‘Techno-historical’ embodies an awareness of the underlying fundamental technical principals and limitations of digital media, and also the changing capabilities of digital means of rendering as they have developed over time, a process that was particularly fast during the 1990s. Chapters Three and Four demonstrate how techno-historical limits operate on both the audio-visual rendering and artificial intelligence capacity of interactive experiences generally. This is very important to the question of this thesis, which investigates the impact of the technical limits of the interface on reader/player/users when they ‘perform’ a work.

Text/Work – These terms are used to describe the physically and audio-visually manifested artefact that a person encounters with their senses. These terms are

derived from their use in cultural, literary and art studies. These terms will also be inter-changed with words such as ‘game’, ‘book’, ‘artwork’, ‘interactive fiction’, etc, where these are contextually more appropriate.

Limitations

This section outlines the limitations on this research of which I am aware.

Readers of this study may notice a sense of admiration in my descriptions of the works studied here. There is no question that this arises from my own experience as a maker of media, and specifically, interactive media. I have also been a curator of international exhibitions that incorporated digital media works. My significant experience of the real world imperatives of overcoming the problems of new media production to ‘deliver on time’ gives me an insight into the construction of these works. This in turn has given me a genuine sense of admiration for the skill and care with which all of the works described in this thesis have been produced. Of course, this does not blind me to the constraints on these works, and indeed the purpose of this thesis is to investigate those constraints. I feel that my practical design background is a useful part of the methods I apply to this study.

Every study has its limits of time and other resources. Thus, the seven works that I am studying in detail are a very small part of the range of experimental, art and entertainment offerings that make up the history and current practice of digitally mediated culture. In describing ‘the unwritable histories of media’ in the preface to [Snap To Grid](#), Peter Lunenfeld says: “In hindsight, some of these works will be seen as the definitive steps towards the dominant operating paradigm, others will be classified within the vector of the avant-garde, and huge amounts will simply be ignored because it slots into none of the official narratives” (Lunenfeld ix).

A limitation of this study is that I have chosen only seven works to analyse, which of course means that many styles, genres, movements and techniques are not represented. With games in particular, the range of offerings is immense, and important movements, styles and periods of history are completely unrepresented here. For example, there are no arcade games, no games specific to consoles, and no

games (or any new media works at all) that were produced outside of North America. This would seem to ignore the very significant aesthetic and technical influence of Japanese culture on global games. Classic mainstream Japanese games, such as the Metal Gear series by Hideo Kojima, or the alternative gameplay and aesthetics of innovative games such as Rez and Katamari Damacy, would have been suitable for this study, but every project has limits of time and space.

In the same way that Japanese games are not represented, this thesis also seems to ignore the significant new media art practice of both Europe and Australia. Of course, I am aware of both of these phenomena, and they are worthy of both celebration and analysis, but they simply cannot be included in the resources available to this study. I do make reference to other works in less detail, partly for comparative purposes, but also to try and draw at least a crude sketch of the wealth of material in new media beyond the specific works studied here.

Further, this study does not attempt to address the burgeoning ‘social’, ‘network’ or ‘convergent media’ phenomenon that includes blogs, but also ‘aggregation’ software such as ‘Facebook’ and ‘MySpace’, and which now use mobile phones as well as the Internet as a platform. The networking, social and narrative consequences and opportunities of the Internet are enormous, but once again, outside the limits of this study.

Finally, I am a white, middle class man, raised exclusively in westernised, English speaking countries, and I speak only English. While I believe I have a balanced and open-minded view of the world, this study may be subject to unconscious biases and limits other than those I have mentioned here.

Structure of the Thesis

This thesis has four distinct parts. The first is made up of the Introduction, Literature Review and Methodology chapters. The Introduction outlines my motivation for this study, which finds expression as the main question of the thesis: how is the reader/player/user's participation in interactive narrative experiences influenced by the technical limits of the interface with the experience. The Literature Review

describes the relevant theory and research on narrative, interactivity and performance. It also argues that discussion around new media has been strongly influenced by notions of ‘interactive narrative’ and ‘unmediated immersion’ that are often drawn from science fiction, rather than from practical working examples. I have described these together as new media’s ‘Holodeck Ideal’, and adopted it as a reference point for the developing argument of this thesis. To investigate the main question, the Methods chapter develops an approach particularly appropriate to the comparative analysis of a wide range of digitally mediated experiences. This approach is a blend of traditional structuralist, literary and new media theory. Specifically, Bal’s approach to narratology is expanded using aspects of the work of Eco, Ryan and Shredroff.

In the second part of the thesis, three chapters (Three, Four and Five) establish a techno-historical context for the comparative analysis of author-reader contributions for all of the works chosen for analysis. Chapter Three sets out a historical context for each of the works (Adventure, Osmose, Afternoon, a story, Myst, Doom, Half Life and Everquest), describing both the creative and technical aspects of their production. Chapter Four then undertakes a detailed comparison of two of the works, the computer games Myst and Doom, to demonstrate how ‘techno-historical’ limits operate on both the audio-visual rendering and artificial intelligence capacity of interactive experiences generally. Chapter Five demonstrates that ‘techno-historical’ limits also affect the physical interface of the works, as well as the audio-visual and artificial intelligence aspects identified in Chapter Four. This chapter further establishes that the common cause of all of these limits is a lack of a dedicated technology for new media, which instead is utilising ‘borrowed’ technology from other fields. A consequence of this borrowing is that many current new media users and designers think that these limitations are natural.

The third part of the thesis (Chapters Six, Seven and Eight) presents the main argument of the thesis: that new media suffers techno-historical limits due to a dependence on borrowed technology, and that these limits cause ‘gaps’ in the interface to specific works which are overcome by a greater dependence on the reader/player/user’s contribution to the interpretation of new media works than other media forms. Chapter Six presents the results of the application of the modified Bal

model to the works chosen for analysis, and finds that the works can be categorised according to patterns of contribution by their author/designers and reader/player/users. These categories are Highly Realised, Highly Undetermined, and Significant User Contribution. These patterns shed light on the unique way in which each work overcomes the techno-historical limits identified in Chapter Four and Five, and accounts for the outstanding characteristics of each work found in Chapter Three. Acknowledging that the theoretical 'Text' level of the works equate to their practical interfaces leads to the realisation that significant 'gaps' in the Text/interface of new media works are caused by the techno-historical limitations to the author's intentions for the work. The cognitive demands produced in overcoming these gaps are much greater than for linear media such as book and movies because the reader/player/user is simultaneously learning and/or overcoming the idiosyncrasies of the interface, interpreting the often low resolution images and sounds, and making decisions about what to do, where to go, how to respond. In the case of some computer games, this all has to be done very, very quickly. The fulfilment of this greater dependence can be described as a 'performance' by the reader/player/user, following Eco's definition of an 'open' work (Eco 21).

Chapter Seven continues to develop the argument by a detailed examination of how gaps actually manifest in specific works. This in turn leads to a distinction between the 'mimetic function' (the extent to which a virtual world resembles a real one) and 'immersion', a difference that is not clearly articulated in the field. I acknowledge that the area of interactive media design has been extremely skilful in developing techniques to overcome the lack of a dedicated technology. However, I also make the point that the accommodation of these limits has ultimately led to the broad community of designers accepting these limits as natural, and the inaccurate use of terminology. The works analysed in this thesis are placed on a 'mimetic scale' to demonstrate the difference between current works and the 'Holodeck Ideal'.

Chapter Eight is an examination of the phenomenon of 'immersion'. I extend the concept of 'natural language' to include the cognitive processes used by reader/player/users to perform any particular explicitly interactive work, and therefore re-described it as 'interface language'. This exploration leads to the conclusion that there is no 'natural language' of interaction with the interfaces that

new media works present to an individual, only ‘familiar interaction languages’. I then review various notions of ‘immersion’ that are prevalent in current game, art and design theory/analysis, and identify that there are a huge range of influencing factors that impact on any one person’s ‘immersion’ experience. This chapter concludes by offering a re-definition of ‘immersion’ as something that is demanded by an experience, not produced by it. This preparedness and competency to become immersed is the readers/players/user’s investment in an experience. The reader/player/user must achieve immersion to create the space where the game is played or the text read, the experience had, and the pleasure taken.

The fourth section, Chapter Nine, is presented as a postscript to the main argument of this thesis. It considers why we don’t have ‘mimetic immersion’ virtual reality systems that would fulfil the ‘Holodeck Ideal’ employed by this thesis as a reference point. It explores what changes might have to occur in society and culture for ‘Holodeck Ideal’ virtual reality systems to come about, considers what such systems might be like, and whether or not they are actually necessary.

Chapter One: Literature Review

This chapter describes relevant theory and research on interactivity, performance, narrative, immersion and interface – the key concepts of the research question and of the argument of this thesis. It also identifies that a characteristic of new media theory is that it has been strongly influenced by notions of ‘interactive narrative’ and ‘unmediated immersion’ that are often drawn from science fiction, rather than from practical working examples. I have described these together as new media’s ‘Holodeck Ideal’, and adopted it as a reference point for the developing argument of this thesis.

Interactivity and Performance

In the 1980s and early 1990s, Ascott, Negreonte and other theorists anticipated a fundamental culture shift in the late twentieth century in the way media works are generated and consumed. This shift moved away from fixed texts with linear narrative that were generated by producers, towards the various processes by which both producers and consumers constructed the texts. Content gave way to context, reception became negotiation, and representation become construction (Ascott, Reframing).

This shift occurred during the mid 1990s, as hypertext, the internet, interactive art, and games became much more part of everyday life, a phenomenon that came to be known as ‘new media’. The scholarly analysis of this phenomenon was confronted with issues such as the accurate definition of commonly used terms and the development of a specialised vocabulary. ‘Hypermedia’, ‘multimedia’, ‘virtual reality’, ‘virtual environments’, and ‘interactive cinema’ are examples of terms commonly used with no clear definition or qualification (Davenport). Each of these

terms suggested some particular bias, predicated on a media type or technology of delivery. Many theorists in the field made the point that the relationship between ‘old media’ and ‘new media’ and their producers and consumers was not well understood (Douglas) (Murray) (Tribe). Manovich, among others, pointed out that commonly used terms such as ‘interactive’, ‘digital’ and ‘virtual reality’ are meaningless without qualification (Manovich 12). Indeed, the primary issue for the new field of study was a lack of a theoretical terminology that was not drawn from pre-existing and established fields of study. Central to this discussion was the problem of how to account for the most obvious aspect of new media, that of ‘interactivity’.

The notion of ‘performance’ by the audience in the interpretation of art works had existed well before the 1990s (Marranca and Dasgupta). For example, the interactive role of the audience had long been recognized in the study of art, Duchamp declaring in the 1940s that ‘the spectator makes the picture’ (Paz 85). The term ‘performance’ was also used by Eco in his description of the ‘open work’: “*Every work of art...is effectively open to a virtually unlimited range of possible readings, each of which causes the work to acquire new vitality in terms of one particular taste, or perspective, or personal performance*” (Eco 21) (note: italics are Eco's).

Of course, the issue of the ‘author function’ as opposed to the ‘reader function’ had also been the subject of study in literary and narrative theory long before digital technologies emerged, and convincingly expressed in Roland Barthes’ 1967 ‘Death of the Author’ essay (Barthes 6).

Barthes’ concept of the ‘author function’ seemed to find literal expression in the potential of interactive media. Hypertext theory emerged in response to the earliest manifestations of clickable, linkable text in the late 1980s, and developed rapidly in the early 1990s, perhaps most notably in the work of Hayles (1984), Bolter and Joyce (1987), Landow (1992), Coover (1992), Moulthrop (1993) and Douglas (1994). Hypertext theory has the intersection of digital technology and traditional literary studies as its departure point, and significant work has been done in applying it to the study of interactive narrative. Also, hypertext theory has largely accommodated the frequent absence of closure or resolution in interactive texts, as well as the presence

of multiple and alternate plot lines. Thus, hypertext theory seemed a very relevant tool for the analysis of all new media works.

However, the application of methods developed specifically for other media to new media experiences has been described as ‘theoretical imperialism’ by Aarseth (Cybertext 16). Some critics, like Sean Burke, warned of the pitfalls of early theoretical approaches, saying that ‘digital arguments tend to draw upon the most vulgar and vulgarised tenets of post-structuralism’, and suggesting that there was too literal an application of Barthes’ notion of the ‘Death of the Author’ (Burke 237). Thus, critics risked applying methods that were unable to account for certain aspects of new media such as interactivity or the effects of new technologies, or that might have even excluded some new media works from consideration altogether (Aarseth, Aporia). For example, Espen Aarseth has noted reluctance on the part of hypertext theorists to study non-text works (Cybertext). In more than one case, the analysis of new media was factually inaccurate, and specific examples of such cases are documented by Montfort (Twisty 9).

In 1997 Aarseth published Cybertext: Perspectives on Ergodic Literature. Aarseth’s work has significantly informed the debate about the specific nature of the participant’s role in interactive works of all kinds. Aarseth defined as ergodic literature, that which requires significant participation and effort by the reader, and noted that the majority of such experiences are in digital form. His book explored the complexities of drawing distinctions between different kinds of texts, including those that are text-only (alphanumeric symbols) in print form, those that are text-only but digitally mediated, and those digitally mediated works that include audio-visual media. Significantly, Aarseth’s work established that explicitly interactive/digitally mediated works could be accounted for inside a framework that also dealt with non-interactive/non-digitally mediated works. He also made a distinction between the actual means of physically recording the media of a work (‘textons’) and the manifestation of that media to the reader/player/user (‘scriptons’). This distinction is relevant to this thesis in that it makes it possible to address the issue of the technical limits of the creation and manifestation of new media works.

Aarseth has also identified the process of ‘epiphany’ that allows a reader’s experience of a work to be satisfying, even though they may not have experienced every possible, or intended, element by the author (Aarseth Aporia 91). Aarseth’s work provides a detailed framework for understanding a broad range of interactive works, and takes into account the very complex relationship that exists between author, text and reader. Marie-Laure Ryan reflects this relationship in her own work, using terminology such as ‘engineered’ (Ryan, Narrative 46) to describe the author’s contribution, and ‘appreciator’ (19) for the reader. This shift in terminology positions the author’s role as a facilitator of the reader’s enactment, through the design of the work. Ryan describes three levels in a virtualised text (Ryan, Narrative 67). The first level is the text as written by the author. The second level is the text as presented or displayed to the reader, and the third level is the text as constructed (mentally) by the reader. She notes that while many potentials exist in this complex of levels, only some will be realised in a single interaction with a reader.

Both Aarseth’s and Ryan’s frameworks convincingly establish that there is a complex process of interpretation of the author’s work by the reader/player/user that may be both physically and cognitively interactive. This complex, individual interpretation can be called the ‘performance’ of the work by the reader/player/user. The term ‘performance’ has three advantages that make it an appropriate device for this thesis. First, the term avoids the implied simple, reductive binary of ‘interactive’ or ‘non-interactive’. Second, it indicates a complex, unique interpretation and experience for each reader/player/user. Third, the term ‘performance’ is utilised with essentially the same meaning in well established pre-new media literary theory, for example, Mieke Bal’s narratological notion of a work ‘implicating’ a reader to ‘enact’ a ‘performance’ (Bal, ‘Visual Narrative’). Thus, the use of the term ‘performance’ in new media theory maintains a strong continuity with existing narrative theory. This is very relevant to the present thesis, which seeks to investigate the workings of new media works with narrative elements.

Narrative and Games

One of the most conspicuous aspects of the new media phenomenon of the late 1980s and 1990s was the emergence of video games as a major popular pastime for both

children and adults. The popular and academic interest in games has created forums for discussions of direct relevance to this thesis, such as the Digital Games Research Association (DIGRA).

A significant debate that emerged in such forums in the late 1990s in the study of games was that of ‘ludology vs narratology’ (Eskelinen "Gaming"). The study of games without essential reference to other media and/or literary forms or theories became known as ‘ludology’, a term established in the field of video games by Frasca (1999) (2003). Those studying video games as a unique form adopted theories of play and games that predate the video game phenomenon. Both Huizinga (1955) and Callois (1961) developed categorisations of play, and later work has been done to identify in great detail a categorisation, or taxonomy, of play elements, types, and functions, for example Avedon (1971) and Redl, Gump and Sutton-Smith (1971).

On the other hand, researchers who felt that games were sufficiently like literature or cinema because of their narrative aspects were considered ‘narratologists’. Obvious narrative elements such as non-interactive ‘cut’ introduction and exposition sequences, or the presence of characters and plot lines, seemed to clearly call for explanations derived from narrative theory. In addition, some scholars felt that even when such obvious narrative elements were absent, the ‘rules’ structure of games could be understood as functioning to create narrative (Ang) (Jenkins “Game Design). In the ‘narratology versus ludology’ debate, Janet Murray’s book Hamlet on the Holodeck (1997) was seen as positioning her as a narratologist, and Aarseth’s Cybertexts: Perspectives on Ergodic Literature seemed to identify him as a ‘ludologist’. However, although the ‘narratology vs ludology’ debate refers exclusively to games, both Murray’s and Aarseth’s books specifically address non-game new media experiences as well as games. This capacity to address all kinds of new media experiences inside one framework is particularly important for the purposes of this thesis.

The structural origins of narratology are apparent in that it uses the difference between aspects and functions such as events, characters and time to understand how meaning is generated. It distinguishes between that which is presented to the reader as the plot and the chronological order of events in the underlying story.

Narratological models also use the term ‘focalisation’ to make subtle distinctions in the way the ‘presence’ and ‘point of view’ of the author, narrator and reader are manifest (Cobley). It has been criticised for being uninterested in the meaning of the texts it analyses, relative to poststructuralist approaches (Currie). This reductive, positivist tendency was identified very early on in the development of narratology by its own proponents (Rimmon-Kenan). Grodal has suggested that structuralist models assume structures within texts that may not be there (Grodal 14), and this is a good example of the potentially inappropriate effects that ludologists perceive may result from narratological analysis of games. Nevertheless, narratological approaches have the advantage of identifying the detail of how meaning is created (Culler). The more fruitful contemporary applications of narratology are in conjunction with other theoretical approaches, particularly in the context of reader-response theory (Bal, Narratology 11).

The investigation of the nexus of ludology and narratology has generated a rich body of work, and includes extensive discussion of important questions concerning the application of the label “narrative” and narrative theory to digital media works (Zimmerman) (Aarseth, "Quest") (Eskelinen, "Introduction").

The narratology versus ludology’ debate is now generally considered to be over, and even some of its most obvious combatants have said that it was mostly a war over terminology (Juul, Half-Real 171). The debate can be seen as a necessary process of games analysis generating enough separation from narrative studies to avoid being overwhelmed by the ‘theoretical imperialism’ identified by Aarseth. This has enabled ‘ludology’ to incorporate some aspects of conventional narrative studies while maintaining an emphasis on the ergodic aspects. While the debate was almost entirely confined to the study of games, it has great relevance to the purpose of this thesis, not only because so many of the works studied in this thesis are games, but because the outcome of the ‘ludology vs narratology’ debate is of importance to all new media studies.

However, this thesis does not approach its investigation from within the rich detail of the ludology vs narratology’ debate. The value of the ‘ludology vs narratology’ debate to this thesis is that its resolution established that new media has unique

aspects that demand interdisciplinary approaches, where no single school of thought dominates. It is now very common to find that scholarly analysis of new media includes a specific use of a narratological approach that is carefully modified with other theoretical tools to offset its limitations (Ryan, 'Beyond') (Walker, 'Fiction and Interaction') (Spoors), and this thesis adopts such a model to investigate its main question.

Immersion

Many successful new media works are described as 'immersive', both by their readers/players/users and scholars (Verburg) (McRobert). Recent literature in art and games analysis has convincingly demonstrated that 'immersion' is produced by a number of different factors, many of which operate simultaneously. Specific typologies of the components of immersion in games have been presented, and many of them agree quite directly with earlier observations made by game designers about what makes a 'good game' (McMahan) (Ermi and Mayra) (Newman 95).

However, there are often contradictory descriptions of immersive characteristics and techniques. For example, Loyall observes that '...for immersion to take place, the characters in the world need to seem real to the participant...' and that this effect could be produced by characters with strong personality traits (Loyall 7). On the other hand, Newman has identified that flat, uninteresting characters may increase the user's sense of involvement (Newman 132). This apparent conflict reveals the very wide range of ways and contexts in which the term 'immersion' is being used. Theorists often attempt to resolve this ambiguity by making distinctions between terms such as 'presence', 'challenge', 'pleasure', 'engagement' and 'gameplay' (Ermi and Mayra) (Douglas and Hargadon) (McMahan).

Both Janet Murray and Marie-Laure Ryan invoke literal water immersion when describing the ideal immersive experience, highlighting the challenge and novelty of being in a different environment as an important pleasure for the reader/player/user (Murray 99) (Marie-Laure Ryan, Narrative 11). Ryan also offers a broad definition

of an immersive text, suggesting that it must... “construct the settings for a potential narrative action, even though it may lack the temporal extension to develop this action into a plot” (Ryan, Narrative 94). In identifying the “lack of the temporal extension” in the text, Ryan acknowledges that it is the reader/player/user’s performance of the immersive work that brings about the fulfillment of the narrative aspect.

Also recognising the active role of the reader/player/user, work by Jesper Juul and others has convincingly defeated the idea that immersion is a trance, trap or delusion that could be induced or delivered by a video game, consuming the player to the point where they are unaware of the real world (Salen and Zimmerman) (Ermi and Mayra). Jesper Juul specifically points out that the apparent state of being ‘lost in a game world’ has often been confused with a player simply being absorbed with the real world activity of playing a game (Juul 162). This is an important point for this thesis, since it makes a distinction between the cognitive effort of managing the interface of the new media work and the pleasures of being in the virtual world described in the work.

It is also clear that reader/player/users of interactive experiences can and do exist simultaneously in several different levels of involvement, for example Juul’s concept of the ‘half real’ (Juul 2) and Salen and Zimmerman’s notion of ‘double consciousness’ (Salen and Zimmerman 452). Juul’s identification of the ‘half real’ nature of video games suggests that players are completely aware of the separate but co-dependant nature of the fictional world of the game and the playing of the game. Part of Juul’s model is the idea of ‘incoherence’ in fictional game worlds, where there is a lack of a unifying logic, the world is implausible, or cannot be imagined as a cohesive, logical entity (Juul). Juul suggests that this characteristic does not matter since the player’s ‘half-real’ engagement with the game does not depend upon real world credibility.

Ryan makes two particular observations about immersion that have clear relevance to the comparison of the works considered in this thesis. The first observation is that aesthetic pleasure is not the same as immersion, and that just because something is appreciated by a reader/player/user as beautiful, or beautifully crafted, does not mean it will bring about immersion (Ryan, Narrative 14). Ryan's second point is that readers are more likely to become immersed when the material they are reading is familiar to them (Ryan, Narrative 95). Both of these observations indicate a highly subjective valuation by a reader/player/user of any particular work, and so once again draw us back to a realisation that circumstances to do with the reader/player/user are at least as important as the characteristics of the specific new media work in the creation of immersion. This thesis will test and develop these notions of immersion, exploring the role immersion plays in the reader/player/user's performance of a new media work.

Interface

Human Computer Interaction was a well established discipline prior to the mainstream awareness of digital media, and it combines cognitive science with computer science in the design of interfaces, primarily for the use of computers as 'tools' in the work place (Preece). A particularly notable innovator in this area was Douglas Engelbart, who in 1968 demonstrated the button and mouse hardware and visual icons and menus systems that we still use today. However, Human Computer Interaction has suffered criticism for its technology and productivity focus, and design practitioners have argued for alternative approaches from non-digital design practice, such as Product Design and Architecture (Norman) (Lowgren) (Oritsland). Although Human Computer Interaction has always assumed that the reader/player/user's cognitive and physical contributions are critical to the overall experience, this is limited by the implicit presumption that interactivity is a recent consequence of, and only occurs with, digital technology, rather than being a pre-existing and separate human behavior (Beames).

Other models of the relationship of the individual to technology relevant to this thesis pre-date the digital era. Cybernetics is the study of complex engineered systems that incorporate internal feedback for their control, and has existed since at

least the 1940s (Heims). The term was originally intended to describe complex technological systems, rather than those involving people. However, in 1960 Manfred Clynes and Nathan Kline extended this notion and created the term 'cyborg' to describe a discrete system made of both a person and machine components that would operate on cybernetic principals (Grey 29).

While Clynes and Kline's work was scientific, the term 'cyborg' was quickly adopted into science-fiction usage (Kuhn). Unfortunately, in this usage, it generally lost the 'feedback' aspect of its 'cybernetic' origins, and came to be associated with either dystopian or utopian ideas about the relationship of technology to the human body. Academic Donna Haraway utilised the popular science fiction image of the cyborg in her 1985 essay A Cyborg Manifesto. While Haraway's approach is specifically socialist-feminist in motivation, her 'cyborg' has been broadly adopted as a useful theoretical metaphor for the human-machine interface. Haraway's work was preceded by the 1960s work of media theorist Marshal McLuhan, who considered that clothes, building, machines and roads were 'extensions of the human body' (McLuhan, Understanding Media 61.) His ideas described a very complex interaction between individuals, media and technology, in which all depended upon each other for function and meaning.

This approach articulates well with the notion of 'performance' that this thesis has adopted, in that it is non-reductive and accommodates consideration of a wide range of characteristics. The fulfillment of the efforts of both the author and the reader of any text is the reader's cognitive and emotional reaction, their making meaning. This fulfillment is personal and intangible. However, it is enabled by the literal, actual, audio-visual and physical elements of the interface to a work. Laurel points out that immersion is contributed to by the one to one correspondence of the virtual representation to the real world (Laurel, Computers). Salen and Zimmerman acknowledge that the rendering of an interactive experience is an important part of its engagement (Salen and Zimmerman). Others agree that the sensory aspect of the rendering, while not exclusively important, is a key part of the experience (Ermi and Mayra). Therefore, the interface itself must also be accommodated in the approaches of new media theorists.

Laurel highlights the importance of the manifestation of the literal interface to a new media work: “The underlying principle here is mimetic; that is, a human–computer experience is more nearly ‘first-person’ when the experience it represents unfolds in the appropriate sensory modalities. The intuitive correctness of this notion is witnessed by the directions of technical evolution in the area of simulators and games — towards higher-resolution graphics and faster animations, greater sound capabilities, motion platforms, and mimetic input devices like force-feedback controllers” (quoted in Meadows 162).

The mimetic potential of the audio-visual and physical interfaces of new media works, as well as the greater focus on the individual’s cognitive and emotional fulfillment requires the development of approaches that can accommodate the comparative analysis of designed experiences regardless of the technical characteristics of their interface. Nathan Shredroff describes ‘experience design’ as an approach to the creation of specific experiences in any medium (virtual and real), focusing on the reader/player/user’s response, rather than the production of a media or technology specific artifact (Shredroff). Shredroff’s approach brings new media works such as games and websites into the same framework as all other designed experiences such as architecture, art and music. Similarly, Mieke Bal’s narratological model, although it does not specifically address new media or digitally enabled works, does not exclude them, and thus allows them to be considered along with novels, visual art and architecture (Bal, ‘Visual Narrative’).

Although Shredroff and Bal, among others, have made the case that all experiences can be considered in relation to a single model, the interfaces to digitally mediated works do need some special consideration, as made clear by Lev Manovich: “Today the language of cultural interfaces is in its early stages, as was the language of cinema a hundred years ago. We do not know what the final result will be, or even if it will ever completely stabilize” (Manovich 93).

This dynamic situation is caused by the rapidly developing nature of the technology by which new media works are made possible, and this thesis adopts the approach of considering this techno-historical aspect as central to its question and argument.

Practice Perspective

Before new media came to either popular or broad academic attention, a practical, applied knowledge of the limitations and potentials of digital technologies had been appreciated and anticipated in art during the 1980s (Ascot, 'Planetary Collegium') (Popper). A significant international community of art and experimental media practice developed, and many of these art works explicitly or implicitly contain narrative elements. Forums such as Rhizome and Nettime record an ever-enlarging body of interactive new media art. Exhibition of new media art works with associated academic conferences have provided a direct link between the practice and academic analysis of new media art since at least 1979 (Ars Electronica). Trade/craft journals such as Wired Magazine and Leonardo provided (and still provide) a crossover between Human Computer Interaction, game design and new media art/experimentation. Such a cross-disciplinary approach was, and is, very common in the field of new media production, but is often absent from critical analysis, leading to shortcomings in observations (Montfort Twisty 9).

More researchers in the field now have a good deal of personal experience in the actual production of new media experiences, which gives them a practical perspective on new media that is often missing from broader analysis. For example, every member of the group blog Grand Text Auto (Flanagan, Mateas, Montfort, Rettburg, Stern and Wardrip-Fruin) is both a published scholar and has worked on multiple practical projects that have been made available to the public (Grand Theft Auto). Simon Penny's written and practical work have informed each other (Penny), and Marie-Laure Ryan has undertaken her own interactive work, and discussed the practical impact of software authoring tools (Ryan Avatar 148 - 181). Due to this appreciation, more recent theory has acknowledged that new media is not quite as new as has often been presumed by popular understanding, and considers the practical and written work by several early, notable practice based researchers to be important.

For example, Brenda Laurel was working in the mainstream of the game industry in the early 1980s, and has produced a series of books that challenged the limitations of specific fields such as human computer interaction, computer science, and the craft

of game design, including The Art of Human-Computer Interface Design (1990). Laurel identified the importance of a ‘theatrical’ approach to the design of interactive experiences in Computers As Theatre (1993). Her later work moves well beyond games into on-line communities and art/research, and thus provides a very wide perspective on new media. In particular, Laurel introduced ideas of engagement and agency as contributing to the construction of compelling interactive narrative experiences, beyond simple games, and these ideas are concisely summarised in Utopian Entrepreneur (2001).

In the same way, Chris Crawford’s experience at the coal-face of the early game industry gives his critique of games in general a powerful perspective, informing his views about the lack of innovation in gameplay in modern games. His published work in the field includes his 1984 The Art of Computer Game Design and the 2004 Chris Crawford on Interactive Storytelling. His work continues to be informed by practice, with his experimental Storytron interactive story-telling system in development since 1992 (Storytron).

The importance of considering the practical dimension when analysing games has been acknowledged in a series of books that address issue of both practical design and theory, perhaps most notably Richard Rouse’s Game Design: Theory and Practice (2001) and Katie Salen and Eric Zimmerman’s Rules of Play: Game Design Fundamentals (2003). Work that specifically addresses the ‘pre-history’ of what is usually considered new media (before the ‘digital 1990s’) is going some way to address this deficiency (Montfort and Bogost). These works acknowledge the often un-recognised importance of the development of the technical systems that support current new media, and this thesis will incorporate this practical appreciation into its methods.

Flexible Analytical Approaches

Analysis and criticism of interactive media has developed rapidly since the late 1990s. There has been an increase in the number of academic forums concerned with the scholarly discussion of new media. Examples are The Journal of New Media and Culture and Game Studies: The International Journal of Computer Game Research.

This level of increased interest can in part be attributed to the now almost complete ubiquity of digital technologies in ordinary lives. Virtual environments such as chat rooms, e-mail and computer games have made issues such as identity formation, manifestation and embodiment into practical concerns (Hayles). The discussion of new media (including the games phenomenon) has developed theoretical complexity, become more open minded, and less reductive. Analysis no longer responds merely to the newness of new media, instead debating analytical terminology and establishing the meaning of key terms. This work has addressed both the lack of a useful vocabulary, and the presumptions of pre-existing media theory.

For example, Katherine Hayles has examined the intimate relationship between humans and technology, notably in How We Became Posthuman. Ryan has examined the notion of immersion and embodiment in narrative experiences and 'possible worlds' as virtual reality for example, Narrative as Virtual Reality: Immersion and Interactivity in Literature and Electronic Media. Henry Jenkins' work presents digital media, and in particular video games, as demanding to be understood in the context of the whole of the modern media-scape. His recent book Convergence Culture: Where Old and New Media Collide continues the tradition of his earlier work that explores the social and cultural impact of all kinds of evolving media. Similarly, significant work has been written establishing the common, fundamental techniques of illusion and immersion in new media art and traditional art practice (Grau). These scholars, among others, have convincingly argued that the analysis of new media needs to be connected to an understanding of fundamental human behaviour, thus positioning both 'old' and 'new' media in the same frame for analysis. This thesis adopts this position, comparing different works because of their common link, the reader/player/user.

A notable feature of the maturing of new media theory has been the careful and deliberate incorporation of a broad range of views. For example, Noah Wardrip-Fruin and Pat Harrigan have edited two books in which a number of researchers from diverse backgrounds discuss each other's positions: First Person: New Media as Story, Performance, and Game in 2004, and Second Person: Role-playing and Story in Games and Playable Media in 2006. Similarly, apart from her own volume of work in the field, Marie-Laure Ryan has also edited two separate volumes

specifically addressing the need for cross-media theory: Cyberspace Textuality: Computer Technology and Literary Theory in 1999 and Narrative Across Media: The Languages of Storytelling in 2004.

More significantly, many of the researchers now conspicuous in the field are relatively young individuals, for whom digital media is not a recent novelty, but something that was a normal part of their adolescence, and as part of their everyday experience. They are able to adopt useful tools from conventional literature, cinema, human computer interaction or computer science, as well as the work done by earlier cross-disciplinary new media scholars, and apply these to current, recently emerged phenomena. For example, 'locative media' is the study of communicative, social and narrative potentials emerging from small, portable networked devices such as mobile phones (Flanagan). The study of 'social' and 'aggregative' software such as MySpace and Facebook is another example (Walker-Rettberg). Those who study new media are typically people who play games, use social networking media, enjoy new media art, and communicate everyday using the various virtual environments the internet facilitates. As such, their own, lived experiences of these phenomena inform their analysis of new media works.

Analysis of new media experiences now typically draws on a very wide variety of approaches, each developed to suit the specific new media manifestation they are studying. This is necessary due to the highly varied texts/works that are studied, the emerging media technology employed by these works, and the social uses to which they are applied. For example, Jill Walker's 2003 doctoral study Fiction and Interaction draws on aspects of narrative, ontology and depiction to develop a theory of 'ontological interaction' to enable the cross genre comparison of new media experience, comparing classic hypertext fiction, Internet experiences and installation art. Ian Bogost's 2006 book Unit Operations: An Approach to Videogame Criticism combines literary theory and information technology to produce a literary-technical theory that can be applied to videogames, and also to poetry, literature, cinema, or art. Keith Armstrong's 2002 PhD study Towards an Ecosophical Praxis of New Media Space Design combines practice based action research with contemporary ecological theories. In his 2005 study Meaning and Emotion in Squaresoft's Final Fantasy X, Glen Spours utilises theories of emotional response to the study of a

single computer game as it develops new versions over time, touching on the technical limits of various versions, and their impact on the narrative experience. These examples demonstrate the very wide range of new media works being examined, and the careful synthesis of theoretical perspectives being applied. In particular, scholarly analysis of new media often utilises a narratological approach that is modified with other theoretical tools to suit its specific purpose (Walker, 'Fiction and Interaction') (Spoors).

The 'Holodeck Ideal' of New Media

Varied approaches to research in new media are to be expected given the sheer complexity of new media works, their relative newness, the highly technical nature of the media and systems they depend upon, and the speed with which this technology is changing. This highly dynamic context does complicate the study of how the core elements of interactivity, immersion, interface and narrative combine to become a single new media work. This complexity caused practitioners and theorists to explore two separate, but often linked, possibilities during the 1980s and 1990s. The first possibility was that of 'interactive narrative', in which compellingly realistic artificial characters would interact with the user/player/reader in dynamically generated storylines (Laurel Computers 72). The second possibility was of 'unmediated immersion' of the senses in a 'Virtual Reality' so richly rendered for all of the five senses that it would be indistinguishable from the real world (Heim), that is, it would be genuinely mimetic.

These two ideals were explored by Janet Murray in her book Hamlet on the Holodeck: The Future of Narrative in Cyberspace (1997), using the (fictional) virtual reality simulator from the science fiction TV and movie series Star Trek as a model. While Murray used the Holodeck as a heuristic device to enable thinking around the topic of narrative in digitally enabled media, the Holodeck has also become an inspirational ideal, and even an objective, of some designers of virtual environments (Cavazza). But as the 1990s turned into the 21st century, the 'Holodeck Ideal' remained highly desirable, but still unattained (Manovich, cited by Meadows, back cover) (Laurel Computers 72) (Crawford in Wolf and Perron). This thesis adopts

both the theoretical and practical implications of the 'Holodeck Ideal' as a reference point for its developing argument.

The distance between the ideals of new media and its practical reality indicate the need to better understand the technical and historical limits of the literal, actual interface between the reader/player/user and the text/work. This interface is how the experience is actually made available to an individual, how it is manifested, or rendered. Because of the physically interactive nature of new media, the reader/player/user's role is not just in the intellectual construction of the meaning of the experience, but in the actual functioning of the interface mechanism. The reader/player/user is literally a part of the interface, and so a clearer, more detailed understanding of the workings of this overall mechanism is very important. New media works cannot be fully studied without an appreciation of this interface, and its limits. Thus, this thesis specifically addresses this issue with its main question: how is the reader/player/user's participation in interactive narrative experiences (such as hypertext fiction, interactive fiction, computer games, and electronic art) influenced by the techno-historical limits of the interface with the experience? Chapter Two describes the methodology developed to investigate this question.

Chapter Two: Methods

This chapter describes the overall methodology used to investigate the central question of this thesis: how is the reader/player/user's participation in interactive narrative experiences (such as hypertext fiction, interactive fiction, computer games, and electronic art) influenced by the technical limits of the interface to the experience? As outlined in the Introduction, and as identified in Chapter One, the methods of this research need to have four particular characteristics.

First, the methodology needs to incorporate a working appreciation of the practical problems that have shaped the nature of new media works at the time of their creation, which this thesis describes as the 'techno-historical' limits. Secondly, the methods need to be able to accurately identify narrative aspects in a single work without merely reducing the work to its component parts. Thirdly, the methods must have the capacity to usefully compare very different types of new media works. And finally, the methods must not consciously or unconsciously value one type of work or genre over another, for example, games over literature.

Although this thesis acknowledges the richness of scholarly work that has been undertaken in the area of ludology and narratology', it does not use this work as a particular reference for its methodology. The value of the 'ludology vs narratology' debate to this thesis is that its resolution established that new media has unique aspects that demand interdisciplinary approaches, where no single school of thought dominates. It is now very common to find that scholarly analysis of new media includes a specific use of a narratological approach that is carefully modified with other theoretical tools to offset its limitations (Ryan, 'Beyond') (Walker, 'Fiction and

Interaction’) (Spoors), and this thesis adopts such a model to investigate its main question.

An important aspect of the methods of this research is my own experience as both a designer of new media works, and as a reader/player/user of the specific works analysed. This particular perspective obviously informs my research, and I regard this as a positive characteristic. I have spent significant time ‘in’ all of the works studied in this thesis, as well as reading the accounts of others who have read/played/used them. However, I also apply a structured, empirical, narratological method for analysing each of these works. This has the value of drawing out similarities and differences, and also of balancing my own experiential analysis with a more formal one.

Thus, my overall approach is:

- To develop a structured, comparative analytical model from a blend of existing structuralist, literary and new media theory. Specifically, Bal’s approach to narratology is expanded using aspects of the work of Aarseth, Eco, Juul, Manovich, Ryan and Shredroff.
- To apply this model to the specific works which are the focus of this research, in order to derive key individual and common characteristics.
- To explore these characteristics with specific reference to the limitations of the interface on the reader/player/user’s engagement with the experience, particularly with regard to common notions of performance and immersion.

Structured Analytical Model

The case for the value of the use of some aspects of a structuralist approach in the analysis of new media experiences has already been well made (see Chapter One: Literature Review).

I have chosen the narratological model of Mieke Bal because of its adaptability to the purposes of this thesis. Most importantly, Bal utilises a concept of narrative in which a designed work ‘implicates’ the reader to ‘enact’ a ‘performance’ (Bal, ‘Visual Narrative’). This aligns with the performance and participation notions of new media theorists Marshall McLuhan, Brenda Laurel, Espen Aarseth and Marie-Laure Ryan.

Bal provides a detailed process for narratological analysis, with three specific aspects that make it particularly appropriate for this study. First, Bal describes narratology as a method that informs other, further theoretical processes, rather than as a process producing an end result of its own. Bal’s model explicitly accounts for the value of a structured narratological approach despite its reductive tendencies: “... reception-oriented theories of language and narrative have persuasively argued that it is the reader who 'makes' the meaning...But it is only once we know how a text is structured that the reader's share - and responsibility - can be clearly assessed.” (Bal, Narratology 11). Bal's approach is inherently designed to be interdisciplinary, and her own application of it has presented a convincing, practical demonstration of this in action. Thus with some modifications, Bal's model can work fruitfully with aspects of other approaches that have been specifically developed for the analysis of new media.

Secondly, Bal’s approach shows the value of applying narratological analysis to constructed artefacts that do not appear to have any explicit narrative aspects. Useful perspectives on their functioning will have been gained even if upon analysis they are found not to incorporate any ‘traditional’ narrative aspects. The outcome of narratological analysis is not limited to deciding to which ‘category’ or ‘genre’ of narrative an artefact belongs.

Thirdly, it can be applied to any constructed artefact, such as buildings and visual art, not just oral, literary or cinematic narrative works. This is obviously an advantage when considering non-literary, non-linear and non-time based works such as digitally mediated interactive experiences.

Bal's model separates a narrative work into three distinct (theoretical) levels for analysis. These levels are Fabula, Story and Text (it is worth noting that Bal’s use of

the term 'story' is at odds with other, similar narratological models, in which the term 'story' describes the level Bal identifies as 'fabula'. This can cause confusion for those who are already familiar with other models).

Fabula

The Fabula is a system of elements and the interaction that occurs between them. At this level, they do not yet have specific details or characteristics. The elements of the Fabula are Events, Actors, Time, and Location.

Six processes convert the Fabula into the Story.

Story

Events are arranged into a sequence, which can differ from the chronological sequence.

Actors are provided with distinct traits and transformed into characters.

The duration of events are determined, develop the characteristics of frequency and rhythm, and so Time is manifested.

The Locations where events happen are given distinct characteristics and become specific places.

Other relationships may be developed between elements of the fabula, for example, symbolic, allusive, traditional, etc.

Focalization is developed in which everything that can be seen by the reader must be presented from some particular point of view.

Narration develops this Story into a Text.

Text

The Text is the actual manifestation of the specific sign system that the reader/player/user actually experiences. This Text might be an art work, building, or book. The same Story could be encoded by narration into two different Texts, for example, a book and a movie. By identifying this level in this way, Bal's model removes the presumption so often found in narratology, and other narrative studies, that the specific sign system will be either written text, a still image, or cinematic. This is particularly important to this thesis since it allows the examination of the interface and its associated technological artefacts as distinct from the narrative elements. Bal's full model description includes detailed breakdowns of possible components in each level, functional relations of components and procedures for analysis of the interaction between the components.

Modification of the Model

In applying this model to interactive experiences such as electronic art, hypertext fiction and games, the most obvious modification that needs to be made is that of accounting for physical 'interactivity'.

Three Kinds of Interaction

Marie-Laure Ryan describes three levels in a virtualised text, in which many potentials exist, only some of which will be realised through interaction with a user (Ryan, Narrative, 67). First, the text as written by the author. Second, the text as presented or displayed to the reader. Third, the text as constructed (mentally) by the reader. This allows a practical definition of how a particular interactive work with such potentials might demand or allow the reader to engage in three different ways.

The first way involves the reader/player/user altering the way aspects of the text actually are (for example, character, settings, quality or style of visual rendering), before or during the 'reading'. The second way involves the reader/player/user responding to the options presented by the experience. The third way is the cognitive mental processes that occur in the reader/player/user's mind to make what they have perceived meaningful to them.

Clearly, not all interactive experiences involve the first type of interaction. It seems likely that most would require the second. It is difficult to conceive of a work that would function without the third, or else, of course, it would not have meaning.

The combination of these three ways of interacting allows this thesis a more detailed description of the ‘performance’ of the work by the reader/player/user, and this returns us to Bal's notion of a work ‘implicating’ a reader to ‘enact’ a ‘performance’ (Bal, ‘Visual Narrative’). The detail of Ryan’s first, second and third ways of interacting allow us to do detailed analysis, while keeping in mind that the reader is having a total, undivided experience that is their enactment of a performance.

Assessing Contributions: The Literal Application of Bal's Fabula, Story And Text

The processes that turn a Fabula into a Story and then into a specific Text are, in the case of a book or a film, most obviously the responsibility of the author of the work. A writer chooses a particular word, a film director composes a shot at a particular angle, and a film editor cuts a shot at a particular moment. Bal is careful to point out that in the creation of a book or movie, ‘neither authors nor readers proceed in this manner’, with regard to dividing the work into these three levels (Bal, Narratology 6). However, in application to explicitly interactive works, control over aspects of the three levels can be literally attributed to either the author or the reader by one of the three kinds of interaction. While authorial control must still exist over some aspects at some level in interactive experiences, it is also possible that the reader will decide how some things will be in each layer.

The Significance of Absence

It is also possible that no decision is made by anyone, that some aspects and processes of some of the three levels are ‘blank’, not attributable to either the author or the reader. This possibility may tell us that such an aspect is simply not important in the context of that particular work, or it may be that it is resolved or rendered not in the text, but in the reader's imagination in the third kind of interaction, its absence being both deliberate on the part of the author, and critically important to the

workings of the interactive experience. A large number of such aspects might reveal an ‘open work’ in Eco's terms (Eco 21).

The Significance of Non-significance

Most works will have a huge number of potential interactions between elements and aspects, and even more if we consider the reader's interaction with them. Bal's model provides a process for determining which aspects have the capacity to cause changes which are ‘significant’. However, there is significance in non-significant aspects or relationships, because they are still there, being interpreted by the reader. For example, there could many navigational choices, none of which actually changes the way the story finally resolves. However, analysis may reveal that these choices are engaging the reader for some other purpose. The significance of non-significance is that it raises specific questions about specific works. This aspect of the model will be addressed in more detail in Chapter Five: Comparisons.

The Interface in the Text

If a novel is reprinted, has a different cover illustration, is set in a different typeface, with a different grade of paper, it becomes a different Text. The cover illustration will convey a different impression. The typeface is the actual manifestation of the complex sign system the reader's eye sees. The corner of the page is certainly the physical, tactile control by which the reader makes progress, and the different grade of paper will feel and sound different during the page turn. By extension this implies that hardware and software, the computer keyboard, mouse, screen and Graphical User Interface of the operating system, or the virtual reality helmet, or the game console, must be part of the Text of the works. Maintaining the hardware and software interface in the Text level affords detailed examination of the impact and significance of the interface/media choices, and avoids them disappearing from our attention due to their familiarity. Of course, this aspect of the model is importance to the purpose of the topic of this particular research – the technical limitations of the works, which are manifested in the ‘Text’, the interface to the overall experience.

The Fourth Level: Experience

The ultimate fulfilment of the efforts of both the author and the reader of any text is the third kind of interaction noted above, the reader's cognitive and emotional

reaction, their making-meaning. This is the personal and intangible outcome of a reader's encounter with any text, be it verbal, textual, cinematic, virtual or tangible, explicitly interactive or not. Bal's model allows the text to be any designed artefact at all, including visual art and architecture. A very similar notion has been proposed by, among others, Nathan Shredroff (Shredroff). He describes 'experience design' as an approach to the creation of specific experiences in any medium (virtual or real world), focussing on the reader/player/user's response, rather than the production of a particular media format or technology-specific artefact. Formalising the third kind of interaction as the fourth level of Experience reminds us that it is common to all reader/player/user's encounters with all kinds of text/works.

The process of analysis is of allocating author or reader contributions for each element or aspect in each of the three levels, Fabula, Story, and Text. In the case of the reader, it is also a question of whether the contribution is of the first kind or the second kind of interaction, and whether it is significant or not in terms of causing change. This can be summarised in a tabulated form, and examples are shown below. The full results for all seven works are presented in Chapter Five: Comparisons.

Determined by author	A
Determined by reader – First kind of interaction	R1
Determined by reader – Second kind of interaction	R2
Not Determined	ND
Significant (in relation to other elements)	S
Not Significant (in relation to other elements)	NS

Figure 1: Key for contribution

<u>Adventure</u>	Event/Sequences	Actors/Characters	Time		Location/ Place/Space
			Rhythm	Frequency	
Fabula	A	A	ND		A
Story	A	A	R2(NS)	R2(NS)	A
Text	R2(NS)	A	R2(NS)	R2(NS)	R2(NS)
Experience					

Figure 2: Contributions for a specific work

It is important to keep in focus that this narratological/performative model is intended as part of a broader analysis, not merely as a process of classification. The model is just a step to inform the qualitative, reflective aspects of this research. The limitations of structuralist approaches are recognised, and need to be complemented with other approaches.

Reflective Analysis

The application of Mieke Bal's narratological model of analysis, with suitable modifications, provides insights into the relationship between 'author' and 'reader/player/user' in the performance of interactive experiences. A systematic and coherent approach makes comparisons between different types of works fruitful, generating questions that are answered by the application of other theories and approaches.

Manovich has indicated the critical importance of the dynamic caused by rapidly developing technology and awareness of technology and its applications (Manovich 93). This thesis investigates this dynamic by establishing a technical and historical context for the specific works chosen for analysis, and extends this into a general techno-historical context for all new media works. With this perspective, Ryan's notions of what factors causes immersion are utilised to assess what technical limits impact on the interface to the chosen works (Ryan, Narrative 14). Laurel's descriptions of the 'mimetic' nature of interfaces (Laurel, Computers) are extended into a 'mimetic scale' to compare the immersive achievements of new media with its 'Holodeck Ideal' ambitions. Juul's concept of the 'coherence' of new media works (Juul 161) is adapted to identify the problems that commonly occur for reader/player/users' performance of new media works. I also extend the Human Computer Interaction concept of 'natural language' (Marie-Laure Ryan, Peeling the Onion) to include the cognitive processes used by reader/player/users to perform any particular explicitly interactive work, and therefore re-described it as 'interface language'. This informs a re-definition of 'immersion' as something that is demanded by a new media work rather than created by it.

Summary

This chapter has detailed the methods that have been developed to investigate the central question of this thesis: how is the reader/player/user's participation in interactive narrative experiences (such as hypertext fiction, interactive fiction, computer games, and electronic art) influenced by the technical limits of the interface with the experience? Chapter Three sets out a historical context for each of the specific works chosen for analysis in this thesis, describing both their creative and technical aspects in order to establish the techno-historical dynamic that impacts the interface of new media works.

Chapter Three: Case Studies

Chapter Three sets out a techno-historical context for each of the specific works chosen for analysis, describing both their creative and technical aspects. This develops the investigation of the main question of this thesis by creating an awareness of the practical issues affecting the development of the works. This awareness is an important perspective when considering how the reader/player/user's participation in various new media works is influenced by the technical limits of the interface with the work.

The brief description of each work includes a justification of why each one has been chosen and why it is notable, and also serves to provide a definition of the wider category of new media experience to which the specific work belongs. Features of each work that are particularly outstanding are identified for examination later in the thesis, using the modified Bal model in Chapter Six: Comparisons.

The experiences are presented in chronological order of their date of production. They are the interactive fiction Adventure, the hypertext fiction Afternoon, the computer games Myst and Doom, the interactive art work Osmoste, and the computer games Half Life and Everquest.

Adventure (1972 – 1976)

Adventure is an example of interactive fiction, a popular and commercial phenomenon of the 1980s. Additionally, Adventure is in the 'adventure' genre of games which are defined by "deterministic, intellectual problem solving in the context of a story" (Tanguay 'A Guide'). Adventure was developed as a hobby by William Crowther and Don Woods during the early and mid 1970s, and directly inspired Zork (1979), a very successful commercial game series of the 1980s, produced by Infocom (Lebling).

The player moves around in a world very familiar from adventure/fantasy stories such as The Lord of the Rings and the role-playing board game Dungeons and Dragons. The world is explored, puzzles solved, opponents battled, objectives

achieved. The interactive fiction model has also been applied to a wide range of other genres, such as murder-mystery and science-fiction.

The most obvious feature of an interactive fiction experience, which can be regarded as a game, is that it has no images or sound media elements. A text description of a scene appears on the screen, for example: ‘You are standing in a small room, with only a small window allowing some light in. The room is completely empty, except for a large rug on the floor. There is a closed door on the other side of the room’.

```
Please wait while I initialise.

Welcome to Adventure!!  Would you like instructions?
>no

You are standing at the end of a road before a small brick building.
Around you is a forest.  A small stream flows out of the building and
down a gully.  In the distance there is a tall gleaming white tower.
>look

Sorry, but I am not allowed to give more detail.  I will repeat the
long description of your location.

You are standing at the end of a road before a small brick building.
Around you is a forest.  A small stream flows out of the building and
down a gully.  In the distance there is a tall gleaming white tower.
>walk

Where?
>n

You are in open forest, with a deep valley to one side.
>n

You are in open forest near both a valley and a road.
>n

You're at end of road again.
>n

You're in forest.
>n

You're in forest.
>n

You're in forest.
>n
```

Figure 3: The beginning of one of the many versions of Adventure. The player’s input is indicated by the ‘>’ prompt.

The player must then type instructions into the keyboard, such as ‘go north’, or ‘look under the rug’. The game replies with more descriptions, and the player gives more instructions. This text only interface was necessary because the computers of the 1970s had little or none of the visual capability that would allow any audio-visual

rendering/description of the scenes, or the 'point and click' interface that would become more usual by the end of the 1980s.

The system uses a technique called 'parsing' to analyse the user's input, and then either responds appropriately, or else, as is often the case, prompts the player to rephrase the input in a manner the 'parser' can respond to usefully. This language parsing technique attempts to allow the player to use normal language to interact with the game through the keyboard only.

The use of typed speech recognition, called 'language parsing', is a major feature of interactive fiction (Montfort, Twisty 108). This 'natural language recognition' technique has, in principle, the advantage that the user can use their existing language communications skills, rather than having to learn an abstract computer programming language.

While the system was supposed to be able to determine the player's intention by 'reading' their text, it was actually only capable of recognising simple combinations of key words. The system was therefore unable to understand the meaning of the player's words. Players would often make a choice and get the reply 'I can't understand what you are saying' or 'You can't do that!'. Game characters often ignored the player, replied with nonsense, or issued repetitive, conversation ending phrases (Aarseth, Cybertext 115).

Despite the audio-visual minimalism of the interface, the size of the fictional world available for the player to explore, and the language parsing capability required as an interface mode, make this genre of games far from easy to produce.

```
Help
I know of places, actions, and things. Most of my vocabulary
describes places and is used to move you there. To move, try words
like forest, building, dntstream, enter, east, west, north, south,
up, or down. I know about a few special objects, like a black rod
hidden in the cave. These objects can be manipulated using some of
the action words that I know. Usually you will need to give both the
object and action words (in either order), but sometimes I can infer
the object from the verb alone. Some objects also imply verbs; in
particular, "INVENTORY" or "I" implies "TAKE INVENTORY", which causes
me to give you a list of what you're carrying. The objects have side
effects; for instance, the rod scares the bird. Usually people having
trouble moving just need to try a few more words. Usually people
trying unsuccessfully to manipulate an object are attempting something
beyond their (or my!) capabilities and should try a completely
different tack. To speed the game you can sometimes move long
distances with a single word. For example, "BUILDING" usually gets
you to the building from anywhere above ground except when lost in the
forest. Also, note that cave passages turn a lot, and that leaving a
room to the north does not guarantee entering the next from the south.
Directions can be abbreviated as N, S, E, W, NE, SE, NW, SW, U and D.
```

Figure 4: The 'help' section for Adventure explicitly explains the limitations of the system.

Brief Development History

Adventure was originally developed in 1972 by William Crowther (Persson, 'Timeline') on 'mainframe' computers. 'Mainframes' were the very large, expensive and rare computers that were owned by organisations such as universities during the 1960s and 1970s. Although these computers had very low computing power compared to a modern personal computer, they were all that was available before the 'desktop revolution' of computing that occurred from the late 1970s (DeMaria and Wilson 52). Crowther was an avid explorer of real caves, and originally wrote Adventure as a virtual simulation of a real cave system in Kentucky, in the United States. His implementation of the simple language parser was intended to make the simulation easier for his two young daughters. He did include some fictional aspects, such as treasures and characters, and gameplay challenges (Montfort, Twisty 88).

The game was distributed via ARPANET, the precursor to the Internet. With Crowther's permission, it was further developed by Don Woods between 1975 and 1977. Woods added many fantasy genre elements, as well as creating a more sophisticated gameplay (Woods, quoted in Aarseth 99).

Debate and uncertainty continue about the 'most original' version of the game, with claims that the Crowther original may no longer exist, (Montfort, Twisty 89). The alternative name Colossal Cave Adventure is often used for the original Crowther

version, to distinguish it from the ‘definitive’ Woods version, and the large number of other versions of it that have, and do, exist (Adams).

Because it was never intended as a commercial project, the source code was freely distributed, allowing its modification, and also ‘porting’ to work on a huge variety of computers. Thus, many slightly different versions of the game were put into circulation, each one adding to the popularity of the game. The non-commercial nature of Adventure and the large number of different versions of it in circulation make it difficult to establish exactly who did what, when, and how many people have ever had the Adventure experience. The source code, and various versions of Adventure, can still be (as of Dec 2008) downloaded from:

http://www.rickadams.org/adventure/e_downloads.html

and a version of Adventure/Colossal Cave can be played on-line at:

<http://www.bulkurtul.com/en/colossalcave.asp>

The ‘DOS’ versions work on even the latest Windows family computer systems (2008). Remarkably, the download file is only 64k. Even uncompressed, the whole data set for the game is only around 100k. This is due to the fact that there is no data needed to supply the audio-visual aspect of the interface, or to describe the world.

Significance and Impact

Adventure is remarkable for several reasons. It is often cited as the earliest form of interactive fiction. Hunt the Wumpus (1972) (Yob), Eliza (1966) (Weizenbaum), and SHRDLU (1968) (Winograd) have all been presented as precursors to Adventure, manifesting at least one of the important features of what came to be known as interactive fiction. However, Adventure appears to be the first that incorporated all these aspects into a single, working, compelling experience that was widely disseminated. It also predates the personal computer explosion by years, regardless of which date is taken for its creation, and it is also very early on in the history of all computer mediated interactive experiences, not just interactive fiction or computer dependant games.

Perhaps most significantly, Adventure was widely played among computer enthusiasts in the earliest days of the desktop computing revolution, and undoubtedly had a huge impact on many future designers of games (DeMaria and Wilson 134). Not the least of these were the creators of Zork, who went on to found Infocom, a company that through the 1980s specialised in interactive fiction in a wide range of genres, and with increasingly sophisticated language parsers.

Since Zork was a fully commercial release, and it had several sequels, it is very often thought of as the first interactive fiction game, overlooking the precedent set by Adventure. In fact, the team who developed Zork explicitly acknowledged the importance of Adventure before Zork was released in November of 1980 (Doherty, 'Timeline'). In a 1979 paper in which they discuss in detail the process of creating both the game, and in particular the language parser, they specifically describe Zork as a '...successor game' to Adventure (Lebling et al 53).

Zork was extremely popular, selling one million copies, and was the keystone product of the Infocom company, who released a large number and variety of interactive fiction games (Aarseth, Cybertexts, 101). For example, Douglas Adam's Hitchhiker's Guide to the Galaxy was converted into interactive fiction and became the best selling game of 1984, with over 350,000 copies shipped. Fortunately, this example of the peak of interactive fiction in popular culture is still available to play for free, on-line, at:

http://www.bbc.co.uk/radio4/hitchhikers/game_andrew.shtml

Interactive fiction's capacity to simultaneously operate as 'Story, Game, Storygame, Novel, World, Literature, Puzzle, Problem, Riddle, and Machine' has been noted (Montfort, 'Story' 310). However, by the late 1980s, this distinctive combination was no competition for the advancing graphic capabilities of computers. As computers became better at doing graphics and sounds during the 1980s, text-only fiction lost its appeal. It seems that its artificial intelligence dependant 'interactive narrative' capacity was simply not compelling enough:

“Images, especially moving images, are more powerful representations of spatial relationships than texts, and therefore this migration from text to graphics is natural and inevitable.” (Aarseth, Cybertexts 102)

It is clear that modern games have continued in this direction towards more and more ‘photo-realistic’ renderings. However, the commercial success of interactive fiction in the 1980s clearly showed that large numbers of people wanted to engage with complex, rich, fantastic interactive worlds. A strong community of developers/artists/researchers continued through the 1990s, and still continues, to do work around interactive fiction’s capabilities, and the role of language parsing (ELO)(Oz)(Zoesis)(Mateas and Stern).

Interesting Features

Many consider the demise of interactive fiction as a commercial and popular form to be a significant loss to games.

“They really have so much more depth than games have nowadays and [it is] really easy to see why. You can do things in text so much more quickly, easily and cheaply than with graphics...or any visual method of showing the same thing. And therefore the games could be so much deeper and have so many more options and possibilities than games have nowadays.” (Meretzky 85)

Of course, interactive fiction has the significant disadvantage of requiring the user to type into a keyboard, to know English, and to learn the idiosyncrasies and limitations of the ‘natural language recognition’ system.

It is interesting to speculate that the demise of interactive fiction has less to do with the capacity of computers, and more to do with the interests of the users. Adventure was released in the early and mid 1970s into a community necessarily made up only of people who had access to computers where the only interface was ‘command line entry’. In ‘command line entry’ interfaces, you type in a command, hit return, and wait for the computer’s response. The response is often not what you expect, and the

computer often prompts the user to re-try. Of course, this is very similar to the way interactive fiction itself works. Naturally, these early players were already ‘literate’ for the format. This has been noted by many who study interactive fiction (Levy, quoted in Montfort, *Twisty* 92).

```
Sorry, but I am not allowed to give more detail. I will repeat the
long description of your location.

You are inside a building, a well house for a large spring.
There are some keys on the ground here.
There is a shiny brass lamp nearby.
There is food here.
There is a bottle of water here.
>key

What do you want to do with the Key?
>hold

I don't know that word.
>keep

Okay
>keep lamp

Okay
>keep food

Okay
>keep water

Okay
>help
```

Figure 5: The trial and error character of interacting with the world in *Adventure*.

Similarly, the people who bought the first desktop computers from the late 1970s were similarly literate and oriented towards this characteristic of the command line entry interface. Just communicating with interactive fiction is like solving a puzzle. People who had bought computers as a hobby, or worked with them in a professional context, were, by the very nature of their interests, skilled at probing the unseen depths of the computer’s virtual workings one line of code at a time. This ‘... sort of informal Turing test...’ aspect to interactive fiction was noted by the designers of *Zork* in their original description (Lebling, Blank and Anderson 52) and has been observed since then (Wertheim 246).

By the end of the 1980s, computers and games were reaching an audience who had no special interest in computers, other than as a means to workplace productivity (for example, keeping a database or word processing) or entertainment. For them, the point and click interface was the natural way of interacting. Command line entry was not.

Of particular interest to the question of this thesis is the inherent ‘puzzle’ nature of interactive fiction that arises from the ‘parsing’ software’s inability to understand what the player types into the keyboard. This indicates a significant limitation in the area of computer science called ‘artificial intelligence’.

Afternoon, a story (1987)

Afternoon, a story by Michael Joyce (1987) is an example of hypertext fiction, a literary phenomenon that arose during the late 1980s. In hypertext fiction, the user reads short sections of a story, and then make choices (by clicking with the mouse) to connect to the next section. These text sections are typically only a few paragraphs long, and are called ‘lexia’ in hypertext terminology (Landow).

A typical hypertext fiction does not involve any obvious ‘game’ aspect, or require the user to type a response, nor is there any calculation by the software system as to what response might occur, since all of the choices are predetermined by the author. In these three ways, hypertext fiction is distinct from interactive fiction (see Adventure in this chapter). However, both hypertext fiction and interactive fiction are regarded as part of Electronic Literature. Electronic Literature includes a wide variety of overlapping areas, and in fact, there is ongoing discussion of where these definitions lie (Hayles) (Montfort, Twisty Little Passages 12).

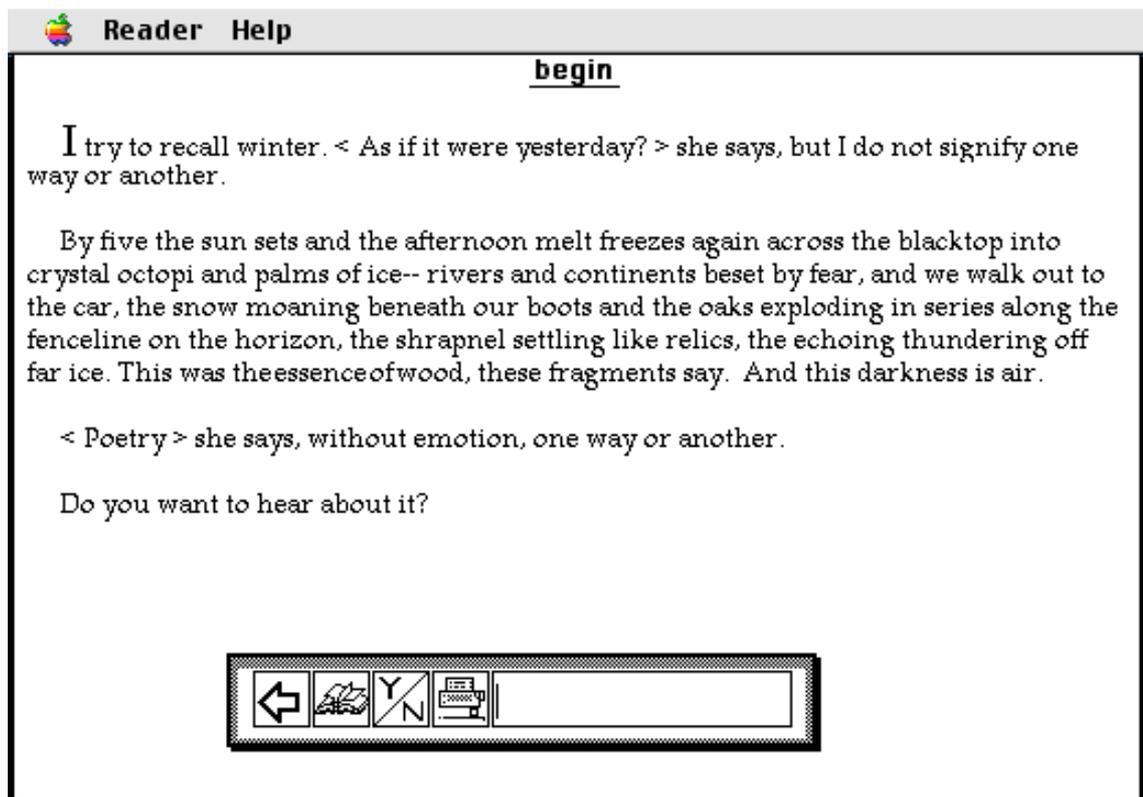


Figure 6: An early screen from Afternoon, a story.

The Experience

The experience uses an ordinary personal computer. In the case of Afternoon, a story, the lexia are written in the 1st person perspective of a man who is concerned about his family. When the user finishes reading a specific lexia, they can choose to click on hypertext links, or else use the default navigation buttons provided by the interface. As the reader moves from lexia to lexia, they have the task of assembling a meaningful narrative, and this is made more complex by unexplained changes in time, location, or even what character is narrating the first person perspective (Walker, 'Piecing' 114). The combination of these changes, as well as uncertainty and frustration with the interface, present a significant challenge to the reader (Shanks, 'Links').

Brief Development History

Afternoon, a story was implemented using a propriety hypertext authoring system called StorySpace. StorySpace itself was designed by Afternoon, a story's author, Michael Joyce, with Jay Bolter and John B. Smith (Bolter and Joyce).

After being presented at an ACM conference in 1987, the work was published by Eastgate Systems in 1990, and available for purchase first on diskettes, and then CD-ROM. Eastgate is synonymous with 'early' or 'classic' hypertext titles, often produced with StorySpace software, though it is acknowledged that the software has been superseded by more widely available and more sophisticated tools for creating interlinked text chunks (Hayles 1).

Afternoon, a story and StorySpace pre-date the creation of the World Wide Web, and any popular awareness of the networking possibilities of the Internet phenomenon. Afternoon, a story became regarded in scholarly literary circles as a demonstration of a future potential for literature, and a working example of the potential of digital technologies (Coover).

Significance and Impact

It should be noted that Afternoon, a story, and the majority of other works categorised as hypertext fiction, have had very little popular appreciation (compared

to games or print media), and remain mostly in the realm of academic and research discourse. Nevertheless, Afternoon, a story is an extremely important work due to the number of noted scholars who referred to it as a seminal work of hypertext fiction, and the degree to which analysis of this specific work has informed wider discussion, and practice, around the topic of interactivity, narrative and digital media (Douglas, 'Print') (Aarseth) (Bolter) (Walker, 'Feral', 'Piecing') (Murray) (Ryan).

It is also important to make a distinction between the popular and commercial impact of hypertext fiction on one hand, and interactive fiction on the other (see the section on Adventure in this chapter). While interactive fiction was both a very significant popular and commercial phenomenon in the 1980s, hypertext fiction has never been either.

Although neither hypertext fiction nor interactive fiction are currently popular forms, both continue to be of great interest to researchers in the field of digital media, for their artistic/expressive value and future potential. Significantly, active forums such as the Grand Text Auto blog and The Electronic Literature Organization (ELO) continue to promote and record the on-going development of these forms.

Interesting Features

It is notable that the reader can choose to use one of several different navigation methods from lexia to lexia in Afternoon, a story. They can simply use the 'RETURN' key to follow a pathway determined by the author, they can browse a list of links away from each lexia, click on specific words in the lexia, or they can type 'Y' or 'N' (for 'yes' or 'no') into a text box, which will activate a link. A further option is an arrow button which takes the reader back to the most recently read lexia. Of course, these options, including the 'back' button and the overview of links out of a particular lexia, have their direct present day counterparts in the modern web page, where links out of a 'page' are highlighted, and there is often a permanent 'site map' or menu, as well as a 'back' or 'history' button. The need to overcome the possibility of the reader's confusion when presented with many options is a primary objective of any experience where there are even quite moderate interactive options. While this was a relatively new problem in the early 1990s, it is a major problem in modern computer interface use.

Hypertext fiction can be seen as a relatively minor academic phenomenon of the early 1990s. Certainly, the threat to conventional reading suggested by Robert Coover's 1992 'The End of Books' article in the New York Times Book Review has not transpired. The impact of digital technologies in desktop publishing has, if anything, made conventional print material more accessible.

It could further be argued that hypertext fiction does not offer any narrative advantage, or other aesthetic benefit, over print literature. The literary device of presenting the reader with the challenge or 'game' of teasing out a satisfying structure from a non-linear structure, (often with a 'stream of consciousness' style) has long existed in print, for example, James Joyce's Ulysses (1922). Such techniques are not uncommon in contemporary mainstream novels such as Tim Winton's Cloud Street (1991), Iain Banks' The Crow Road (1992) and movies such as Pulp Fiction (1994), and are readily accepted by popular audiences. While the reader does not physically interact with these experiences, they are certainly intellectually engaged.

Afternoon, a story gained much attention from the academic community in the late 1980s and early 1990s because it was the first commonly available approximation of Vannevar Bush's 1945 'Memex' concept and Ted Nelson's 'Xanadu' (Bush) (Nelson). Bush envisaged a mechanical system for creating information trails to increase its accessibility. In 1965, Nelson began the Xanadu project, a practical attempt to use digital technologies to network information into a single accessible collection, and coined the term 'hypertext'. The specific technique was probably first implemented by both Nelson's team and Douglas Engelbart's in 1968 (Levy, Insanely Great).

However, Bush, Nelson and Engelbart's intention was that their systems would allow linking outside of the authored system of a single work, which Afternoon, a story did not. Afternoon, a story was also professionally authored fiction, and such a narrative, literary application was not a particular objective of hypertext. Ironically, even as the

literary world was discovering Joyce's work, the software protocols that enabled the hypertext linking World Wide Web were being released by Tim Berners-Lee. By 1994, the Internet would come to mainstream attention (Berners-Lee).

The explosion of the World Wide Web in the mid 1990s made it clear that hypertext linking was an easy, intuitive process for users (Koskimaa, Ch1). The interactive 'novelty' of hypertext fiction has disappeared into the Internet, or at least been normalised by it, to become a modern 'screen text' literacy that seems to favour shorter passages of text such as real time news feeds, blogs, postings to bulletin boards, etc (Pontin). E-mail and mobile phone text messaging are part of the same broad scheme of 'browsing and linking'.

Like hypertext fiction, this scheme involves 'lexia' with many linking options (Walker, 'Feral' 47). However, the World Wide Web has the advantage of linking into an ever-enlarging world of text and image experiences (and now video and sound). Merely clicking with the mouse to choose from limited options inside a single hypertext fiction document cannot compete with the instant gratification provided by the dynamic volume and variety of the Internet. It is noted that there are very few examples of 'compelling' interactive hypertexts (Douglas) (Laurel).

The lesson for literature and the study of narrative that emerges from the development of hypertext may be that, as Edgar Doctorow said in 1998: 'There is no longer any such thing as fiction or non-fiction; there's only narrative'. It seems that this has quite possibly come true, given the enormous impact in readership of the hypertext-driven Internet, and in particular, the explosion of 'social' media. Most of the content of the Internet is non-fictional, not professionally authored, and describes everyday events, rather than the exceptional events of drama. This is, of course, exactly the opposite of what we expect from literature. Nevertheless, much of what is available on the Internet is clearly structured into a narrative, often with a chronological structure, for example, blogs.

Despite the enormous advantages of the Internet-enabled experience, it still shares a very important characteristic with hypertext fiction. Despite the increasingly common use of images and dynamic media such as video and sound, these 'lexia'

still depend strongly upon the ability of reader/player/users and machines to read and write text, even if just for the context (Walker-Rettburg) such as titles, explanations, and the text ‘tags’ by which they are organised and found by ‘artificial intelligence’ search engines. For example, if you use a search engine to do a search for images of ‘flowers’, the search engine will show you pictures of images that were in close association with the text word ‘flowers’, even if these pictures are not of flowers. ‘Artificial intelligence’ system such as search engines cannot read images or sounds. This is why the creators of content for the internet have to text ‘tag’ it so it can be found by search engines. This is a significant point for this thesis, because it points out a limitation of technology, specifically, the lack of artificial intelligence systems that might be used to implement works.

Myst (1993)

Released in 1993, Myst is one of the most often cited computer games (Aarseth, Cybertext) (Darley) (DeMaria and Wilson 259), and is considered a ‘graphical adventure game’ to distinguish it from the ‘text only adventure’ game genre (Montfort, Twisty 224). It was described as both ‘immersive’ and ‘interfaceless’ by its fans, who were impressed by the richness, delicacy and texture of the audio-visual experience, and the sense of ‘being there’ (Miller, ‘Riven Rapt’). Fusions of architectural styles and technology dot unpopulated island locations, surrounded by empty seas. A series of puzzles must be solved in order to travel to other island worlds, to recover missing pages of magic books. These can then be used to discover which of three characters, a father and his two sons, is the villain of the story.

Myst anticipated the consumer CD-ROM revolution and became a multimedia sensation, selling over seven million copies (Verburg). The original Myst has had four sequels: Riven (1997), Exile (2001), Revelation (2004), and End of Ages (2005). Additional game titles derived from the original Myst are realMyst (2000), Uru: Ages Beyond Myst (2003) and Myst Online: Uru Live (2007).



Figure 7: ‘On the dock’ in Myst (1993): The starting view from the first node of the game.

The Experience

Myst is played on a personal computer, using only the clicking of the mouse, rather than any keyboard input, in order for the vast majority of the gameplay to progress. Myst depends upon long, slow consideration of the detail of the virtual environment to solve complex puzzles. Three-dimensionally modelled and rendered still images link to one another to form navigable walkthroughs, with very small video clips invisibly inserted so that birds hover in the breeze, butterflies fly across the path, windmills turn in the distance. Environmental soundscapes change as the player moves around, and movie style incidental music signals important discoveries.

Brief Development History

Myst was developed by the company Cyan (now Cyan Worlds), who had previously produced children's software, the first such title being The Manhole in 1987 (DeMaria and Wilson 258). The Cyan team were well placed to take on the significant challenge of producing Myst. They successfully integrated a wide range of file types/media elements into one seamless experience that was technically robust enough to go into mass production. The game experience was a completely original intellectual property, and utilised large amounts of media assets, including video of real human actors.

Released in September 1993, Myst required not only a CD-ROM drive, but colour monitor and sound capability. It quickly became a 'killer app' for personal computers, prompting users to upgrade, or make their first ever computer purchase (Seward). 'The Killer App (short for 'application') is yet another grail of the computer industry: the hardware/software combination that creates an entire market segment for itself' (Lunenfeld 80).

Myst went on to sell around seven million copies (Takahashi), probably making it the largest selling personal computer game (as opposed to dedicated console gaming systems like Sega or Nintendo corporation's) until at least the late 1990s (Carroll, 'Hit or Myst?'). As early as August of 1994, Wired magazine made the Myst phenomenon official in the world of new media, its front cover declaring the game's designers to be 'the first cd-rom superstars' (Carroll, 'Guerillas'). The strength of the

Myst popular phenomenon was such that it was parodied in a 1995 episode of the TV show The Simpsons, ‘Treehouse of Horror VI’ (Mathisen). The Cyan production team even made the front cover of mainstream media such as Newsweek (Levy and King), and appeared in a Gap clothing brand advertisement (Lillington). The marketing efforts of the Myst franchise’s distributors, and the sheer size of Myst’s original sales, have contributed to two often repeated myths about the game. These are of direct interest to this thesis, since these myths relate to several important technical achievements by which new media experiences are actually manifested to the reader/player/user.

There is the notion that Myst was actually the reason that CD-ROM drives were made standard on personal computers, since Myst could only be delivered on this format (Cyril). This is not correct. CD-ROM technology is a minor adaptation of the Audio CD format which had already become standard in the popular music market during the 1980s. The improvement in capacity of data, not to mention the significant financial advantages, made the default inclusion of CD-ROM drives into personal computers inevitable.

What is possible is that the success of Myst may have accelerated the speed with which CD-ROM drives became a standard item on base model desktop computers (Farris). The CD-Myst connection is a significant one, but it is that Cyan/Broderbund were astute and experienced enough to realise the coming of age of the new format. Cyan claim that Cyan’s 1987 product The Manhole was ‘the first entertainment product ever on the new medium of CD-ROM’ (Cyan).

The second common myth about Myst is that it was ‘the first’ something; that it was the first adventure game, the first three dimensionally rendered environment, the first CD-ROM delivered game or the first game to use first person perspective. None of these is the case. All of these specific milestones had already been achieved by the gaming industry. Digital video games had already become common place in games arcades during the late 1970s. The early home console game industry had already had its first boom and bust by the mid 1980s (DeMaria and Wilson). What was new during the second half of the 1980s was the production of games using, and for, personal computers. Cyan was part of that process. Their publisher for Myst,

Broderbund, had a very strong track record in PC games before Myst was released. But they were not alone.

For example, a company named Trilobyte released Seventh Guest on CD-ROM months before Myst was released in 1993. Seventh Guest sold somewhere between one and two million copies (Keighley) (Demaria and Wilson 257). Like Myst, Seventh Guest required players to own a computer with CD drive. Seventh Guest also used extensive three-dimensionally modelled and rendered graphics, and incorporated even more complex video than Myst.

Geoff Keighley's article 'Haunted Glory: the Rise and Fall of Trilobyte', provides a very useful companion to John Carroll's Wired magazine article 'Hit or Myst? Cyan's struggle to make the sequel'. Brenda Laurel's book Utopian Entrepreneur provides another valuable and reflective insight into the many non technical problems that could befall developers at the leading edge of the art form during the 1990s (Laurel).

The reason Seventh Guest has not enjoyed the same enduring reputation as Myst may be largely explained by the fact that Myst's runaway success (approximately seven million copies sold) overshadowed even Seventh Guest's impressive sales figures, and that Myst has spawned a franchise that has continued unbroken to the current time.

Significance and Impact

Despite not being the first of anything, Myst clearly was the first time that many people had this kind of interactive virtual experience, or seen this kind of multimedia, and so Myst became a benchmark. Even those who don't admire Myst acknowledge its impact on the field of computer gaming, for its significant aesthetic appeal and technical achievements (Cyril).

Myst presented a constructed, consistently behaving, deep, media-rich world that unfolded in people's living rooms or work cubicles. It was creatively and technically competent, and created a compelling sense of 'being there' (Laura Miller, 'Riven Rapt'). Myst also offered those who took for granted the richness of audio-visual

experience in film and television production something they could connect with aesthetically. In some ways, it achieved the immersion constantly promised by ‘virtual reality’ hype of the late 1980s (Sandin et al 266).

Thus, it is possible to suggest that Myst may be the first widely experienced computer mediated, audio-visually rich ‘desktop virtual reality’ experience (in which the experience is produced using only an ordinary personal computer system).

Interesting Features

Myst has now had four direct sequels, and a further three related titles. Every one of these titles has received critical acclaim and most have won popular and/or industry awards on release. However, sales of them have been very much lower than the original (Takahashi) (Hamilton). Despite being remarkable (at the time) for its ‘interfaceless’ interface and rich audio-visual nature, the Myst franchise has not increased, or even maintained, its popularity by improving its audio-visual rendering with each successive sequel, regardless of whether using real time rendering (as has become standard for almost all games) or pre-rendering (as the original Myst did).

The general decline in popularity of the overall Myst series may, ironically, be explained by the very uniqueness of the Myst intellectual property. Myst’s originality has been one of its most admired aspects, but possibly also its great weakness. Doom/Quake, Half-Life/Counterstrike, Everquest, Ultima on-line etc, are all highly referential of genres of books and movies in action-adventure, science fiction/cyber punk, dungeons and dragons or role playing. The obvious inter-textual references allow an ease of access and a fulfilment of fantasy built up over countless movie and story experiences. However, Myst does not allow this at all, presenting the player with a unique blend of extremely difficult puzzle-solving with a quirky, surreal, semi-science fiction theme set in a vaguely Victorian era world, and this has not proved to be as attractive to a wide fan base as Myst’s early success had suggested (Daigle).

The sophistication with which Myst integrated so many relatively new techniques in the rendering of a new media works is of great significance to this thesis, because it presents the possibility that Myst’s early success and then relative decline can be

explained by the sheer novelty of its aesthetic, rather than its genuine ‘immersive’ capacity. Another relevant aspect of the interface of Myst is that despite its sophisticated audio-visual rendering, it was still dependant upon alpha-numeric text in a very important sense. The gameplay-puzzle solving depended on the player reading books (in the game world) in order to derive clues and narrative elements critical to the gameplay. This continuing dependence on text, despite having such a sophisticated overall audio-visual aesthetic, demonstrates once again the need to utilise the reader/player/user’s pre-existing reading abilities.

Doom (1993)

Doom (1993) is a 'first person shooter' game produced by id Software [sic]. It is considered to be the definitive example of the genre by both fans and scholars (Manovich 244). A first person shooter is a game principally based on finding and shooting enemies, in which action is represented in a first person view point, usually showing only the hands of the player's character, and of course, the weapon the character holds (Rybka).



Figure 8: The original Doom (1993). 2D low res bitmapped characters on low res 3D backgrounds.

The Experience

Doom was about killing science-fiction/horror monsters with a variety of weapons, with no narrative offered (other than the 'US Marines in Space' theme borrowed from the 1986 movie Aliens, and a brief framing comment in the 'readme.txt file').

Doom was played on PC computers at a time when many computers did not have sound cards, speakers, or even a mouse control. Only the keyboard was required, with specific keys used to move the player's character and perform various actions.

Many of the actions in the game, such as picking up weapons and ammunition, occurred ‘automatically’ as the player moved over them. This made the interface easier, and also allowed a very fast pace of game action. Because of the limitations of sound systems at the time, the experience was designed to work even if the audio component was not reproduced.

The gameplay is primarily concerned with finding and destroying enemies before they destroy the player’s character. The greater objective is to progress to a different level of the game. This is dependant upon developing a pattern of movements that allows the player to collect ‘health’, ‘armour’, ‘ammunition’ and additional ‘weapons’ before they are killed by the enemies. Success depends upon very fast reactions, since the game cannot be won without collecting these objects very quickly. Although the player’s character is frequently killed, they are ‘re-spawned’ each time back to the beginning of the level. Thus, the player can immediately replay, and so improve their skills. Each higher level becomes more difficult, and so requires faster response times. In this way, the pace of gameplay becomes faster and faster.

Brief Development History

Before releasing Doom in 1993, id Software had released Hovertank 3D in 1991 with the claim that it was the first ever personal computer game with 3D elements (id Software). This claim has been contested, and the game Elite (1984) has been presented as an earlier example (‘Elite’). Also, in 1991, id Software produced Catacomb 3-D, and then 1992, Wolfenstein 3D, a first person shooter with a very similar game scheme and technical implementation to that which Doom would have the following year.

These games provided id Software with the experience to produce Doom, which popularised the genre. It should be noted though, that there are other claims for the ‘first networked, three dimensionally modelled and rendered, first person shooter’ game. MazeWars is a contender, with dates ranging from 1973 to 1987 (Thompson) (Montfort, Twisty 80) as in Spasim in 1974 (Bowery).

Nevertheless, like Myst (also discussed in this chapter), Doom was a ‘killer app’, prompting people to upgrade hardware, or even make their first ever computer purchase. Downloaded from the pre World Wide Web internet by technically adept computer enthusiasts, or bought as ‘shareware’, Doom was then passed hand to hand on multiple floppy disks. Many fans bought both the commercial release of the game and a better computer to experience it.

Significance and Impact

Doom has become a standard reference point in the popular discussion of games because of its violence, commercial success and technical mastery (GameSpy) (Wolf). The technical achievement of Doom is often overlooked by Doom’s critics. Very significant hardware and software limitations restricted the sense of presence that could be presented to a user in the late 1980s and early 1990s, and Doom overcame these. Doom demonstrated the emerging power of two particularly important new media techniques: real time three dimensional rendering, and real time networking. The combination of these two features allowed multiple players to play in the same visually rendered virtual environment from different computers.

id Software has produced two sequels to the original game, as well as another extremely successful first person shooter series, Quake (1996). id Software also allowed, and strongly supported, the practice of ‘modding’ the original game assets by fans into new versions. This created a whole community of skilled developers who were then available to the games industry, arguably accelerating the development of the industry (Kushner).

Further, id Software licensed the underlying software that renders the game world to other game developers. Many other games, not all of them first person shooters, were quickly created this way, and the use of these pre-existing ‘game engines’ has become normal practice in the game industry. For example, the game Half-Life (1997), also discussed in this chapter, was produced using the Quake game engine.

Interesting Features

Doom did not burden itself with an ambition to tell a specific story, although it made good use of inter-textual connections to popular movies. Rather, the sheer speed of

the graphic representation and gameplay made the experience compelling to a huge demographic of players in a way that had never existed before.

Doom established the very common practice of using a pre-existing game engine to produce another game experience. While this obviously reduces the burden of a game development process, it also produces some limitations. The ‘game engine’ is a set of rules for describing a world, and so the limitation of the original game engine can impact on the new game.

The popular success of Doom, and the storm of media concern that fed on Doom’s reputation for un-motivated, graphic, visceral violence, seemed to erase much of the positive pop-culture reputation that video games had developed due to the success of children’s console games such as Sonic the Hedgehog and Mario during the 1980s. Doom’s reputation seems to have dulled critics’ and analysts’ appreciation of the astonishing technical and experiential achievements of Doom, and the clear and obvious impact this has had on games, virtual environments and popular culture generally.

Osmose (1995)

Osmose (1995) is a virtual reality artwork by Char Davies (Davies, 'The virtual'). It is therefore considered as both art (Grau 1993), and as a notable virtual reality experience (Sims). Beyond the phrase 'new media art', Osmose does not fit into a genre, since it is extremely unusual (Davies, 'Landscape').

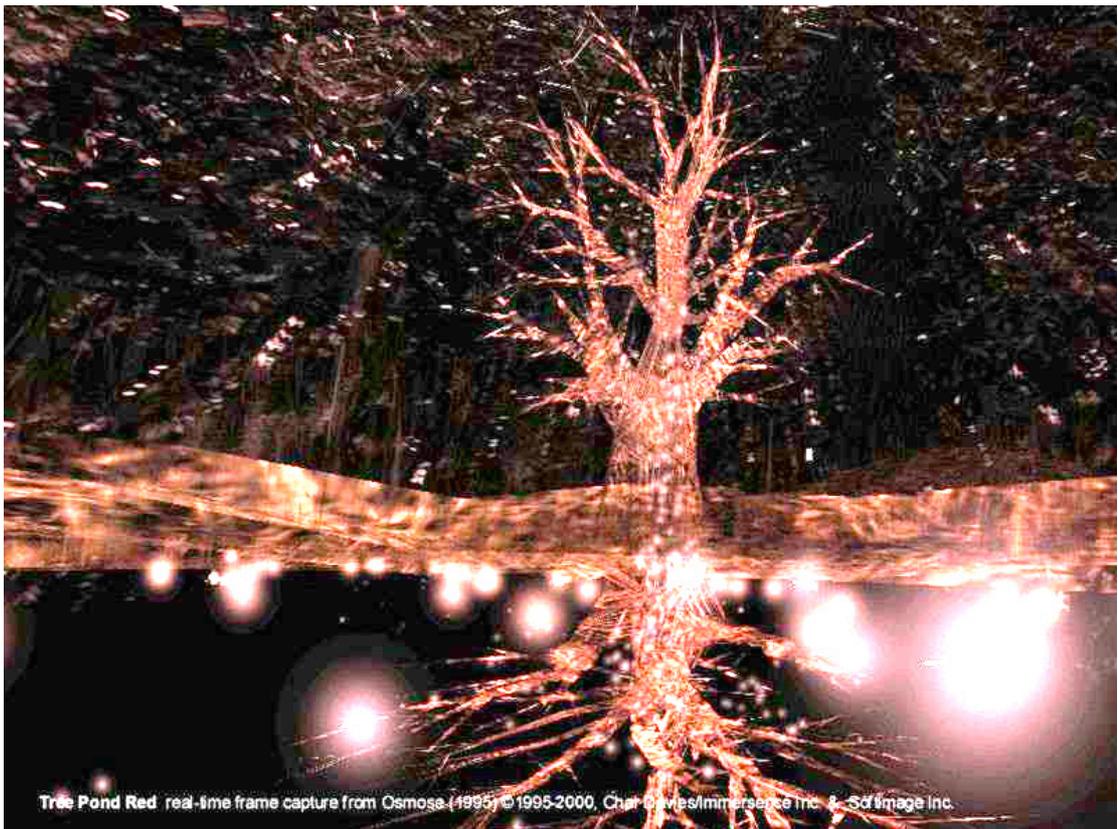


Figure 9: The tree and pond near the beginning of the immersion in Osmose.

The Experience

This experience can only be had by attending a gallery or similar institution, where the unique hardware/software combination is installed.

The 'immersant', as Davies herself describes the user, wears a Head Mounted Display (HMD), a stereo vision display and surround audio system contained in a wearable helmet/mask device. The immersant also stands in a sensor field that detects their position. As they lean left, right, back and forth, their movement is

reproduced in the virtual space. A special vest worn by the immersant measures the expansion and contraction of their chest as they breathe, which translates into up and down movement in the experience. An attendant helps the immersant put all this equipment on, as well as explaining the basics of moving through the virtual landscape. The immersant is also aware that they will literally be performing, since the location is contrived to show the immersant's silhouette on a glass screen dividing them from a room where people are watching on a conventional screen what the immersant will see in the HMD, as well as watching the immersant 'perform'.

My own opportunity to have the Osmose experience was at the Biennale of Electronic Art in Perth, Australia, in August in 2002 (BEAP). Osmose virtually positions the immersant in a huge three dimensional space, filled with abstract, evocative, other-worldly images and sounds, which can be navigated. You move up and down by breathing in and out, and move in a particular direction by leaning that way. You float in space, and familiar objects are few and far between. There are grids, clouds, streams of red dots, ghostly trees, infinite walls of text, and layers with indefinite boundaries between zones. An abstract soundscape of non specific, organic sounds helps produce a calming but slightly eerie mood.

A notable feature is the lack of a cursor, or joystick, or any other pointing device. In some cases, you can interact with objects by holding your gaze on them for a period of time, to trigger a change.

The position of the view screens inside the HMD means that your field of vision is totally filled by the virtual environment. Since there is no hand pointing device, you have to literally turn your head and body in order to look around, just as in real life. This is surprisingly different from 'looking around' in a game using a standard screen as in 'desktop virtual reality'. In the case of the ordinary computer screen, the virtual world slides past the window of the computer screen, while with the HMD, the movement of the world is actually connected to your head movements. However, despite the bodily interaction mode, you do not have a 'character' or 'avatar' inside the virtual world of Osmose, and when you look down at where your hand and legs should be, they aren't there. After what seems like a very short time,

but in fact was fifteen minutes, you feel yourself being drawn gently away, up, against your will to move, and then the experience is over, and the attendant is helping you out of your equipment.

Brief Development History

It is important to note that the Osmose experience and the hardware set it utilises were specifically developed for each other. The technological complexity of this experience was such that a team of specialists worked with Davies to create the software, develop and integrate the interface, and create the media elements (Davies, ‘Osmose’). The result was extremely demanding on computer processor power, so much so that the project originally required a very expensive Silicon Graphics computer (typically used for movie special effects or large scale data visualisation) to render the images, and a separate computer to render the complex audio. Advancing technology made it possible to use a more common personal computer by 2002 (Thwaites, ‘immersant’).

Significance and Impact

Osmose is of note because it directly addresses notions of immersion and performance, and because it uses a very unusual interface, deploying expensive, rare and customised arrangements of hardware and software.

Osmose is deliberately designed to produce a state of contemplation in the immersant (Davies, ‘Ephemere’ 197). This was certainly my own reaction. I was struck with just how compelling an experience I had with this 15 to 20 minute ‘immersion’. The particular harmony between the hardware and code/content of Osmose makes it work very well. For many of those who have had this experience, Davies’ work clearly indicates the powerful potential of virtual reality.

Despite being produced in the mid 1990s, Osmose is still currently referred to as an outstanding example of ‘immersive’ virtual reality, or ‘immersive virtual environments’ (Pesce, 2006, The Playful World) (Thwaites, 2005, ‘immersant’).

Interesting Features

However, while Osmose is perhaps the best working example of the technical and creative potential of the 1980s ideal of bodily ‘Head Mounted Display’ immersive virtual reality, it also illustrates the crudeness of the technology available. Although the work was produced in the mid 1990s, some of the hardware, such as the virtual reality headset, dates from the 1980s, and there are significant ergonomic problems. The helmet is heavy, often ill-fitting, and the images are very low resolution. A variety of other issues also have a negative cognitive impact. Outside light sometimes leaks distractingly into the helmet, and the resolution of the HMD display screens is very low compared to the large screen image probably seen beforehand, and the difference takes some getting used to.

It is interesting to consider when (and if) these technical problems are resolved, and the interface becomes cheaper and more available, how Osmose and Ephemere will be appreciated by more proficient immersants with more time. As of 2005, Davies was working with a team of engineers to develop a new, wide field of view head mounted display (Thwaites, ‘immersant’ 155). For the moment, though, the overall hardware/software system remains expensive and fragile. As in the case of artificial intelligence and ‘language parsing’ in interactive fiction, it is surprising how little progress has been made in the field of immersive virtual reality since Davies produced this astonishing work.

The system also depends upon a mode of interaction that, while certainly bodily, is not intuitive, and is unlike any the first-time immersant has experienced before. Davies's intention was to create a work that produced an immersion in space, with an alternative interface. Unfortunately, this creates problems. Most ‘immersants’ have a total experience only fifteen minutes long. Even if the immersant was already aware of the basic movement techniques, there isn't really time to get used to the interface. Some people do not move around at all, and in fact, one of the designed aspects of the later work Ephemere (1998) was to introduce a time component, so that even if the reader is static, they still witness a dynamic environment (Davies, ‘Ephémère’). This aspect is of direct interest to the question of this thesis, since it reveals that readers/players/users can only perform the potential in the work if they have the requisite skills to do so.

Half-Life (1998)

Half-Life is a computer game for personal computer, and clearly fits into the genre of ‘first person shooter’, that is, principally based on finding and shooting enemies, in which action is from a first person view point, usually showing only the hands and weapons of the player’s character (‘First-person shooter’). Half-Life is credited with significantly advancing the genre with many innovations. It was produced by Valve Software. It is one of the biggest selling personal computer games of all time (Musgrove).



Figure 10: Half-Life’s first person perspective, with minimal information displayed, and only at the edges of the screen. Atmospheric lighting is complemented with rich ambient sound. The superimposed text ‘We’ve Got Hostiles’ is a chapter title that appears only briefly.

The Experience

Half-Life is played on an ordinary personal computer, with no additional hardware required. The player takes on the character of Gordon Freeman, a scientist who survives an accident at a secret military research base. Gordon has to try and escape

the destroyed base while battling a variety of science-fiction monsters spawned by the accident. In doing so, Gordon/the player needs to learn how to fight, and then discovers that the military forces sent to rescue him are in fact trying to kill him, which introduces the military/government conspiracy theme.

This science-fiction narrative unfolds as Gordon/the player advances through constant obstacles. However, this story is never ‘told’ by a narrator or expressed in text form – the player must piece it together as the game progresses from level to level. For example, the gameplay involves meeting security guards and scientists also stranded by the accident, who often have important clues to the developing narrative, obstacle solving, or both. However, it is possible to shoot these characters dead before they can produce this information, or render this help. This makes the player’s own progress more difficult, or impossible.

As in the definitive first person shooter Doom (also discussed in this chapter), when the player’s character is killed in Half-Life, they are immediately re-spawned to a point just before they died, so they can rapidly learn how to pass the impediment to progress. It is common for players to learn to ‘commit suicide’ (usually by dropping two grenades at their own feet) when stranded in an impossible situation, or to use the keyboard ‘quick-reload’ shortcut in order to re-spawn at a ‘safe’ point slightly earlier in the game.

Brief Development History

Half-Life was the first game produced by Valve Software. They licensed the Quake game engine from id Software (see the section on Doom in this chapter), but significantly re-developed it to allow their own innovations. An experienced science-fiction writer was employed to develop the characters and the narrative. Half-Life was in development for approximately two years (Hodgson 28).

Significance and Impact

Half-Life won a large number of popular and game industry awards (‘Awards and Honors’). It had a sequel in 2004 (Half Life 2) that was also notable for its attempts to further advance character artificial intelligence, animation and credibility, and was also a critical and popular success. Half-Life is still regarded by game designers as

one of the most significant breakthroughs in the genre (Cifaldi). It has also been the subject of constant reference by academics, particularly those who study immersion and narrative in games (Mactavish) (Aarseth, Marie and Lise) (Järvinen, 'Halo') (Pearce).

Two major features make Half-Life distinctive. Firstly, it was one of the first games to use its real-time game engine to play the narrative/exposition cut scenes that occur at the beginning, and occasionally through the game. In the introductory sequence, the title and credits appear superimposed on the screen as in a movie, but the player can still look around the environment while this is occurring. This is distinct from the technique of using non-interactive 'cut scenes' sequences, which can 'break' the player's involvement in the game.

Secondly, it had a distinct story unfolding amid the action, as well as constant puzzles to be solved, involving non-violent physical dexterity. Although Half-Life does have frenetic gun battle scenes, these are significantly separated by the narrative and puzzle solving interludes.

Half-Life was also distinctive in a variety of other stylistic aspects. The game displays a sophisticated, subtle and dark sense of humour, with frequent inter-textual references to science-fiction and popular culture. The game's non-playing characters are integral to the gameplay, but are also comic stereotypes; absent-minded scientists and red-necked security guards, whose dialogue reveals the game designers' sense of humour. Each new level is marked by the appearance of a superimposed title for the level that re-affirms the player's progress, but also lends a 'literary' chapter-like structure to the game.

The game has very realistic and impressive architecture, varying from dark interiors to expansive exterior landscapes. Further, the points of view the player has are carefully chosen to show off these designs to their best advantage. These environments also include significant 'redundancy', for example, corridors are long and have to be walked down in a realistic manner (even if this slows down the pace of the gameplay) and the player can go places that have no function in the game,

other than to increase the sense of ‘being there’. This effect is supplemented by the impressive soundscapes that help overcome the low resolution textures of the period.

Interesting Features

The story in Half-Life is interactive only in the sense that it must be discovered fragment by fragment. The actual trajectory of the narrative is totally pre-set, with no branches or variations from player to player (or from playing to playing). Nothing can change the storyline. The ‘story’ aspect possibly seems so rich because it so unexpected, it is delivered so subtly, and the delivery never removes the player from the ‘free look’ immersion they are in. However, it does introduce the possibility that the player will miss important visual or audio delivered exposition, and some ‘artificial intelligence’ techniques were developed in the sequel, Half-Life 2, to overcome this problem. This is an example of how a solution to one problem causes a new problem in another area of the gameplay, and highlights the practical problems of making a new media experience. An appreciation of these practical aspects is an important part of the methods of this thesis.

EverQuest (1999 - current)

Everquest is a Massively Multiplayer Online Role Playing Game (MMORPG). The ‘Massively Multiplayer Online’ aspect of this form of game is that the player can interact with dozens, or even hundreds, of other players in real time, using avatars. The ‘Role Playing’ aspect is that the player takes on a character with distinct skills and appearance, who is likely to behave in a certain way. Each MMORPG situates its players in a specific theme of world, usually based on ‘fantasy’ folklore, such as Northern European mythology. However, there are MMORPGs based on science fiction themes, for example, Star Wars Galaxies (Kohler).

A further unusual aspect of a MMORPG is that the game world is persistent, that is, it continues to exist and progress independently of a single player. This is because the software that defines the game world does not exist on the player’s computer, but on a central server. Because of this, it is possible for the game designers to fix problems and update the game after the customer has bought and installed it. Additionally, the game world can be expanded by the designers while it is being played, with additional characters, locations, props, etc.

The MMO phenomenon gathered pace in the late 1990s, when the increasing speed of both personal computers and Internet connections meant that players could co-exist in relatively richly rendered audio-visual environments without suffering time lag.

The Experience

The game is played using a normal personal computer with no additional hardware needed. EverQuest requires the player to create and name a character with a unique combination of skills and attributes (from a set of options), and then to determine the physical appearance of the avatar that represents this character (also from a range of options). This level of choice also applies to the gameplay itself, with the player in control of a vast number of interactions with characters, objects, and locations.

The basic gameplay involves undertaking activities that will earn the player virtual objects, money and experience credits, which then allow them to improve their character. Each player can interact with automated characters generated by the game's designers, and/or with other real players. The automated, or 'non playing', characters are extremely limited in their interaction, providing basic information, exchanging objects, and engaging in fights. However, what really defines EverQuest and other MMOs is the opportunities that the player has when interacting with other real players. Players usually band together to co-operate, increasing the opportunity to accumulate possessions, skills and advance their character.



Figure 11: Many overlaid control panels dominate Everquest's interface.

Most other forms of game do not attempt to provide this complexity and duration of interaction. A result of this is that EverQuest has so many options for interaction that it has a conventional Graphical User Interface, much like a productivity tool, complete with drop down menus and text entry chat box. The need to access these controls and information is so great that critical information about the character

appears in a semi-transparent ‘Heads Up Display’ over the view of the game world, whereas in most games such information is usually restricted to status bars/menus across the bottom or side of the screen. This visual coincidence of the control interface with the gameplay is mirrored in the logic of the organisation of the menu options themselves. Controls for the technical performance of the computer the player is using are right next to the controls for the items the player's character has collected in the game world. The interface is so complex that most of the one hundred page manual is dedicated to explaining it, and the interaction options available to the player (Everquest).

Brief Development History

EverQuest was developed by the company Verant Interactive, a subsidiary of Sony Corporation. Verant was renamed Sony Online Entertainment Inc in 2000. The key designers of EverQuest acknowledge that, although graphical and 3D, the game is heavily influenced by much earlier, ‘text only’ based computer role-playing games (Nelson). The game was in development from 1996 (Everquest). It quickly became a huge commercial and popular success, boasting almost half a million users at its peak (Stokes).

Significance and Impact

Everquest is often credited with bringing the MMORPG phenomenon to the forefront of popular/mainstream attention in the West (Boudreau). It should be noted that Ultima-Online already existed since 1997 (Butts), and maintained subscription figures similar to those of Everquest. Further, Lineage is a Korean MMORPG released in 1998 that had over three million subscribers at its peak in 2004, easily dwarfing any Western MMORPG in popularity until the release of World of Warcraft, a ‘next generation’ MMORPG, in 2004. World of Warcraft has taken the genre to new heights of popular appeal, not only taking players globally from other such games, but also expanded total market size, with over seven million regular players in 2006 (Blizzard). Everquest’s own ‘next generation’ sequel, Everquest Two, was released almost simultaneously with World of Warcraft but failed to achieve even the original Everquest’s declining popularity (Woodcock, ‘Analysis’).

Nevertheless, Everquest remains an excellent exemplar of the MMORPG as it became widely experienced in the late 1990s, and was frequently referred to by scholars in the field of game analysis (Kolo) (Wallin) (Manninen) (Klastrup, 'EverQuest') (Whang and Kim).

Interesting Features

Clearly, the infinite possibilities offered by the presence of real human players in an MMO overcomes one of the missing pre-requisites for the 'Holodeck Ideal' of new media; interactive narrative by artificial intelligence. In MMOs, the in-game challenges provided (quests and raids) and artificial characters (non-playing characters) are only a frame-work for the much richer interaction between real players. The unlimited variety offered by multiple real player experiences, and actual social interaction, makes the gameplay much more compelling. Players often synchronise their real world schedules in order to play together, often over periods of weeks and months. However, for others, these temporal demands, both in terms of synchronisation and total time available, are major impediments to satisfying involvement in MMOs.

Easing the demands of time to invest, time to learn, and time to advance are anecdotal reasons frequently given for the astonishing success of World of Warcraft in drawing players away from Everquest, and for attracting new ranks of players. World of Warcraft's gameplay structure is much more accessible to 'casual' players, requiring less time to achieve a satisfactory gameplay experience.

Another notable feature of Everquest is that, despite the rich graphic and audio nature of the environment, it also contains a significant degree of text. This occurs in the interface, of course, but is also used to identify the avatars, which all look so similar that the default settings for the game have all the character's names hovering over their avatar's head in bold text during the gameplay so that they can be identified. Players can utilise the built-in animations for their avatars to visually express emotions, or give directions. However, when these graphic 'in game' techniques fail, or are simply not sophisticated enough, players just type to one

another in the message box. As with the player's own status bars and the control menus, the interface appears inside the game world, or at least, they conflate.

Later manifestations of MMORPGs allow voice to voice communication to overcome the slowness of using text. This dependence on text and voice from real players is an interesting, continuing link to MMORPG's gaming origins in board games and face to face Role Playing Games such as Dungeons and Dragons (Bartle). This thesis is specifically interested in the interface to new media experiences, and how they are manifested, and it is significant that this dependence upon text/voice does not limit or diminish the 'game' experience, or the capacity to engage in meaningful interaction. Rather, it enables it.

Chapter Summary

This chapter has established a techno-historical context for each of the specific works chosen for analysis, describing both their creative and technical aspects. This develops the investigation of the main question of this thesis by outlining and analysing the practical issues affecting the development of the works. This awareness is an important perspective when considering how the reader/player/user's participation in various new media works is facilitated within the technical limits of the interface to the work. Further, some features of each work that are of particular relevance to the question of this thesis have been highlighted. A fuller description of the workings and production history of each work is not possible within the restrictions of this study.

However, a detailed understanding of the practicalities of the 'techno-historical' aspect is a very important objective of this research. Therefore, Chapter Four: Techno-Historical Limits provides a much more detailed description of the similarities and differences between two of the works introduced here, Myst and Doom. This detailed, specific exploration progresses the main argument of this thesis by demonstrating how 'techno-historical' limits operate on both the audio-visual rendering and artificial intelligence capacity of new media works in general.

Chapter Four: Techno-Historical Limits

This thesis argues that the technical limitations at the time of a work's creation have an enormous impact on the overall manifestation of that specific work, especially on its interface. Thus, an awareness of this aspect is critical to the useful analysis of new media works. However, as identified in Chapter One: Literature Review, this is often missing from, or under appreciated in, current analysis. This chapter undertakes a very detailed comparison of two works (the computer games Myst and Doom) to demonstrate how 'techno-historical' limits operate on both the audio-visual rendering and artificial intelligence capacity of interactive experiences generally. This is very important to the question of this thesis, which investigates the impact of the technical limits of the interface on reader/player/users when they 'perform' a work.

To illustrate both the significance of techno-historical limits, and several fundamental principles of digital technology, the landmark games Myst and Doom are explored as examples of the evolution of new media aesthetics over time, and a limited, working definition of aesthetics is adopted for the purposes of this comparison. Myst and Doom were released within months of each other in 1993, and are frequently referred to by new media scholars (Manovich 244) (Wolf 62) (Aarseth) (Darley) (DeMaria and Wilson) (Wardrip-Fruin and Harrigan). While digital games and new media works certainly existed before Myst and Doom, the time span covered by these two series includes the remarkable period we can refer to as the 'digital nineties', when digital devices, and especially the personal computer, became an everyday part of the lives of most people living in the modernised world. Both Myst and Doom were dependant on the personal computer, which not only

became commonplace in the 1990s, but also quickly became capable of networking, reproducing colour, sound, animation and video from CD, and then Internet, DVD and broadband video delivery.

This chapter describes the many similarities between Myst and Doom, and how their very different game aesthetics were the result of unavoidable technical compromises, rather than the intentions of the designers. This demonstrates how ‘techno-historical’ limits operate on both the audio-visual rendering and artificial intelligence capacity of the interface the reader/player/user encounters when engaging with a new media work. This chapter then examines the possible future limits of the rendering of images and sounds, and how this may impact on future new media aesthetics and genres. Since all new media works depend upon the same basic technological and interactive principles, these realisations are relevant to the aesthetics of all new media works, even though the comparison in this chapter is between two works that are undoubtedly regarded as games.

Defining ‘Game Aesthetics’

This thesis does not seek to propose a single, simple, resolved scheme for the understanding of a ‘game aesthetics’. Rather, a definition of ‘game aesthetics’ is presented here only for the purpose of this chapter.

Many authors have discussed the uncertain nature of the term ‘game aesthetics’ (Lautern) (El-Nasr et al) and have used the term in a variety of ways, often including (or at least not excluding) both the interactive aspects of the player’s experience, and the audio-visual aspects (Klevjer) (Jenkins and Squire) (Myers) (Jenkins) (Hayward). Well accepted definitions of ‘gameplay’ exclude the audio-visual rendering of a game, either explicitly (Juul 164), or just by not mentioning it (Rouse 18), and tend instead towards an identification of rules as a defining feature of games (Salen and Zimmerman 158).

Drawing collectively from these ideas, this chapter defines ‘game aesthetics’ as the combination of the audio-visual rendering aspects and gameplay and narrative/fictional aspects of a game experience. This linking of the ‘audio visual’

(and other sensory inputs such as touch) rendering with the ‘gameplay’ explicitly highlights the important co-dependence that this thesis considers.

Myst vs Doom

Doom and Myst were similar in fundamental ways. Both were created from a three dimensionally modelled and rendered world, and also experienced from a first person perspective. However, Doom’s gameplay was completely different from Myst’s, since it involved killing science-fiction monsters with a variety of weapons. Doom delivered no specific narrative, although the ‘US Marines in Space’ theme borrowed from the 1986 movie Aliens, together with a brief framing comment in the ‘readme.txt’ file, could comprise an implied narrative. Doom utilised real time three dimensional rendering for getting its graphics to the screen, producing a very low resolution, fast moving aesthetic in which sound was not critical. Myst, by comparison, was simply unplayable without sound, not only because its immersive ‘atmospheric’ effects were central to the experience, but also because of the need for the communication of information critical to the gameplay and narrative.

Myst and Doom quickly became iconic of two completely different game forms, with regard to their content, gameplay, over all audio-visual aesthetic and demographic of players (Wolf and Perron 6). This is ironic because if the design teams had had their way, Doom and Myst would have been audio-visually very similar.

The Pragmatic Expression of Myst and Doom

The source of the difference between the audio-visual aesthetic of Myst and Doom is a pragmatic one, imposed by a limitation in technology. Doom’s cartoon style characters were not the product of a lack of imagination or technical skill on the part of the designers at id Software. Myst did not have still images because Cyan’s designers were limited in their vision and ambition. Both companies negotiated the enormous technical limitations of the early 1990s in order to make their virtual worlds manifest in the best way possible at the time (Halifax) (Miller, ‘Interview’).

The worlds of both Myst and Doom are virtual, mathematical representations of the shapes and dimensions of spaces and objects, and their relative positions. A virtual

‘camera’ defines a view of the world, and in both Myst and Doom, this is from a ‘first person’ point of view, simulating that of a normal-sized person standing up on the horizontal plane of the virtual world.

The problem was, and still is, that to produce the image ‘seen’ by the virtual camera requires mathematical calculation from the descriptions. The more realistic the shape of the objects, the more they overlap, the more detailed the textures and lighting, the more they move, then the longer these calculations will take for each view. In 1993, there were no computers in general use that were capable of doing such large amounts of calculation in a practical amount of time.

Current (2008) personal computers are massively more capable. The central processing units/motherboards of computers are many times faster. Industry standards for graphics and audio generation now exist, and the sophistication of the software programming of games engines has also improved enormously. The effective result is that an up to date computer with suitable video and sound cards is hundreds of times more capable of the real time rendering of images and sounds than in 1993. A good illustration of the increase in computer capacity between 1993 and 2008 (and the resulting sophistication of the audio-visual rendering) is that the original demo for Doom is only 2.3 Megabytes in total size. The 2004 remake of Doom, titled Doom 3, has a downloadable demo of 460 Megabytes. Another measure of the difference is that Doom contained only 54,000 lines of code, while Doom 3 has 785,000 (Kent, Making of Doom).

Thus, we can see that in 1993 personal computers were hundreds of times less capable of creating the images and sounds of a virtual world. Having both high image/sound resolution and real time responsiveness was impossible. Designers were left with the difficult decision as to which aspects of their possible environments to implement, and which to sacrifice. Myst and Doom, with different immersive/gameplay ambitions, went in two opposite directions. Myst went the visual ‘high and slow’ road, and Doom went the ‘low and fast’ road.

The Low and Fast Road – Low Resolution Real Time Rendering

Doom's producers, id Software, needed to create the experience of the user fighting monsters, and to make this compelling they needed to fulfil two prime characteristics. First, to allow 'free movement' of the player's point of view. Second, for this view to respond immediately to the player's input, as they pressed the keyboard arrow keys for forward, back, look left and look right. This could only be achieved by 'real time three dimensional modelling and rendering' (also referred to as 'on-line rendering'). In 'real time 3D', the mathematical descriptions of the world are loaded onto the player's computer, and the computer renders the images to the screen in direct response to the user's input. This is happening simultaneously, in real time, with the user's gameplaying experience. To achieve this on the common personal computers of 1993, the quality of the image had to be reduced to an almost abstractly low level. The objects and characters were extremely crude, with minimal, repetitive textures. Even these compromises were not enough, and further short cuts had to be taken. Doom's images are a combination of real time 3D rendered techniques and the inclusion of more conventional two dimensional animating, pre-rendered graphics. Thus, although it was a technical triumph of its time, the original Doom now looks like an abstract art cartoon.

The original playable shareware 'demos' of Doom still work on current (2008) Windows and Macintosh operating systems, and are available at:

Windows system - <http://www.dosgamesarchive.com/download/game/7>

Macintosh system - <http://www.Doomworld.com/files/shareware.shtml>

The High and Slow Road - Nodes and Video Files

Overcoming exactly the same technical limitation, but prioritising a different gameplay ideal, the designers of Myst took the opposite approach to achieve their rich-media 'environmental' immersion. They achieved the highest possible level of detail in the images and sounds by sacrificing the features of 'free look', and 'immediate response'. The creators of the game used a virtual camera to create four

wide angle still pictures (north, east, south and west) from many predetermined view points or ‘nodes’ in their virtual world. Because these still images were not being generated in real time on the player’s computer (just loaded from CD-ROM), they could be of much higher quality. The resulting visual experience was a series of ‘landscape paintings’ or ‘postcards’ linked together, with occasional live action video clips of actors performing.

The disadvantage of this system is that the player cannot have a view in the world, or go anywhere, that is not provided by the designer of the game. You, as the player, literally cannot take a step wrong. Further, the player’s movement is not a continuous view, since the first person view cuts, or at best dissolves, from one predetermined node to another as ‘you’ move around. The price of high resolution images in 1993 was stillness and discontinuity.



Figure 12: The flight of the butterflies in *Myst* is carefully restricted to a small area, actually a video file running ‘on top’ of the still image. The area of the video file has been highlighted for the purposes of this thesis.

Another consequence of the ‘nodes’ technique is that there is very little redundancy of images/places (due to the time-consuming production process). This has an obvious impact on the gameplay: if you go somewhere, it almost certainly indicates

that there is a clue there to be seen or heard. This lack of redundancy increases the sense of lack of free movement, and the feeling of stillness.

As with Doom, even these sacrifices were still not enough to accommodate the limitations of the computers of the day. To reduce load time and data size, Myst's images are even smaller than the small screen sizes of the time, and images are often marred by conspicuous 'dithering' of colours to give the impression of more resolution (Watson).

However, in what is possibly the greatest aesthetic achievement of Myst, the creators 'streamed' audio files directly from the delivery CD to overcome this visual stillness (Fargo) (Miller, 'Myst Masterpiece Edition'). The visual gaps are filled in with a continuous sound scape, for example, the sound of the wind, the lapping of water on the shore. Sound effects are often used to 'render' the movement of walls, doors and machinery, so that less animation is required. Music is used sparingly during actual gameplay, mostly to herald the discovery of an entrance to a new place.



Figure 13: The original Doom (1993) superimposed on Doom 3 (2004). Notice the difference in size and detail. Additionally, the frame rate is many times higher in Doom 3.

Another critical technique for overcoming the overall stillness of the images in Myst is the movement of specific objects, such as a door opening, the turning of a handle, or the flight of a butterfly across the path. This was achieved by creating an animation sequence of only the relevant part of the screen and playing it on top of the background. Once again, this reduced the amount of data and machine capability required to create the sense of motion in the seen world. The success of this technique was dependant upon the ‘on-top’ animation’s image quality being identical to the background image. Unfortunately, this was not always possible, due to the loss of image quality inevitable in the ‘codecs’ (compression/decompression algorithms) of the animation files.

Another side effect of creating all of the hundreds of images before the game is delivered to the player’s computer is that a large amount of data is produced, and this is why Myst was dependant upon CD-ROM technology to physically deliver it to the player’s computer - and stream it from CD-ROM during gameplay, since there were no hard drives big enough to store it. Unfortunately, early CD-ROM drives were very slow at delivering files, and this produced quite a slow response and/or ‘jumping’ when the player moved from one node to the next, or an ‘on-top’ animation played. In contrast, Doom’s mathematical descriptions and low resolution textures were originally small enough to be delivered to the computer on a series of floppy discs, transferred to hard drive, and the experience calculated from those small files.

The End of the 1990s

While Myst and Doom are iconic of the 1990s PC games boom, and both have spawned sequels that extend to the present day, their fortunes have been very different. id Software have gone from strength to strength, each new title (including the Quake (1996) first person shooter game series) pushing forward audio-visual rendering in games and consolidating popularity. The Myst series, however, has undergone a dramatic drop in popularity, with sales of each successive title not achieving anything like the original Myst’s success (Myst5) (Takahashi) (Hamilton).

Some industry observers have characterised Myst's non-violent, story-based puzzle-solving adventures as 'an antiquated style of gaming' (Kasavin).

At the same time, by the late 1990s, it was clear that the significant steps forward in computer technologies and techniques meant that pragmatic choices between 'the high road' and 'the low road' would no longer have to be made.

Future Limits of Game Aesthetics

The advances in the audio-visual rendering of games are taken for granted by consumers, and it seems, the games industry itself. However, the ultimate limits of these purely audio-visual improvements may not be far away. If the image and sound rendering of games reach a plateau, what will become of the other component of this thesis's loose definition of 'game aesthetics', the gameplay and narrative/fictional aspects? What technical and craft limitations, and new opportunities, might present themselves?

Making the Water Move

A convenient indicator of the development of computer speed and aesthetic ambition of games designers during the 1990s is the treatment of water in the Myst series. By the time of realMyst (2000), the water was fully real time rendered. The surface of the oceans moved and had surface effects such as foaming, and the weather changed as you watched. In 1997, Riven had 'photo-realistic' still images of the oceans, and managed in one scene to animate the part of the ocean closest to the shore (the 'whark cove'). The oceans of the original Myst in 1993 are completely flat and frozen, without any visual motion on them at all, and now look very primitive compared to any of the subsequent versions.

However it is very important to note that these oceans did not 'look' frozen in 1993. Not only was it not technically feasible to do the water effects in 1993, it was not expected. At the time, Myst was the most audio visually detailed virtual experience ever had on a personal computer. In the same way, Doom's sheer speed of response made it compelling, despite its low resolution. Their aesthetic and immersive impact cannot be denied, as surveyed from the sales figures, and the press of the time.



Figure 14: Water treatments in the Myst titles. All screens are shown in actual relative size.

Top: realMyst (2000), with full motion of the oceans, and dynamic weather effects.

Middle: The ocean in Myst (1993). The black blobs on the surface of the water are not an oil spill, just the result of the reduction of detail in the 8 bit colour graphics (posterisation).

Bottom: The ‘whark cove’ in the more photo-realistic Riven (1997), which also had full screen transitions.

The success of the earliest, crudest forms of Myst and Doom make it clear that all forms of audio-visual rendering, including text and photographic images, depend on the reader/player/user's capacity to fully render it in their own imaginations (Miller, 'Riven Rapt'). This phenomenon is similar to the cognitive process of 'closure' as described by McCloud, amongst others (McCloud 63). However a further reader/player/user characteristic, and a fundamental principle of computer science, both work to quickly defeat this imaginative tolerance of low resolution audio-visuals.

The Moore's Law Guarantee

In 1965, Gordon Moore predicted that the cost of computer hardware would continue to go down very quickly, even as its capacity increased rapidly (Moore). This phenomenon, which has held true for forty years and allowed the digital revolution, has become known as Moore's Law (Intel).

Game designers, especially of the Myst and Doom series, often push current technology to the limits. They often produce successive, more sophisticated game experiences that cannot work even on quite recent computers, gambling that users will upgrade (Daigle). And users do upgrade. Literally hundreds of thousands of people planned significant computer/video card upgrades around the release of Doom 3 and Half-Life 2 in 2004 (Morris). What makes this gamble worth taking for the designers, and worth the cost for the players?

In 1997, Aarseth specifically accounted for the demise of the text-based interactive adventure game thus: 'Images, especially moving images, are more powerful representations of spatial relationships than texts, and therefore this migration from text to graphics is natural and inevitable' (Aarseth 102).

It seems a logical extension to Aarseth's observation that the constant evolution from lower quality graphics to higher quality is driven by this same natural desire. Every step forward in gaming audio visual sophistication has been met with comments such as 'it was like being there', including Space Wars (1961) (Russell)(DeMaria and

Wilson 13), and even the text only Adventure (1972 -1976) (Crowther and Woods). However, this ‘more powerful representation’ only remains more powerful until the reader/player/user’s eye sees something rendered with more sophistication (Darley 28). The games Myst (1993) and realMyst (2000) demonstrate this effect particularly well, since the two titles actually share the same gameplay/narrative/world: ‘Steven Ogden has described the difference between the original Myst and realMyst to be as varied and pronounced as the difference between looking at postcards from a place and actually going there in person’ (Jong, para 4).

The 1993 version was regarded as a breakthrough, but by 2000, a new cycle of expectation had made it ‘antiquated’. Each step forward quickly becomes a new minimum standard, and is itself sure to be outdated by the next step forward, which occurs incrementally in desktop PC hardware, and in giant leaps with console hardware. The accolades Doom 3 (id Software) and Half-Life 2 (Hodgson) received in 2004 for their textures, lighting effects and dynamic elements were also awarded to their predecessors only a few years earlier. For example, in 2004, Newman described the original Xbox and PlayStation 2 as producing ‘near-photo-realistic 3D graphical environments’ (Newman 163). In light of the audio-visual steps forward made by the current generation (Xbox 360 and PlayStation 3), it is clear that ‘near photo-realistic’ has a highly transitory meaning. However, each step forward is compelling for end users – however briefly.

For example, gameplay in TombRaider (1996)(Core Design) is very much the same in the PlayStation 3 version as it was on PlayStation 2, and as it was on PlayStation 1, but the game has still sold very well on the basis of the audio-visual improvements. The current generation of games consoles (PlayStation 3, Microsoft Xbox 360 and Nintendo Wii) have each sold tens of millions of units in their first year of release (Enderle).

The Moore’s Law effect has guaranteed an escalating cycle of increasing capability and affordability, commercial competition and cultural/consumer expectation. Both the producers and the consumers of games expect each version to be audio visually bigger, richer, smoother, etc (Magal in Hodgson 63).

The Spectacular

Lending strength to this phenomenon is a current trend in popular culture which emphasises ‘spectacle’ over narrative and gameplay. Peter Lunenfeld has identified this broad movement in popular culture generally: ‘...our culture has evacuated narrative from large swaths of mass media. Pornography, video games, and the dominant effects-driven, high concept Hollywood spectaculars are all essentially narrative-free: a succession of money shots, twitch reflex action, and visceral thrills strung together in time without ever being unified by classic story structure’ (Lunenfeld 141).

Andrew Darley has argued that: ‘Computer games are part of a cultural space of surface play and neo-spectacle...’, adding them to theme parks and music video clips as examples of a cycle of production and consumption dominated by sensual stimulation and demonstrations of technical mastery of digital visual effects, in which narrative is displaced (Darley 149).

Darley’s view can easily be applied to games that have shown a marked increase in sophistication of audio-visual rendering, but little in the other aspects of this chapter’s definition of ‘game aesthetics’. Leading game designers warn about the escalation in graphics, at the cost of other features such as gameplay and story (Feldman).

Situating games in a paradigm of music video clips, thinly plotted action movies and theme parks would seem to confirm Aarseth’s 1997 concerns about the loss of the opportunity that could, and might still, arise from the unique structure of interactive adventure games (Aarseth 128).

How Far Can Audio-Visuals Develop?

It is possible that Moore’s Law will cease to apply. Certainly, there is no real technological limit to the effective audio-visual improvements that could be made. However, Moore’s Law is not just a prediction about the rate of computer power increase. It is that the capacity will increase at the same time as the dollar cost will

decrease. It is this counter intuitive relationship that has allowed for the continual turn-over of gaming hardware in the user's hands, and fuelled ever increasing expectations about the 'realism' of audio-visual renderings.

While some speculate that the limits of digital technology are near, Moore's Law has already surpassed several earlier, predicted 'walls' (Twist 2). Despite the specific limitations of the current generation of technology, there is plenty of evidence that the improvements will go on (Kanellos). Projecting the trend of Moore's Law into the future, we can see that there is very unlikely to be a limit to the improvements in richness, depth, smoothness and fidelity of audio-visually rendered images anytime soon. Alternatively, a plateau in audio-visual rendering may soon occur, because 'photo-realism' is actually achieved, with attempts to achieve photo-realism in games 'in their final stage' according to some observers (Jenkins 1).

However, John Carmack, the famed game engine designer and co-founder of id Software, has suggested that there will still be improvements to be made to the realism of game worlds in twenty years (Back Door). He indicates a distinction between pure photo-realism in a non-interactive animation and 'realism' in an interactive experience, where the unpredictability of the user's actions provide many more expectations and possibilities for the rendering engine than mere 'photo-realism'. In 2008, Aarseth's 1997 observations still ring true: 'It is a paradox that, despite the lavish and quite expensive graphics of these productions, the player's creative options are still as primitive as they were in 1976' (Aarseth 103).

Aarseth was making this point in direct reference to both Myst ('unpopulated and boring') and Doom ('completely robotic villains'). He also noted that such problems had been identified in an even earlier generation of games, by Mary Ann Buckles, in her 1985 PhD study of the interactive fiction work Adventure.

So why does an area as apparently full of potential as digitally enabled games rely so heavily only on improvements in audio-visual rendering and movie style spectacular effects? While there are noteworthy attempts, games are still conspicuously without the 'interactive narrative' capacity of the 'Holodeck Ideal' of new media. Game

characters still cannot respond to an individual user, and storylines remain pre-scripted and limited (Crawford 257).

The Lack of ‘AI’, and Abundance of ‘RI’

‘Unfortunately, I think we have gone through a bit of a dark ages as far as communications AI is concerned, but we’ll hopefully come out of that soon.’ (Darling, quoted in Poole 107)

The as yet unfulfilled promise of AI (artificial intelligence) is a conspicuous absence in the development of computer games. This limitation is probably the real reason that Cyan Worlds took its Myst related world Uru (2003) on-line and real time rendered. To go beyond the fixed (though multiple-ending), character-poor games of Myst and Riven, Cyan Worlds had to overcome the lack of AI with what we must obviously call RI (real intelligence). By bringing players together (on-line) so they could interact, they collectively generate dramatically credible and experientially satisfying gameplay for each individual player. Cyan Worlds did not use real time rendering in Uru just to achieve the feel of free movement and free look, or a current audio-visual ‘photo-real’ aesthetic. These features also facilitated the inherent variability needed for player to player engagement, and the dynamic environments they would populate and effect. And Doom, while it has always had a single player option, was network multiplayer capable in its first release.

Of course, the value of this use of RI in games has been convincingly demonstrated by the success of several MMORPG (Massively Multiplayer On-line Role Playing Game) titles, of which Everquest (1999), Ultima On-line (1997) and World of Warcraft (2004) are now classic examples. It is important to recognise that these games have a clear lineage back through text only on-line MUDs (multi-user dungeon), and then back to non digitally mediated, face to face role playing games, where RI systems were/are the norm for example, Dungeons & Dragons (1974).

The time when artificial intelligence might be able to replace real human intelligence seems a long way off. In 1950, Alan Turing proposed the ‘Imitation Game’ as a

benchmark for artificial intelligence (Turing). Variations of Turing's original proposal have become known as the Turing Test, in which, during a text to text conversation, an automated computer programme tries to convince a real person that the programme itself is actually human (Saygin, et al). The annual Loebner Prize for passing the Turing Test has a one hundred thousand dollar prize, but is still un-won in sixteen years (Loebner). While 'chatter-bots' are already in use in certain limited applications, it is quite dispiriting to have an on-line conversation with any of these recent examples, and find the conversation turn evasive or ridiculous in only three sentences, for example:

<http://www.jabberwacky.com/chat-joan>

The application of natural language recognition of the reader/player/user's typed speech, also called 'language parsing', is a major feature of interactive fiction such as Adventure (discussed in Chapter Three) (Montfort, Twisty). Aarseth noted that interactive fiction characters of the 1970s and 1980s were 'autistic' (Aarseth 115), often ignoring the player, replying with nonsense, or issuing repetitive, conversation-ending phrases. And this problem has not improved since then. Mainstream games with significant resources behind them still feature characters that behave this way.

The solution to this in Everquest (a MMORPG) is to simply have the non-playing characters largely ignore the real player after a few lines. In fact, the user's guide for Everquest explicitly warns the player just how limited the language parser is, and explains how to enter only key words in the 'conversation' to save time, since the parser software cannot actually understand the whole sentence. In trade exchanges with the non-playing character merchants, a visual menu is provided, rather than risk even relatively simple exchanges to language parsing dependant 'chat'. In the case of Doom 3 (2004), clicking on non-playing characters to get more conversation will cause them to them repeat variations of three or four conversation-ending lines. The Myst games avoided these 'autistic' conversations by videoing actual actors delivering the lines. However, this just compromises the player's character instead.

Steven Poole has suggested that natural language recognition for games was essentially abandoned in the 1980's, partly because of the rush towards graphics, but

also because in the days before personal computers were common, there were no keyboards that any language could be typed into, since console systems did not have them (Poole 106). The whole area of natural language recognition by computers (also known as natural language processing, natural language parsing, and computational linguistics) is regarded as important to the future development of games, but also considered very problematic, and with no solution in sight (Mateas). Hugh Loebner, the founder of the Loebner prize, does not expect it to be won in his lifetime (Graham-Rowe).

This lack of artificial intelligence does explain the failure of new media to fulfil one of the pre-requisites of its 'Holodeck Ideal' (identified in Chapter One) – that of 'interactive narrative', in which compelling, realistic, artificial characters interacted with the user/player/reader in dynamically generated storylines.

A New 'Spectacular'

There is no shortage of commentary about the limitations of games, for their regurgitation of Hollywood style violence, lack of dramatic credibility or questionable social/political function (McGuire) (King and Borland 173). The points I have made above about the lack of AI and the unrelenting advance of glossier graphics and spectacular effects would seem to suggest that there is nothing much to be gained from advancing graphics technology capability in games. However, this is not the case. Higher quality images are not necessarily just glossier and more colourful, and richer sound does not just have more bass and come from several different speakers. Richer media do have the potential to actually carry more information, and therefore to convey more meaning for dramatic/narrative/immersive/gameplay effect, even if game designers are not yet fully using this potential.

Further, it would be unfair not to acknowledge that games designers have been using some of the increasing power of hardware for more than just the audio-visual quality. The term 'AI' is used very broadly by game designers to refer to improvements in

how closely the virtual world can represent the real world in its behaviour (Rabin). 'Physics engines' give inanimate objects the ability to fall, bounce, break, etc more realistically (Hodgson 61). Characters can be made to move much more credibly, often with motion data recorded from real life actors (Hodgson 120). First person shooters' non-playing characters, the enemy 'bots', are certainly more adept and plausible as combatants since the early 1990s, their design utilising more sophisticated programming (although to keep these developments in perspective, these gradual improvements are probably not yet obvious unless you are very familiar with the first person shooter genre) (Woodcock).

The capacity for these behavioural advances in the game world are, like the audio-visual improvements, made possible by the advancing processing power of games hardware, and contribute to environments that might move well beyond merely 'looking' better.

For example, in the creation of a forensic crime/mystery game, it could be of great significance in the gameplay/narrative if dust falls heavily like sand, if it falls slowly like flakes of dust, or if it floats in the breeze that is stirred by your hand movement. This difference is currently very difficult to recreate credibly. Or it may already be possible, and has just not yet actually been implemented, as designers are distracted with the 'sensational', rather than 'subtle' aspects of the audio-visuals. Of course, fans of the Myst series might point out that this observational, contemplative gameplay style has already existed. Myst was, in its time, an environmentally immersive breakthrough requiring, and allowing, significant observation skills of the player. Have Myst and its lineage just been too far ahead of their time, despite their early success? Will the future history of game design consider that Myst was simply overrun by gameplay forms that were less susceptible to a lack of artificial intelligence, faster to incorporate Real Intelligence, and more able to exploit the sheer spectacular potential of early games hardware? Will Myst even be remembered in an ever deepening history of games?

However, there is the possibility that gaming audio-visual rendering will reach a plateau. Perhaps this would prompt a resurgence in AI communications and interactive storytelling as games designers compete to win the favours of

gameplayers. This might fulfil the lost potential that Aarseth noted in 1997 (Aarseth 128). These ‘clever’ developments may become the new ‘spectacular’ that fuels a further cycle of player’s expectation and designer’s craft, and practical research work is being undertaken in the field. For example, in 2005, Cyan Worlds released Myst Five. The game includes a form of language recognition where players can draw symbols onto a special device, causing the gameworld’s characters to change their behaviour in response (Logan). While this is still a long way from natural language recognition, and may not even be much more sophisticated than teaching a hand held device to recognise your handwriting, it is an innovative and welcome attempt at ‘communications AI’ in mainstream games. Also of note in 2005 was the release of Andrew Stern’s and Michael Mateas’ interactive drama Facade. This strongly research informed experience has re-energised the discussion about natural language recognition, incorporating it into an environment with rich audio and visuals, and additional interactive inputs (Rauch 82).

Summary

This chapter has presented a very detailed comparison of two specific new media works to demonstrate how ‘techno-historical’ limits operate on both the audio-visual rendering and artificial intelligence capacity of interactive experiences generally. It has shown that improvements in both image quality and real time rendering have narrowed the gap between these landmark games’ original aesthetics. However, it has also demonstrated that there has been very little improvement in artificial intelligence, either in the characters or storylines (Newman 101) that make up part of the aesthetics of these experiences.

This chapter has also examined the future limits of the rendering of images and sounds, and how this may impact on future new media aesthetics and genres. Since all new media works depend upon the same basic technological and interactive principles, these realisations are relevant to the aesthetics of all new media works, even though the comparison in this chapter has been between two works that are undoubtedly regarded as games.

Chapter Five identifies that the ‘techno-historical’ limits operating on the audio-visual and artificial intelligence aspects also affect the physical interface to the works. Chapter Five also establishes that these ‘techno-historical’ limits are caused by the lack of a dedicated technology for new media, which instead is utilising ‘borrowed’ technology from other fields.

Chapter Five: Borrowed Technology

This chapter further develops the ‘techno-historical’ context begun in Chapter Three and Chapter Four. Chapter Four examined the significant practical and technical limits of new media works due to their dependence on digital technology.

Specifically, the limitations of artificial intelligence were identified as a major influence in the overall aesthetic of new media experiences. This lack of artificial intelligence currently limits the fulfilment of one of new media’s pre-requisites for the ‘Holodeck Ideal’; compelling, credible interactive narrative (identified in Chapter One: Literature Review).

The other pre-requisite to the ‘Holodeck Ideal’ is that of ‘unmediated immersion’ of the senses, in which the virtual world would be so richly rendered for all of the five senses that it would be indistinguishable from the real world. Of the works described in Chapter Three, only Osмосе does not use the standard personal computer hardware interface. Osмосе’s steps towards ‘unmediated immersion’ with head mounted display virtual reality, compared to the ‘desktop’ virtual reality of all of the other works, prompts a consideration of the technical limits to the physical interface; the tactile, audio and visual aspects. This consideration leads to the realisation that ‘techno-historical’ limits operating on the audio-visual and artificial intelligence aspects of new media works also affect the physical interface to the works.

This chapter further establishes that these ‘techno-historical’ limits are caused by the lack of a dedicated technology for new media, which instead is utilising ‘borrowed’ technology from other fields.

What Ever Happened to Virtual Reality?

In 1993, Nicholas Negroponte predicted that head mounted displays would be ubiquitous by 1998 (Negroponte 136). Clearly, in 2008, head mounted displays are still conspicuous by their absence from every-day use, compared to mobile phone, the internet, and mp3 music players. An obvious question is why? Head mounted displays are commercially available, and some do not cost much more than a sophisticated laptop computer (Bungert) (Cyberworld on-line). Yet there have been many failed attempts to bring head mounted display systems to the games/entertainment market, sometimes with gestural interface devices such as the Dataglove (Laurel Computers 200) (Arcadian Virtual Reality LLC).

In fact, the vast majority of what are loosely called virtual reality systems are designed to fulfil very specific tasks in training, simulation, access to very large data sets, etc. In these systems, 'immersion' is produced by big screen projection onto a wide field of view, sometimes incorporating stereoscopic vision capability. Indeed, early definitions of virtual reality restricted themselves to only the audio-visual aspect (DeFanti, Sandin and Cruz-Neira), a long way from the 'interactive narrative' ideal.

Perhaps the most well known working virtual reality model is the 'CAVE' format in which all six inner surfaces of a room are projected onto (including the floor and ceiling), and the less complex 'wedge', in which only the two walls forming a corner are used. Both the CAVE and the wedge format offer the user the ability to move physically relative to the projected surfaces ie: walk around. Other systems use the 'command seat' configuration, where the user sits still, and often, the physical interface closely resembles specific, real world control interfaces, for example, aircraft simulators. Task specific training simulators are now reasonably commonplace in industrial applications (Immersive). Immersion in 'fictional worlds' and transparency of mediation are not what they these virtual reality systems are for. They are about training outcomes and access/clarity of information in highly specialised professions.

The 1980's dream of entertainment virtual reality, however, was about seemingly unmediated and compellingly realistic virtual experiences. This idea was symbolised in the common 1980/90s media image of someone wearing a head mounted display, and this unfulfilled promise was easy to keep up because so few people had/have ever put a head mounted display on. Perhaps the best known illustration of the potential of virtual reality has been the TV and movie series Star Trek, in which an extremely sophisticated CAVE style system called the 'Holodeck' made regular appearances, and played an important part in many plot lines. This is the model explicitly adopted in Janet Murray's book Hamlet on the Holodeck: The Future of Narrative in Cyberspace. Significantly at odds with the original audio-visual only immersion intention of virtual reality definitions, the Holodeck included tactile feedback, and credible automated characters/agents with dynamically variable storylines.

The dream of immersive, interactive virtual reality makes perfect sense, if viewed from the perspective of the early 1980's. The history of the cinema showed a marked development in sophistication. Starting as small, square screens with black and white images with flickering, low frame rates and no audio at all, the movies had progressed to super colour wide screens and surround sound with huge dynamic range by the 1950s. TV and home audio systems also underwent constant and rapid improvement in size, quality, colour and sound reproduction after their introduction. It seemed reasonable to assume that all technologically mediated audio-visual quality would get bigger and better, and more affordable. When interactivity with graphics arrived in the late 1980's in the form of the even more rapidly evolving personal computer, it seemed that the virtual reality dream was only years away, and so Negroponte made his very well informed (but now obviously unrealised) prediction. By 1997, Murray's book, amongst others, made dreams of compelling, credible immersion in fictional worlds worthy of practical academic/research ambitions (Cavazza). Yet, over ten years later, the 'desktop virtual reality' of computer games are still as close as we have gotten to this ambition, and they remain only a gesture towards the sensory or narrative aspects of the 'Holodeck' ambition.

Problematic Virtual Reality

Osmose is the only work considered in this study to attempt 'head mounted display/immersive' reality. While Osmose is celebrated as a major achievement in the field of new media, the experience is far from flawless. Some people develop motion sickness. Others never 'get' the mode of movement, since it is not obvious (it is bodily, but not intuitively so). The head mounted display is very low resolution, physically heavy and uncomfortable (for example, I had to use one hand to hold the weight of it off my nose during my own time in Osmose), and even in a carefully facilitated gallery setting, there was still light and sound intrusion inside the helmet from the outside world.

Researchers and critics (like myself) are often also designers of new media experiences, and therefore are likely to have a particular appreciation and enthusiasm for the technical and creative mastery demonstrated in Osmose. I greatly admire the work, and what it indicates is possible. But I suspect that most people who encounter such an experience outside of a gallery setting will regard these virtual reality artworks as an amusement park novelty. They will have no tolerance for poor ergonomics, low resolution, or obscure interaction modes.

The technical quality of currently affordable virtual reality head mounted displays is very poor, with very low resolution, very narrow field of view, or both, and there are still concerns about the long term health effects on the eyes (Pesce, 'VR Hurts' 25). The advantage of the head mounted display system is that it fills the users' field of view, and also that it excludes all other sight (McMahan). However, this is a positive disadvantage if you are watching TV or playing a game with a friend, since they won't be able to see/hear what you are experiencing, thus removing an often important social aspect to entertainment. And as we all know, if we want to exclude the audio/visual world outside a normal TV or computer screen, we need only close the door of the room, turn up the volume, turn down the lights, and in the case of the computer screen, lean a little closer to make it appear bigger.

So it is not surprising that the head mounted display system, icon of the 1980/90s hype around virtual reality, is not enjoying any appreciable level of domestic use. In day to day use, it is potentially dangerous, and in almost every way vastly inferior to

a normal TV or computer screen. The alternative to a head mounted display is the impractical size and cost of a CAVE, and so we do not see or hear more of virtual reality in entertainment. The closest we have got in common usage to the interactive, realistic environments of the virtual reality dream is the ‘desktop virtual reality’ of video games, which have an increasingly high level of visual rendering (though restricted to an ordinary screen), and are populated by only slightly intelligent agents/actors. However, ‘desktop virtual reality’ falls well short of the ‘Holodeck virtual reality’ dream, and the shortcomings of current virtual reality systems with ‘Holodeck’ ambitions leads us to a very important realisation.

Borrowed Technology

It is perhaps surprising, given the cultural and economic size of the current games phenomenon, to realise just how little time and effort has been spent on the hardware aspect of the games industry compared to the development of technologies for other media forms.

Moving picture technology is based on mechanical and chemical means such as photographic film strips, intermittent pull down shutter mechanisms, etc. The technology and delivery infrastructure such as the cinema projectors and the architecture of the cinemas themselves evolved to near perfection during the first part of the 20th century, and the essential nature of movie technology has been unchanged except for the introduction of sound in 1927 (Schoenherr) and colour in the late 1930s (Hart). Many cinemas still use projectors manufactured in the 1950s, when electric lights replaced carbon arcs (Majestic).

Television represents an even more impressive development. It took only twenty years to evolve from its experimental stage in the 1930s to become the domestically ubiquitous PAL and NTSC systems in the 1950s, still in use today (Genova). The only significant change to TV after its introduction was the addition of colour, which was completed in the 1970s (Spring).

The arrival of Audio-CD technology in the early 1980s, replacing vinyl records, is often quoted as the most rapid uptake of a new technology in history (Red Book) and

its direct descendant DVD supplanted VHS cassette tape for movie storage and delivery. After a brief fight in the market place with Sony's Betamax format in the early 1980s, VHS itself served for over twenty years as the world standard for domestic recording and playback.

More recently, the development of the mobile telephone and its increasing sophistication (smaller size, longer battery life, wider range, added features such as text, video calls and internet connectivity) is a striking example of the possible speed of development of a medium. In the late 1980s, 'mobile' phones were so large and heavy that they had a handle so they could be carried like a suitcase. In only fifteen years, they have become so small that they can't get any smaller if they are still to be held in the hand, and the keypad operated by fingers. The increasing sophistication of this technology is evident in the literal merging of the functions of the camera (both the still and video camera) and the personal computer into the mobile phone, so that we now talk about 'mobile devices'.

Each of these innovations has been the result of very deliberate, often internationally co-ordinated efforts, supported/underwritten by government legislation, big business interests and entire professional associations. Very often, major corporations have co-operated to push forward technology standards, for example, Audio-CD. This co-operative commitment is what is required to ensure the investment of billions of dollars that it takes to develop the first workable, marketable, mass producible version, and then evolve it to further sophistication. Each of these has processes has produced a hardware system, physical interface and supporting infrastructure that did not exist before.

This level of investment has not occurred for the entertainment and games sector of new media, which is still almost totally dependant upon borrowed bits and pieces of hardware and media types.

Evolution, not revolution

Almost all current new media systems use personal computer technology, which was intended primarily for data and text processing functions. This is quite problematic, since most of the interface for personal computers was borrowed from even earlier, different applications. The computer screen is literally just a television without a receiver, and the logic of the 'Qwerty' keyboard was originally designed to slow down the speed that words were typed on mechanical typewriters in order to stop the letter arms from jamming on each other (Qwerty). Thus, some of the technology that new media is currently employing is not just a second hand borrowing. It is a third hand borrowing.

The twin promises of the digital revolution for entertainment were interactivity and improved quality audio-visual quality. Ironically, since PCs were never designed to deal with pictures and sounds, early 1990s digital media was inferior to analogue image and sound in every regard (physical size of image, resolution, clarity, frame rate, audio quality, length of programme) due to bandwidth, storage, processor speed and compression limitations. It was not until DVD became widespread that digital image quality actually moved forward from analogue VHS quality, and DVD is not interactive in any 'virtual reality' sense.

This lack of inherent suitability of the basic hardware is evident in the phenomenon of video card upgrades for personal computers being required to play the latest games with audio-visual improvements, and the complicated finger/key combinations required to have a presence in them. Even now, in 2008, PC based media remains plagued by competing and incompatible data compression/decompression formats, not to mention operating system differences. Most on-line gameplay is limited not just by the PC's internal limitations, but for many users, also limited in bandwidth by the use of copper wires designed for voice only telephone communications.

Even the latest console systems are still only one or two generations ahead of a moderately priced personal computer in terms of overall capacity (Brim). Every major brand of console game system ever produced plugs into the existing, lowest common denominator domestic TV for its display system.

Even the handset of the dedicated console system is only a slightly more ergonomic and complex derivative of the multi-button panel of a video arcade game, and the main criterion for its design is that it works on the floor of a living room, in front of a TV. The fact that almost all games found on console systems can be played on both a 'dedicated' console system and on an ordinary personal computer's mouse and keyboard demonstrates just how unspecialised consoles are. It might be argued that some console handsets have 'haptic' feedback ie: the handset vibrates to simulate car engine vibrations, crashes, gun fire recoils etc, but this is hardly an amazing development. More expensive children's toys have had similar features for decades.

Nintendo have recognised that the conventional console handset is problematic, and introduced a new gesture interface (Wii). The welcome arrival of the Wii has created a much greater 'whole body' involvement for players of games. The Wii handset incorporates motion sensors that allow the users' actual hand movements in three dimensional space to be converted into x, y and z depth in the game world, as well as acceleration (Wii). However, the fact that that the 'Wii' system is having such a popular culture impact can be considered evidence of how relatively unsophisticated games interface design has been so far.

Computer games platforms (both personal computers and consoles) are not rapidly developing compared to other major media forms. Film, TV, music and mobile phone technologies all took about twenty years from the first time of their introduction to arrive at essentially finished, stable hardware and software standards. Computer games have already had most of that time, and there is no unique interactive games technology in sight. The constant upgrading of hardware systems, and the incompatibilities between them, does not necessarily indicate rapid development. It might, however, indicate the still young nature of the industry. Personal computer technology was adopted because it was, and still is, the only tool set available to the new media development community. The creative and technical achievements of new media designers, and game designers in particular, seem even more impressive when viewed in this light.

To summarise, new media arts and craft have never had the amount of funding and/or large scale organisational support that other media, communications and entertainment forms have received. Despite the growing popular awareness and use of new media, most new media experiences are still played on essentially borrowed hardware. This imposes massive limitations on the state of new media as craft, art, and experience. It is significant that a whole generation or more of new media users and designers now think that these limitations are natural.

The Gulf to ‘Holodeck’ Virtual Reality

What separates the ‘Holodeck Ideal’ of virtual reality from its practical realisation is a gulf of perhaps billions of dollars of research and development that will produce a paradigm shift away from the borrowed technology of computer science and TV to enable compelling, immersive virtual reality systems. These systems will need to be as different from current new media works as new media now is from the black and white photography of the late 1800s. That is the true scale of the problem.

Compared to virtual reality systems, film and TV, music, telephone, word and data processing are simple technical problems to solve. They are merely recording or transmitting images and sounds, or performing automated functions on textual and numerical information. ‘Holodeck’ virtual reality, however, is the creation of an alternative reality that not only has to be largely invisible in terms of its interface, but also be interactive, that is, simulate at some credible level the enormous variety of all of the interaction possibilities of the universe we live in. It is a vast undertaking, far beyond simply increasing processor power or screen sizes. The question of what might have to occur to bring about the necessary resources for such a transformation is considered in the final chapter of this thesis, Chapter Nine: New Virtual Reality.

Of course, the works studied in this research do not have the benefit of ‘Holodeck Ideal’ virtual reality. The realisation of the significant techno-historical limits for designers and readers/players/users of the interface of new media works raises the question of just how and why the specific works analysed in this thesis have been so successful, despite these limitations.

Summary

This chapter demonstrated that ‘techno-historical’ limits also affect the physical interface of the works, as well as the audio-visual and artificial intelligence aspects identified in Chapter Four. This chapter further established that the common cause of all of these limits is a lack of a dedicated technology for new media, which instead are utilising ‘borrowed’ technology from other fields. A consequence of this borrowing is that many current new media users and designers think that these limitations are natural. Together with the case studies of specific works in Chapter Three, and the limits discussed in Chapter Four, this chapter has established a techno-historical context for the comparative analysis of the chosen works.

This comparison occurs in Chapter Six, which considers the results of the modified Bal model and identifies patterns of relative contribution by the author/designer and the reader/player/user across the works chosen for analysis. Chapter Six also establishes the basis of the main argument of this thesis: that techno-historical limits cause ‘gaps’ in the manifestation of new media works that are overcome by a greater dependence on the reader/player/user’s contribution to the interpretation of new media works than other media forms.

Chapter Six: Comparisons

This chapter presents the results of the application of the modified Bal model developed in the Methods chapter, and identifies patterns of relative contribution by the author/designer and the reader/player/user. It demonstrates that the Text level in the modified Bal model directly equates with the hardware and software interface to new media works. The difficulties caused in the Text/interface level of each work by the ‘borrowed’ technology characteristic of new media are defined as ‘gaps’ in the works. These gaps in the Text/interface level are overcome by the reader/player/user’s contribution in the ‘Experience’ level of the analytical model.

This chapter therefore proposes the main argument of the thesis, that the gaps caused by the borrowing of technology are overcome by a greater dependence on the reader/player/user’s contribution to the interpretation of new media works than other media forms. This greater dependence can be described as a ‘performance’ by the reader/player/user, following Eco’s definition of an ‘open’ work (Eco 21).

Results of the model application

The model developed for the initial analysis of the seven works is described in detail in Chapter Two and an example of the attribution of responsibility for contribution is shown there with the key for contribution codes. The key for the contribution codes is reproduced again here with the tabulated contributions for all seven works.

<u>Adventure</u>	Event/Sequences	Actors/ Characters	Time		Location/ Place/Space
			Rhythm	Frequency	
Fabula	A	A	ND		<i>A</i>
Story	A	A	R2(NS)	R2(NS)	<i>A</i>
Text	R2(NS)	A	R2(NS)	R2(NS)	<i>R2(NS)</i>
<i>Experience</i>					

<u>Afternoon</u>	Event/Sequences	Actors/ Characters	Time		Location/ Place/Space
			Rhythm	Frequency	
Fabula	A	A	ND		<i>A</i>
Story	A	A	R2(NS)	R2(NS)	<i>A</i>
Text	R2(NS)	A	R2(NS)	R2(NS)	<i>R2(NS)</i>
<i>Experience</i>					

<u>Myst</u>	Event/Sequences	Actors/ Characters	Time		Location/ Place/Space
			Rhythm	Frequency	
Fabula	A	A	ND		<i>A</i>
Story	R2	A	R2(NS)	R2(NS)	<i>A</i>
Text	R2(NS)	A	R2(NS)	R2(NS)	<i>R2(NS)</i>
<i>Experience</i>					

<u>Doom</u>	Event/Sequences	Actors/ Characters	Time		Location/ Place/Space
			Rhythm	Frequency	
Fabula	A	A	A		<i>A</i>
Story	A	A	A	A	<i>A</i>
Text	R2(NS)	A	A	R2(NS)	<i>A</i>
<i>Experience</i>					

<u>Osmose</u>	Event/Sequences	Actors/ Characters	Time		Location/ Place/Space
			Rhythm	Frequency	
Fabula	ND	ND	ND		<i>A</i>
Story	ND	ND	ND	ND	<i>A</i>
Text	A	ND	A	ND	<i>R2(NS)</i>
<i>Experience</i>					

<u>Half-Life</u>	Event/Sequences	Actors/ Characters	Time		Location/ Place/Space
			Rhythm	Frequency	
Fabula	A	A	A		<i>A</i>
Story	A	A	A	A	<i>A</i>
Text	R1(NS)	A	A	R2(NS)	<i>A</i>
<i>Experience</i>					

<u>Everquest</u>	Event/Sequences	Actors/ Characters	Time		Location/ Place/Space
			Rhythm	Frequency	
Fabula	A	A	A		<i>A</i>
Story	R2(NS)	R1(S)	ND	ND	<i>A</i>
Text	R2(S)	R1(S)	R1(S)	R1(S)	<i>A</i>
<i>Experience</i>					

Figure 15: Contributions for the Seven Works

Determined by author	A
Determined by reader – First kind of interaction	R1
Determined by reader – Second kind of interaction	R2
Not Determined	ND
Significant (in relation to other elements)	S
Not Significant (in relation to other elements)	NS

Figure 16: Key for contribution

Summary of Contributions

Five of the seven works have extremely similar contribution characteristics – despite these works being in different genres, from different times, with very different styles of audio-visual rendering.

These five are the interactive fiction Adventure, the hypertext fiction Afternoon, and the games Myst, Doom and Half-Life. All of these show a high level of contribution by the author-creator. The reader/player/user’s contribution is of the second kind (R2) – choosing from options presented by the author. Further, these choices are of the non-significant (NS) kind, having no real impact on the way the text manifests. These works can therefore be collectively described as ‘highly realised’ – reflecting the high level of ‘finish’ by the author at all three levels – Fabula, Story and Text.

Only two of the seven works stand out from this ‘high realised’ author-reader contribution pattern. The artwork Osmose shows a distinct lack of contribution by either the author or the reader – much of it is simply not determined in narrative terms. Thus, Osmose can be described as ‘undetermined’. The game Everquest, by comparison, has a much more even spread of author, reader and non-determined aspects. Of particular note here is that most of the reader's contributions are of the significant kind, and of the first kind of interaction – both of which actually change the way the text occurs or appears. Everquest can therefore be described as having ‘significant user contribution’. These three patterns, highly realised, undetermined and significant user input, are discussed in more detail below.

Highly Realised - Adventure, Afternoon, Myst, Doom and Half-Life

These works all have a high level of both author contribution, and the second kind of interactive, non-significant contribution from the reader. Each of them achieves this in a very different style, but all with a high level of detail presented to the reader/player.

The Player's Sub-Fabula of Problem Solving

Applying one of the more detailed aspects of Bal's model, we can see that the player's 'embedded' or 'sub' fabula in all five of these games is highly determined. For example, the fulfilment of the game in Myst is brought about by travelling from a central location to four other locations, in order to recover two pieces of paper from each location. The pieces of paper allow the player slightly more information about the answer to the game's ultimate question of who committed the crime.

Thus, in narratological terms, Myst is four 'cycles' of solving puzzles to travel to a world, to find pages, to solve another puzzle, to return again. Each cycle produces two pages that produce more clues. However, all of the puzzles and information could have been designed to be hidden/provided on the main island of Myst, where the game starts, and the three characters are imprisoned. This prompts the question: why does the player have to solve puzzles to get there and back? Why are there other worlds at all? A possible answer to this question is that the solving of each puzzle requires closely examining the world it is in, in fine detail, producing a kind of forced immersion in the virtual world.

Similarly, each of the other four works with a high level of author contributions can be seen to have a clear sub-fabula in which the reader-player must inevitably follow a pattern of movement and discovery that is highly prescribed by the author/designer. Since this puzzle solving needs the freedom to move around and experiment, as in Myst, the player can move backwards and forwards between sections in Adventure and Afternoon. In the case of Afternoon, the reader also has the capacity to move around in time, as they visit and re-visit the different 'lexia' of the text, solving the 'puzzle' of understanding the logical sequence of events. Half-Life and Doom, both first person shooter games, do not have the capacity for the player to go backwards in

time in the story level, but they do allow extensive movement within ‘levels’ (or ‘chapters’ as they are called in the case of Half-Life), and require the development of ever increasing skills to solve puzzles of dexterity. It is also a key characteristic of first person shooters that the player frequently dies while trying to solve puzzles, and is ‘re-spawned’ back into the game immediately before the death-inducing puzzle. This is highly cyclical, and could be considered a movement in time in the story. However, this movement does not have any impact on the pre-determined narrative of the experience, and the world the player finds each time they re-spawn is exactly the way it was before they died.

The freedom to move is highly defined, obvious, and carefully controlled, and the solutions to the ‘puzzles’ are, naturally enough, very specific. Thus, the reader-player’s contribution to the work is that of finding the prescribed path, rather than making their own. This also applies to the reader/player/user’s own character.

The Reader as Character

There is wide variation in the way the reader/player/user is represented across the five ‘highly realised’ works with strong author/designer contribution. Obviously, these are motivated by, and to some extent contribute to, the specific style of the work. In Afternoon, the reader is sometimes directly addressed by the narrator in the text, for example, ‘Do you want to hear about it?’ in the section titled ‘Begin’, but does not appear as a character in the story. In Adventure, the player is constantly directly addressed by the narrator, and also engages directly with the many characters. While Adventure makes humour out of the breach of the usual separation between reader and text, Myst strives to maintain it. The player's character in Myst remains in the fabula level of rendering, so much so that the other characters address the player’s character only as ‘my friend’. Avoiding making the player enter a name, or choose an avatar, or see an author-allocated avatar, helps maintain the effect of the absence of an intrusive, conspicuous interface. Quite the opposite approach is taken in Half-Life, where the player is constantly reminded that they have become Gordon Freeman, a white, twenty or thirty-something male scientist.

However, these great variations in the way the reader/player/user is manifested in the work all have one thing in common: they are highly determined, and the exact limits

of the relationship the reader can have with other characters in the work is also largely, if not completely, determined and limited. This detailed realisation also extends to the reader/player/user's relationship with the overall storyline.

Fixed Storyline

Doom and Adventure use their narrative as a mere backdrop for the action and puzzle solving, and do not burden themselves or their players with any expectation of a credible narrative in a literary sense. In contrast, Afternoon, Myst and Half-Life certainly do, presenting detailed, rational, cause and effect relationships of events. The difference is, once again, due to the varying styles and genres of the different works. However, what all five of these works have in common is that absolutely nothing the player can do will change the story or text level. In Afternoon, the lexia are unchanging, and in Myst there are three endings, but with only slight variations. In Adventure, Doom and Half-Life, the player can only progress towards the 'completion' of the single, already defined ending of the experience.

Carefully designed and rendered, these works are narrated in extreme detail. This detail is not restricted just to the images, sounds and/or text, but also to the specific causality of events, time, space and movement. This strong author contribution can be found at almost every level and aspect of the works.

Osmose – Highly Undetermined

My personal experience, discussions with others, and published reports indicate that although many people find Osmose very compelling, it lacks obvious, describable features for them to report. Nevertheless, analysis shows that Osmose certainly has narrative elements. Locations are defined by the presence of objects such as a fish in a pond next to a tree. The experience the user has occurs in a structured time, and the world is seen from a point of view, implying that there is at least the immersant's own character involved.

Applying the author/reader contribution summary reveals many aspects that are undetermined by either the author/designer or the reader/player/user. Osmose's

creator Char Davies has stated that the intention was to produce indeterminate spaces to induce a contemplative reaction from the reader (Davies, 'Osrose: Notes'). Since most of what we have in these experiences is about space with no usual visual elements, it is not surprising that people's responses are highly individual, as each person reaches deeper into their own memory and subconscious to make connections. This is the very opposite of Adventure, Afternoon, Myst, Doom and Half-Life, which use highly determined and specific characters, locations and plot at all levels of the Fabula, Story and Text levels.

Everquest - Significant User Contribution

In great contrast to all the other works, the author/reader contribution summary for Everquest shows a high level of significant interaction of the first kind, and this may explain the complexity of the interface. While Myst's designers left the player's character undefined, Everquest requires the player to define their character themselves, taking them from 'actor' function in the Fabula level to 'character' in the Story level, with a unique combination of skills, characteristics and name, and then to determine the physical appearance in the Text level. This degree of control also applies to the gameplay itself, with the player in control of a very large number of possible interactions with characters, objects, and locations.

Each player can interact with Non Playing Characters, generated by the game designers, or with other real players' created characters. Non Playing Characters are limited in their interaction, providing 'quests' (mini-fabula embedded inside the greater fabula of the background worlds), exchanging objects, and engaging in fights. However, the opportunities that open up when interacting with other real players are what really define Everquest. The causal cycle of events that can be generated by relating to other real playing characters is unlimited other than by the combined imagination of two or more reader/player/users interacting in real time. Players can band together in communities and engage in rich collaborative activities.

A merging of the real and game world occurs due to this interaction with other, real people. For example, messages from the game's system administrator about maintaining current e-mail addresses are given in the vernacular of the game world,

and are addressed to ‘The residents of Norrath!’ Experienced players often give advice to new players about how the interface works, dropping out of character to do this, but using the same text box that their ‘in-game’ character uses.

The huge range of interactive options in Everquest may explain the great complexity of the visual interface (discussed in Chapter Three). Ninety two pages of the one hundred pages of the game’s instruction manual are devoted to explaining how the interface and game work. Only eight of the pages are devoted to a short story about how the EverQuest world and peoples came about, serving to invoke a genre, utilising character, story and settings familiar from fairy tales and mythic/fantasy texts, such as The Lord of the Rings (Tolkien).

This has the advantage that while the thin, genre-driven world provides a point of reference and a set of guidelines for operating, it allows the player to experiment with the under-defined events, objects and characters, creating their own narrative. When more complex interactions are required, the real intelligence of other players overcomes the lack of a sufficiently powerful artificial intelligence. The fact that these ‘narratives’ are never recorded, and are constructed by amateurs who are ‘playing’, is a major departure from the sensibilities of ‘old’ media narrative.

This characteristic is a strong reminder of the literally text-based nature of the early on-line Role Playing Games that are EverQuest's parents, and the even earlier, verbally rendered, face to face Role Playing Games. They were unlimited by visual rendering, and EverQuest seems similarly unburdened by the need to have a uniform aesthetic, or ‘invisible’ interface.

Summary of Attributions Process

The summaries show that Adventure, Afternoon, Myst, Doom and Half-Life have a high level of author contribution, and the second kind of interactive, non-significant contribution from the reader. The highly divergent styles, topics and narrative structures of these works do not prevent them from having these characteristics in common.

Osmose shows a majority of aspects in all levels to be undetermined by either the author or the reader, and only one, insignificant, contribution by the reader.

EverQuest has a much more even spread of author, reader and undetermined aspects. Of particular note here is that most of the reader's contributions are of the significant kind, and also of the first kind of interaction, that actually changes the way the text occurs or appears.

Having applied this tool, it is important to realise that these observations should not be regarded as value judgements, or as results in themselves. They are merely leads for further investigations, to be followed towards a particular outcome. My own interest is in how the actual hardware and software interface of these works relates to 'immersion', with reference to the notions of immersion presented by Ryan (Ryan, Narrative).

Ryan's notions of 'Immersive'

In her exploration of immersion, interactivity and narrative, Ryan makes a broad definition of an immersive text: "For a text to be immersive, then, it must create a space to which the reader, spectator, or user can relate, and it must populate this space with individuated objects. It must, in other words, construct the settings for a potential narrative action, even though it may lack the temporal extension to develop this action into a plot" (Ryan, Narrative 94).

All of the analysed works fulfil this qualification to some degree, constructing a 'potential' narrative experience. Myst, Osmose and Half-Life, although all rendered in very different styles, have been described as 'highly immersive' (Verburg, McRobert), and are very carefully presented in particular, unique, audio visual styles. However, Ryan also makes some observations that have clear relevance to a comparison of the works considered in this thesis.

The first observation is that aesthetic pleasure is not the same as immersion. Just because something is appreciated as beautiful, or beautifully crafted, does not mean it will bring about immersion (Ryan, Narrative 14). So although Myst, Osmose and

Half-Life are clearly produced with a strong emphasis on high resolution audio-visual treatments, this does not necessarily make them more immersive than the low res, repetitive, clunky EverQuest, the abstract cartoon-like rendering of Doom, or the predominantly text-only rendering of both Adventure and Afternoon.

Ryan's second point is that readers are more likely to become immersed when the material they are reading is familiar to them (Ryan, Narrative 95), and in this regard, Adventure, EverQuest, Doom and Half-Life's use of a pre-existing genre of narrative elements is much more likely to immerse the reader/player/user, compared to Afternoon, Myst and Osmose's totally unique subject matter. For example, Myst's strong narrative elements function to justify the amazingly detailed worlds the reader encounters, and to require the reader to 'immerse' in them.

However, these strong narrative elements and high production values may also create a high cognitive burden on the player, and produce expectations of a spectacular ending, either in terms of plot or visuals, leading to the 'lack of a good ending' for many players (Griffiths). At the conclusion, Atrus invites the player to 'continue to explore', but these worlds are without any further potential, since they contain nothing that is not connected with the puzzles that have already been solved. Fully finished in the Text level, Myst's principal activity for the reader is the solving of the puzzles, as it is in most of the other works.

EverQuest, on the other hand, requires the reader to do much in the Text level to make sense of the under-determined narrative combinations and relatively low resolution audio-visuals. A conspicuous feature of Everquest is the highly intrusive interface, with many drop-down menus, text boxes, windows etc, and this certainly compromises the 'immersive' audio-visual ideal of Myst. Myst and Half-Life succeed in minimising the interaction interface to the absolute, with almost no windows, textboxes, menus or buttons appearing on screen. Adventure, Afternoon, Myst, Doom and Half-Life tend, in their own ways, to reduce the reader's visible presence in the world to the minimum achievable in their respective formats.

EverQuest, by contrast, presents a world that is literally cluttered with its interface, and thus allows the player to have several different characters, and alter their visual

appearance during gameplay. However, the constancy with which the interface mechanism and the game world have been combined creates a continuity of overall interface experience arguably greater than that of Myst, Osmose, and Half-Life, since it is never interrupted. It utilises already well known conventions of computer interaction, and can also be customised to each reader's specific needs. Certainly, the authors of EverQuest feel it is so immersive that one of many options presented to the new user is an alarm clock function, to remove the player from the game world when necessary.

Osmose is completely distinct from all of the other works considered in this thesis in that it has literally dispensed with the conventional computer hardware and interaction mode, and replaced it with one which was at the time, and still is, rare and expensive. Osmose's unique interface has the effect of rendering some 'immersants' immobile, and this is perhaps an inevitable price to pay for demanding interaction habits other than normal. The other technique employed by Osmose is the deliberate 'defamiliarisation' of the images to invoke a contemplative response. Osmose is also very distinct in that it does not offer any obvious narrative combination, or task fulfilment, instead providing just enough of a space with recognisable objects to invoke contemplation on the part of the 'immersant'.

Thus, in the context of Ryan's definition, it seems likely that the descriptions of 'immersive' for Myst, Osmose and Half-Life are due to their audio visual finish and absence of obvious interface, rather than their superior immersion capability, relative to EverQuest, Adventure and Afternoon.

The Text Level as Interface

As described in Chapter Two: Methods, the Text level of the modified Bal model is the final tangible, visible manifestation of the work that can be observed by the senses. So in a very practical way the Text level is the Interface. As identified in Chapter Three: Case Studies, Osmose is the only work that does not use a completely standard personal computer hardware set up in its Text level. This common dependence of all of the other works upon a single, pre-existing interface/hardware system in the Text level is a significant feature revealed by this analysis. The fact

that Osmose is the only work to deviate from this ‘desktop’ virtual reality only makes this trend more conspicuous.

The realisation of the significant techno-historical limits for designers and readers/players/users of the Text/Interface level of new media works raises the question of just how and why the specific works analysed in this thesis have been so successful, despite these limitations.

The very term ‘interface’ indicates the contact point between two things. In the modified Bal model, this interface is between the author/designer’s intention on one hand, and the reader/player/user’s experience on the other. As described in Chapter Two: Methods, the ‘Experience’ level was added beyond the Text level to ensure that an all important fact is not overlooked – that ultimately, it all has to become meaningful in the reader/player/user’s mind. This allows us to now deal with the ‘non-significant’ attributions that appeared in the attribution tables for each work presented in the beginning of this chapter.

The Significance of Non-significance

A notable characteristic of the attributions is that many were ‘R2’ (making very simple choices) or were ‘NS’ (not significant in changing anything) or in fact both ‘R2’ and ‘NS’. Further, there were many instances where characteristics were ‘ND’, not determined by either the author or the reader. It is quite clear, then, that these aspects must be somehow created, resolved, or dealt with in the Experience level, that is, inside the reader’s own, actual cognitive and emotional processes. The significance in the model of non-significant attributions is that it throws attention onto the Experience level, beyond the Text level. How this occurs in specific examples is revealed by the model: Osmose has many aspects undetermined, and so much must be resolved in the ‘immersant’s’ mind, while Everquest gives the player strong, significant control over the Text level so they can have unique, rich interactions with other players, in which the actual text is merely a venue for their meeting of minds.

This characteristic, where much is resolved in the user's mind, is clearly alluded to by Eco in his description of the 'open work': "*Every* work of art, even though it is produced by following an explicit or implicit poetics of necessity, is effectively open to a virtually unlimited range of possible readings, each of which causes the work to acquire new vitality in terms of one particular taste, or perspective, or personal *performance*" (Eco 21) (note: italics are Eco's).

While Eco was almost certainly referring to non-digital works in his comments, it is a logical extension that this 'unlimited range' of possible readings is also occurring in relation to new media works. However, it seems likely that the unique technical limitations and failings in the audio-visual and tactile rendering of the Text level of new media works make them dependant on an even greater level of reader/player/user 'performance' than non-digital works to make them function. To put this differently, the reader/player/user is the critical mechanism in the interface that overcomes the 'gaps' in the Text/interface caused by the techno-historical limitations to the author's intentions for the work.

Summary

This chapter has identified patterns of relative contribution by the author/designer and the reader/player/user, and demonstrated that the Text level in the modified Bal model directly equates with the hardware and software interface to new media works. Significant 'gaps' in the Text/interface of new media works are caused by techno-historical limitations to the author's intentions for the work.

This chapter has also developed the central argument of this thesis: that the gaps caused in the Text/interface by the borrowing of technology are overcome by a greater dependence on the reader/player/user's contribution to the interpretation of new media works in the 'Experience' level than other media forms. This greater dependence can be described as a 'performance' by the reader/player/user, following Eco's definition of an 'open' work (Eco 21). This argument is extended in Chapter Seven by examining in detail how gaps actually manifest in specific works. This in turn leads to the identification of a distinction between 'mimetic function' on one hand, and 'immersion' on the other.

Chapter Seven: Immersion and Embodiment

This chapter further develops the main argument of this thesis, that ‘gaps’ caused by borrowed technology are overcome by a greater dependence on the reader/player/user’s performance of new media works than is the case in other media forms. The detail of how gaps actually manifest in specific works is examined, particularly with regard to notions of immersion. These gaps cannot always be attributed to the simple hardware or software limitations identified in Chapters Four and Five, and sometimes appear to be errors and/or oversights by the designers of the games. This chapter acknowledges that the area of interactive media design has been extremely skilful in developing techniques to overcome the lack of a dedicated technology. However, I also make the point that the accommodation of these limits has led to a culture of acceptance of the limits as natural, and to the inaccurate use of terminology.

These gaps are presented in broad categories – the visual embodiment of the reader/player/user, the behavioural embodiment of the reader/player/user, and inconsistencies in the rendering of the virtual world the reader/player/user finds themselves in. The identification of these gaps leads to a discussion of the ‘mimetic’ function of virtual environments (the degree to which a virtual world resembles a real one). A ‘mimetic scale’ is utilised as a device for demonstrating just how far away from truly mimetic new media experiences we are. This produces a distinction between ‘mimetic’ on one hand, and various notions of ‘immersion’ on the other.

Visual Embodiment of the Reader/player/user

Digitally mediated interactive experiences have shown a clear evolution towards greater and greater audio-visual detail and ‘realism’ over time. In discussing the demise of interactive fiction, Aarseth described the ‘inevitable progression’ that occurs as soon as the technology is capable (Aarseth, Cybertext). Laurel points out that immersion is contributed to by the one to one correspondence of the virtual representation to the real world (Laurel, Computers). Salen and Zimmerman acknowledge that the rendering of an interactive experience is an important part of its engagement (Salen and Zimmerman). Others agree that the sensory aspect of the rendering, while not exclusively important, is a significant part of the experience (Ermi and Mayra). It is very surprising then, to find that the avatars that establish the reader/player/user’s presence in a virtual space often lag far behind the general level of a new media work’s rendering. Perhaps the most obvious gap in the rendering of avatars in games is that of the lack of legs and hands in so many game avatars.

Missing Legs

Released in 2001, Myst Three: Exile is the third instalment in the Myst (1993) series (discussed in Chapter Three and Four). Exile continues the Myst series’ trademark gameplay style in which detailed observation of the richly rendered environment enables puzzle solving that in turn enables more exploration. This all occurs from a first person point of view, in which there is no obvious visual avatar, or body parts of an avatar. However, Exile’s visual rendering was significantly different from the original Myst.

Myst did not use real time three dimensional modelling and rendering, as its famous contemporary Doom did. Instead, Myst provided the player with view-points or ‘nodes’ from which they could view the world. Each node was made up of four still, pre-rendered images, one for each of the north, east, south and west views. This provided Myst with high resolution images, rather than the low resolution images of the ‘free look’ of real time 3D modelling and rendering (discussed in detail in Chapter Four: Techno-Historical Limits). Additional still images were provided for the up and down views, if these were required for the gameplay.

By 2001, Exile also used the original Myst's essential space construction technique of 'node view points', but took advantage of the huge advances in computer processing power since 1993. Instead of four different still pictures together creating each node's 360 degree view, in Exile the player can move the virtual camera around and look anywhere at all, up, down, around, providing a continuity of free look from any node point. Rather than the designers themselves having moved the virtual camera and chosen limited specific views from the 'node', the player directs their own gaze. This creates an unsettling effect, which is that when you look down at the ground, you can plainly see that your legs are not there. This sharply draws attention to the fact that you are not really embodied in the environment.

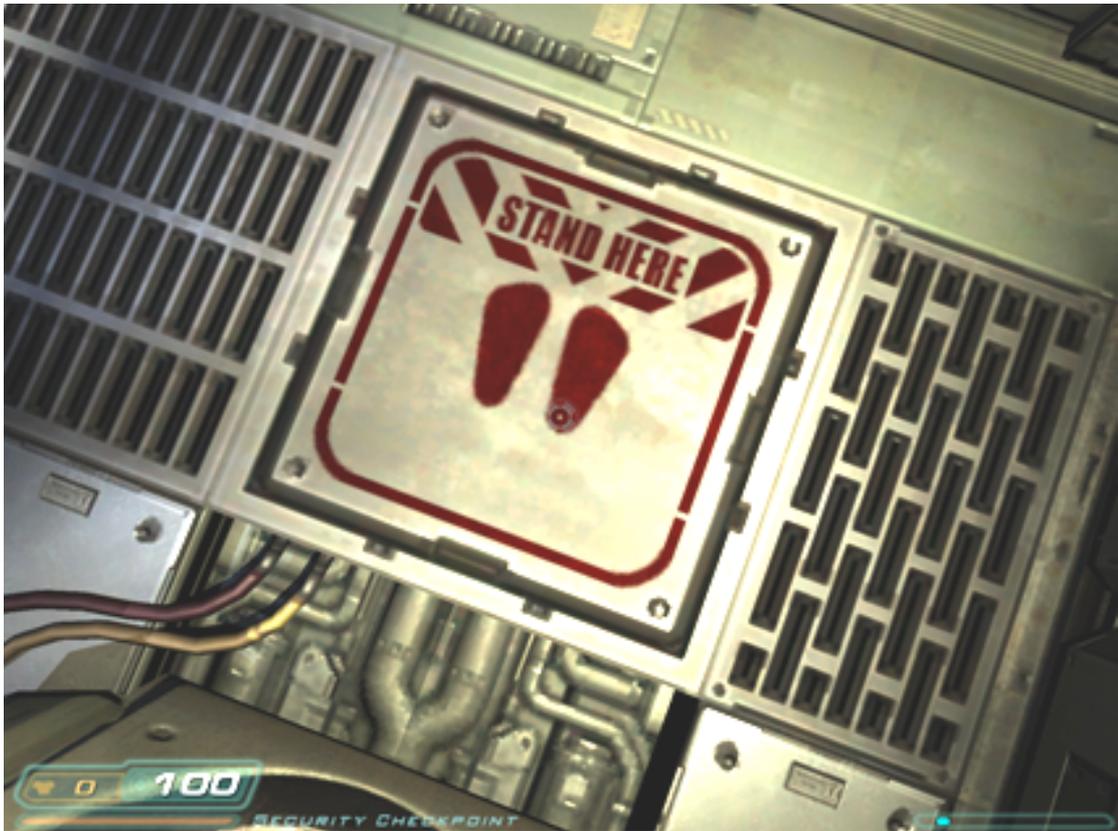


Figure 17: The view through 'your' invisible legs and feet to the plate 'you' are now standing on in Doom 3 (2004).

While technical limitations at the time of Exile, and its distinctive, pre-rendered audio visual treatment may have made the lack of legs difficult to overcome, the same cannot be said of the latest generation of real time rendered first person shooters. Both Half-Life 2 (2004) and Doom 3 (2004) have continued a tradition of

having no legs that has survived from their 1990s originals (discussed in Chapter Three: Case Studies).

Although the designers have gone to the trouble of carefully rendering the arms and hands that hold various weapons, when you look down at the ground past those arms, you still have no legs. In Exile, the lack of legs is an odd moment of realisation, a breaking of the surface tension of the immersion, but it does not specifically impact on the gameplay. However, in both the Half-Life and Doom series, there are times when it is important to stand accurately in particular places, in order to progress the game. For example, in Doom 3, the player must stand their avatar exactly on a sensor plate. To help in this regard, the plate has 'STAND HERE' written on it. However, it is not possible to simply put 'your' feet on the words, since you have no visual representation of these feet. It is a matter of trial and error (in your real world efforts) to activate the (virtual world's) sensors.

Quake 3 Team Arena (1999) is a first person shooter game that specifically involves real players playing each other. Of course, this means that each player has to have a full body avatar (the representation of their body), so that their avatar can be seen by other players. Oddly, if you look down during the combat play in Quake 3 Team Arena, you find that you have no legs, not even those of the default avatar.

Ironically, you do have a small, circular shadow directly underneath your body. It is not the shadow of any kind of humanoid body, and it does not change its angle or density as you move between different lighting arrangements. This shadow seems like a jarring 'in world' technical artefact left over from the game's development phase. We know that games are produced in a context of financial limitations, like any other creative endeavour, so it is possible that this is a detail that was simply never high enough a priority to get resolved. These invisible feet can become a significant problem, particularly in the Half-Life series, where physical dexterity is an important and constantly recurring part of the gameplay.

Standing on the exact edge of a ledge or cliff in order to see, shoot or jump is critical to solving puzzles/challenges. In the real world, with our real bodies, we could do this in one of two ways. We could feel the edge with our toes/feet, or just look down to see our feet's position. In Half-Life, we can do neither. Trial and error are the only

solution while you learn to judge the relative position of your whole field of view, and the object where your feet ‘are’ in the game’s logic (but not in the game’s visual rendering). While it could be claimed that this is in itself part of the challenge of the game, it seems to me to be simply a tradition/convention of games that has been given little thought.



Figure 18: Trying to climb along a pipe to avoid the electrified water below, with no vision of your feet, in Half-Life (1998). Your invisible feet are already standing on the pipe. Without your feet as a reference, you have no accurate sense of scale or self-position, and are clumsy.

I certainly find it to be an irritation, a disincentive to playing games in the genre. There are plenty of challenges presented within the game world, without adding to the problems of merely ‘being there’. The weapons in these games have aiming devices such as cross hairs, and/or we can observe the fall of the bullets to aim them. Why don’t we have renderings of our legs to facilitate their use?

The provision of legs (or not) when you look down is treated in a variety of ways in other games using real time three dimensional modelling and rendering, ranging from nothing at all, to an animating shadows of legs moving, to full animation of legs, so it certainly is technically possible.

Missing Hands

Not surprisingly, since Half-Life and Doom are first person shooter games, representations of hands are included in the operation of weapons (including the use of just the hands as weapons for punching). However, when the player's character holds objects other than weapons, the hands/arms are suddenly absent. This is most common in the moving of boxes, climbing of ladders, driving of some vehicles (for example, the water bike in Half-Life 2). The difference between the use of hands for weapons and the use of hands for other objects causes confusion and frustration, and not just because of a visual gap.



Figure 19: Pulling the box backwards in Half-Life (1998), even while you are still holding a weapon with both hands.

The problem is that the interaction for 'moving the box' is not in the same physical (keyboard) or logical array of choices as using your virtual hands to select a different weapon. The process of changing weapons (including selecting a grenade) is merely a matter of choosing from the numbered keys across the top of the keyboard, or cycling through the available weapons by pushing a single key on the keyboard

repeatedly. In contrast, the process of moving objects in the game world is a rather more complicated combination of other keys, clicking the mouse and ‘direction of motion’ keys/mouse.

There is, of course, an obvious rationale for this, which is that the game is about shooting stuff and so everything else is secondary. However, this is not a logic derived from the player’s experience of the real world, or their real body. Nor is it a logic derived from the game’s own gameplay, which demands physical dexterity and the moving of objects. It is a convention derived from a combination of the limitations of the physical interface, and a lack of analysis of how the visual interface might work better. The game has elaborate animations of hands operating the weapons (including pumping shotguns and reloading ammunition). These animations could easily have been extended to the frequently occurring actions of climbing of ladders, opening of doors, operation of vehicles, etc. These inconsistencies are not a matter of a lack of processor power, or a limitation of the crafts of programming or animation.

The danger of such a convention/oversight is that if the interaction logic and visual rendering of the interface convention remains biased towards ‘just shooting’, it becomes an impediment to the development of not only first person shooter games, but also to other virtual experiences that use first person shooter game engines, as is quite common.

Whole Body Missing

A lack of the whole body of the avatar is disruptively evident in several ways in the much more contemplative, slow moving Myst sequel Exile. The game has several locations where highly polished marble surfaces in ‘your’ view clearly reflect the doorway ‘you’ must be standing in, but the doorway is completely empty. Such immersion breaking visual disembodiments were carefully avoided in Exile’s predecessors, Myst and Riven. As with the lack of legs and hands in Half-Life, this moment of disembodiment is functionally confusing in that it causes doubt about the shape of the space the screen images represent. If I stand in a doorway with the sun behind me, I intuitively use the way the light is blocked out, and the way my shadow falls, to understand the space inside. Even without creating a specific image for the

avatar, this gap in embodiment could easily have been avoided by the designers by showing a blurry, humanoid silhouette in the doorway in the reflection.

Another example of this lack, or confusion, of important spatial prompts occurs in the Exile game in the forest world of 'Edanna'. I noticed that I was continually unsure of 'my size' relative to 'Edanna' (and this spatial confusion was noted in several of the walkthroughs I used). 'Edanna' was without any of the trademark architectural constructs typical of Myst and Riven that usually provide a relative scale, and perhaps this contributed to the confusion.

However, I suspect that an additional factor is that the still images in the audio-visual rendering of Myst and Riven allowed the designers to 'cheat' the composition of each image. This provided a better sense of the intended relative scale of the player to the environment. This 'cheating' of the representation of a real space so that it overcomes the loss of relationships introduced by the technology is common practice in film and television production, particularly when shooting inside buildings, and has been used to good effect in Myst and Riven. It is ironic that Exile's 'free-look from a viewpoint' technique for overcoming the 'stillness' of its predecessors seems to have actually introduced a loss of perspective that is a practical problem in the clue finding, puzzle solving gameplay.

Very few new media works deliberately point out our absence of presence in the virtual world. One that does is Char Davies' virtual reality art work Osmose, where you can also look down to see that you have no body at all. While a sense of visual disembodiment is a deliberate, designed intention in Davies' Osmose, it is quite clear that it is not intended in the Myst, Doom or Half-Life series.

Behavioural Embodiment of the Reader/player/user

The failure of a work to visually manifest the reader/player/user's presence can also extend to the behavioural functionality of the player's character.

Autistic Player

Books are very important in the Myst series, being of great significance to the background story and puzzle-solving. A resulting problem in the gameplay of the original Myst game was the need for the player to travel laboriously from one island to another simply to refer to the books kept in the central library. In the much more ambitious Riven, this problem is solved by the use of an ‘inventory’, a visual strip along the bottom of the screen where the books are kept. The books also act as important objects of plot fulfilment and character motivation in the gameplay.

Significantly, the books appear automatically in the inventory whenever you first encounter them at their original location. You cannot choose not to pick up a book, and you cannot put a book back down from the inventory once it appears there. Further, you cannot refuse to accept a book from a character who gives it to you, and non-playing characters can take books from you with you having any choice at all. It is frustrating to be paralysed in such a way.

Aarseth refers to this lack of natural behaviour on the part of the characters in the text-only interactive fiction Deadline as a kind of ‘functional autism’, in which the non-playing characters in the game have to treat the player’s character as though they are incapable of normal relationships (Aarseth, Cybertext 117). Aarseth was writing in 1997, but Deadline was published in 1982, well before image and sound came to personal computers. However, Aarseth’s description still fits the limitations of the player’s character in much more audio-visually sophisticated, later games. Aarseth’s notion of ‘functional autism’ can be extended to describe the player’s character as possessed.

Possessed Player

The ultimate achievement of visiting each ‘age’ in Exile is to reach a viewpoint where you can witness a secret symbol that is revealed by a sudden, magical rearrangement of the landscape. In the game world, you need to copy this onto a piece of paper, return to the central island and use the paper/symbol to activate a transport machine. However, rather than the actual player noting down the symbol, an animation occurs in which a piece of paper magically appears from nowhere and a pen automatically draws the symbol onto the paper, complete with sound effect. The

piece of paper then deposits itself into the inventory at the bottom of the screen. This automatic drawing of the symbols at the end of each stage of the game solves many problems for the designers of the game, including the possibility that the player will not know what to do with the symbol, but it seems very heavy handed, since every player has already solved several puzzles to get to this point, each requiring much greater powers of observation than are required to notice the symbols, or to deduce what to do when presented with a blank piece of paper and a pencil.

The ‘possession’ of the player in these moments may not be intended to make it easier for them, but rather to ensure that they witness, cinema style, the great event that is the fulfilment of their journey to that point. This possessed nature is also found in the ‘auto-pan’ function of the game. Whenever an impressive event occurs, the player’s ‘free look’ inside each view point is taken over by the game and ‘auto-panned’ to the correct place to see the opening of a door, raising of a building, etc. You literally cannot miss these spectacles (many of which are genuinely very imaginative and impressive).

These ‘cut scenes’ (‘cut’ in the sense that they are both carefully organised and non-interactive), are a far cry from the original Myst, where the rotation of an entire building was described by just a sound effect. In Myst, realising what had happened was part of solving the puzzle. In Exile, however, every control panel is ideally placed to witness the unmotivated spectacle that will occur when a puzzle is solved. The ‘auto-pan’ cut scene makes sure you do not miss a thing. However, in my own experience of the game, I found it not only stylistically and aesthetically problematic, but the sudden loss of control of my own presence in the virtual world was unwelcome. This guarantee of the spectacle is bought at the cost of ripping control of the player’s character from the player.

A very important technique to overcome this ‘cut scene’ possession/interruption in games was part of the success of Half-Life (1998). The exposition sequences occur from exactly the same first person perspective as the gameplay. The player can literally walk around inside the real time rendered scene as it unfolds, and even miss important events if they are looking the wrong way. This ‘free look and movement’ technique used by Valve for Half-Life was noted for its positive ‘immersive’ impact

on test audiences (Hodgson). This ‘un-possessed’ control is established even during the title sequence, as the train pulls into the station at the beginning of each game. The possibility that the player will miss important information was reduced in Half-Life 2 by having the non-playing characters follow and face the player’s character while delivering the exposition. It is interesting to note, as a measure of how little games are improving, that even this kind of incremental improvement is quite a rare event.

A more recent example of avatar possession is Doom 3 (2004). Perhaps influenced by the enormous success of Half-Life’s combination of first person shooter with linear storyline, id Software have incorporated significant aspects of narrative into the Doom 3 gameplay. Doom 3, however, adopts the unusual technique of moving the player’s perspective from first person to third person, not by the use of a cinema style cut, but by literally sliding the point of view out of the back of the head of the avatar. The player then hovers behind their own avatar, powerless to do anything but watch the scene unfold, before sliding back to resume play. Once again, it is disruptive, and not to my own liking. It is significant to realise, though, that this technique has not stopped Doom 3 from being very popular. These gaps are of great interest, because while they clearly do not present a ‘fatal error’ to the experience, they do point out the extreme narrowness of the presence the reader/player/user has in even very successful interactive experiences.

Inconsistencies in the Virtual World

“Immersion is not just a function of the technological prowess of presentation, but a result of the clear and consistent conceptualisation of another world.” (“David Tanguay's Game Reviews” Tanguay)

Juul has presented the notion of the ‘half real’ nature of video games, in which players are completely aware of the separate but co-dependant nature of the fictional world of the game and the playing of the game (Juul). Juul’s, and similar work by others, has convincingly defeated the idea that immersion is something to do with the player being consumed by the game to the point where they are unaware of the real world (Salen and Zimmerman) (Ermi and Mayra). Juul specifically points out

that this being ‘lost in a game world’ has often been confused with a player simply being absorbed with the real world activity of playing a game (Juul 162).

Part of Juul’s model is the idea of ‘incoherence’ in fictional game worlds, where there is a lack of a unifying logic, the world is implausible, or cannot be imagined as a cohesive, logical entity. This characteristic does not matter, he says, since the player’s ‘half-real’ engagement with the game does not depend upon real world credibility. He specifically raises the example of Grand Theft Auto’s ‘big blue arrow’, in which a large arrow appears hovering over parts of the action to indicate some detail to the player (Juul 161). Another example he offers is that of Myst (1993), in which it is possible to move only certain objects, and the example he gives is the ‘flip-able marker switch’, and the associated un-movable ship model on the main island (Juul 155). There are pragmatic reasons for these features, of course. The blue arrow in Grand Theft Auto helps the player notice an important point that might otherwise be missed in the flow of the fast action of a detailed world. That not everything in the Myst world is movable is due to the lack of resources by the design team to make them movable, but it also avoids the player being overwhelmed with redundant information in a gameplay style based on puzzle solving.

However, it needs to be pointed out that Juul’s application of ‘incoherent’ is not the same as ‘inconsistent’. The ‘big blue arrow’ and the ‘flip-able marker switch’ are consistent in, and fully conform to, the internal logic of their respective games world. They are incoherent because they are part of the implausible, improbable, irrational nature of their fictional game world. But they are very consistent in that incoherency. It is the consistency of the incoherence that stops these features from rupturing the overall experience, and so it becomes a convention of the specific work, or of the genre. Unfortunately, even very well known games are full of disruptive inconsistencies that break these important internal conventions.

Unusual Devices

A common occurrence that produces a break in a game’s established convention is that of the appearance of an unusual object in the game world.

Several examples of this occur in the Myst series. The Myst franchise has no obvious avatar at all, in the sense of a visual manifestation of a body. Instead, it utilises what might be called an ‘invisible interface’, adopting the pointing finger/hand icon so commonly found in both the Macintosh and Microsoft operating systems. The cursor simply changes from a simple ‘pointing finger hand’ icon to a ‘grabbing hand’ icon to indicate the ability to move, or to interact with levers, handles, etc. This technique presents the player with an interface with very low visual impact, and that they almost certainly already know how to use.

However, the Myst games contain jarring disruptions to this ‘invisible’ interface, quite inconsistent with their own standard. Special cursor icons occasionally appear for the operation of special devices. This is a convention not unheard of in gaming environments, but certainly out of keeping with the Myst series in which the control of objects has almost always been mediated via control of ‘in game world’ panels/interfaces.



Figure 20: The inconsistent train interface in Half-Life (1998). The control is a visual overlay, as well as a keyboard operation.

An example in Exile is ‘the swing icon’. Twice during the game, in the ‘age’ of ‘Edanna’, the player must use a swing to move from place to place. Without any precedent in the game, or any of the other previous Myst games, the cursor changes to a unique icon (a small picture of the swing). It is a disruption to the interaction interface, and an unnecessary one. In Riven (Exile’s immediate predecessor), a similar hand swing was used to lift the player up, and ‘grabbing it’ was accomplished without the need for an extra, customised cursor.

Other similar exceptions are the ‘steam boiler match’ (in the original Myst) and the ‘looking through flowers’ and the ‘quarters of spheres’ puzzles, (both in Exile). These three rare exceptions could have been overcome with a little more consideration to the continuity of the experience.

A more frequently occurring example of this inconsistency in the Half-Life series is what happens when the player needs to use the train, a device that makes several appearances in the gameplay/storyline. An ‘out of game world’ text overlay appears on the screen with an arrow, telling the player that they can now ‘use’ the train. The player interacts not by clicking on the control panel of the train, or by clicking with the mouse on the text overlay, but by using the keyboard. The train is then set in motion, and accelerated and decelerated, by pushing on a single keyboard key. Once again, it seems like a clumsy way to resolve the problem of a unique device, involving at least two levels of cognitive disruption to the normal interaction mode, and taking the player out of the game world.

The problem of altering the player’s mode of interaction when operating transport vehicles was also described by the creators of the interactive fiction Zork. They described problems with the text-only interface to the experience when the player was presented with the challenge of operating a boat to cross a river (Anderson, Blank and Lebling). In Everquest, the similar problem of operating boats has been removed by having the boat simply start up as soon as the player steps aboard, without any crew to operate it. This is also well outside of the game world logic, in

which everything else has to be paid, bargained, or fought for. It is interesting to see how quickly these problems defeat the usual interaction options.

Breaches of Internal Logic

This is more fully illustrated by some further examples from Riven (1997), the sequel to Myst. Myst and Riven are dominated by designed, architectural structures that afford agency. Paths, walkways, elevators, ladders, door handles and control panels provide access to, and operate, marvellous devices, and these are the only ways to reach new places. You cannot fall from a walkway or bridge, because in the game of Myst you cannot (for the most part) be hurt and also because it was impractical for the designers to render the pictures of ‘you’ falling. This lack of freedom to move from the pre-determined pathway becomes a convention of the gameplay, and in particular, a major motivation and objective in the puzzles.

Thus, in Myst you cannot simply wade the three paces through shallow water to the clock tower, you must solve a puzzle to raise some stepping stones. In the temple area of the forested island of Riven, as you walk along a path you look up and see, only three meters away, a walkway you cannot find access to. You suspect it leads to more of the world, and more of the gameplay. If this were the real world, you could just scramble up the bank from where you are. But in Myst and Riven, you cannot scramble. Another good example of this is in the third Myst title, Exile (2001). One of the puzzles involves using a contrived lever mechanism to move a barrel blocking a walkway. In real life you could simply climb over the barrel, but the gameplay doesn’t allow it. You are stuck on the path, as part of what Aarseth has describes as the ‘ergodic intrigue’ (Aarseth, Cybertext 113). It is a very consistent incoherency in the fictional world, part of the rules. The player quickly accepts this as a convention. After all, it is a game, and these rules make for the particular gameplay that makes the game compelling.

This strong convention across the Myst series highlights the inconsistency of the ‘vent fan’ and ‘gate scramble’ exceptions in Riven. In the ‘vent fan’ example, you can only gain access to a place (Ghen’s laboratory) by ‘climbing’ up over a control panel for a device, climbing through a fan and along the ventilation duct. Not only does this movement occur without a ladder or steps, but you do not need to (and are not able to) push the fan away to reveal it was a secret door. The fan just disappears, with no visual or audio rendering to explain where or how it goes. The other exception is the ‘gate scramble’ example, in which you can (and have to in order to progress) slip under the locked gate to the tunnel at the back of the rotating room on the first island in Riven. Both of these cheats break a very clear convention in Myst and the rest of Riven that you cannot deviate from the architectural affordances of the game world. As such, many players do not even try it, and so get stuck in the game. Not part of an evolving style, these inconsistencies are like mistakes on the part of the designers, or are perhaps intended as playful jokes – which are often regarded by the frustrated players as ‘cruel’ jokes, since these inconsistencies are the only way to progress the game.

The Unfinished Works

Some inconsistencies arise from a lack of resources to finish the project to a consistent standard. It has to be acknowledged, in fairness to the creators of these experiences, that the sheer amount of inherently variable media make it very difficult to ensure an even, high standard of finish. Nevertheless, these ‘rough bits’ break the surface tension of the immersion.

An example of such an occurrence is in Half Life 2 (2004), which has a friendly character called Father Grigori. When Father Grigori first appears, the player has just finished shooting zombies. In my own experience of playing the game, I started shooting at him as soon as he moved (it is a first person shooter after all). It was only as he didn’t die that I realised he was ‘unshootable’. However, he didn’t seem to notice that I was trying to kill him. Worse, he didn’t even wait for me to stop shooting, and so his important dialogue was drowned out by the sound of gunfire. As in the case of Exile, this seems to be oddly badly handled for a game/world as

generally so well crafted as Half-Life 2. It is easy to think of several ways this could have been more convincingly handled. For example, the player's gun could simply not fire while Father Grigori talks. Or Father Grigori could make a few derogatory remarks about the player's bad shooting, in order to explain why Father Grigori isn't being hit. Or Father Grigori could be killed, and the game restarts at the beginning. Even Half-Life (1998) had better examples of handling the player shooting at 'friendly' non-playing characters.

These 'unfinished' traits can extend into the audio-visual rendering of an experience. In the third instalment of the Myst series, Exile (2001), there are many such examples. Some of the sound effects for the closing of doors seem to have been taken directly from the original Myst, bringing with them a much lower technical quality (low sample rate and bit depth). Not only that, the door sounds are sometimes just wrong. Doors that appear to be made of steel with complex hydraulic latches have an audio track that sound like a heavy wooden door when jostled. This might be an 'easter egg', a designer's homage to the original Myst, or it might be the designer's expectation that any door that cannot be opened has a common, default 'can't be opened' noise. Or it may just be a mistake judged to be of low priority that never quite got fixed before the game had to be delivered.

A simple lack of time may explain another 'immersion' breaking phenomenon in Exile. Some of the doors you walk through in Exile have very long and elaborate sound effects to 'tell' of their closing behind you. However, you can turn around to see a simple still image of the door already closed while the sound effect is still playing. That the animation of the door closing was never made is understandable, and both Myst and Riven made good use of just a sound effect to 'tell' of the closing of a door or other event. However, they also made it impossible to turn around until the door was 'closed', preventing a jarring dissonance between the audio and video aspects of the world.

Kent has written that that John Carmack, one of the founders of id Software (makers of the Doom and Quake series), describes a phenomenon he calls the 'Hanna Barbara' effect, in which the slightly different image quality of the animating or interactive part of the scene makes it stand out from the background (Kent 161). It is

a common anecdotal observation that no matter how sophisticated any game rendering seems on first sight, the player can detect these slight technical artefacts after hours of play. Players learn to use them as cues for the opportunity to interact, or that something is about to occur. However, because they are so consistent, these become part of the game schema, even if the designers do not intend it.

However, when they are not consistent, they are distracting, as in Exile, where there are ‘stretched’ textures, a commonly occurring artefact of real time three dimensionally modelled and rendered worlds. Particularly obvious in the first person shooter games of the 1990s, wall and floor textures appear stretched and/or repetitive. In order for the real time responsiveness that allows the player to look at anything and move anywhere, this is usually unavoidable. Since the player is typically moving very quickly anyway, and the artefact is consistent, this is of little consequence. In contrast, the world of Myst, Riven and Exile are actually pre-rendered images, and it was possible for each image to be manually checked to ensure that it did not have such ‘stretching’. However, there are several occurrences of obvious ‘bad 3D’ in Exile, and because the rest of the game is so carefully presented, it is once again a break in the consistency of the illusion.

Whatever the reason for these various exceptions to the usual standard of finish, they are again at odds with the overall seamlessness of the environment, a jarring inconsistency. It seems likely that there are simple, pragmatic reasons why these things are the way they are, and the published case studies of the making of games are full of evidence that money, time and focus run out (Kent) (Hodgson) (Keighley) (Carroll). This once again reminds us that new media objects are made by real people in real circumstances.

Mimetic vs Immersive

Chapters Four and Five of this thesis have presented the argument that significant technical limits impact negatively on the audio-visual, artificial intelligence and physical aspects of the interface of a new media work. The first part of this chapter has also identified that further problems can occur for the reader/player/user because of oversights, errors or lack of resources on the part of the designers of the new media works. These failures can be described as ‘gaps’ in the interface. Juul’s ‘half-

real' model goes some way to explaining how so many games, and new media experiences generally, work with these inflexible interfaces and interaction modes, and we can point out the inconsistencies as specific accidents, or lapses, of design standards. However, the fact that we have to put up with 'big blue arrows', or not being able to see or feel our own feet when we are supposed to standing on narrow ledges, demonstrates to us just how 'not there' we are.

But the fact that millions of people overcome these limitations every day to enjoy games and other new media works tells us that they are somehow 'immersive'. In order to better define 'immersion', it is important to draw a clear distinction between immersion in an experience, and the mimetic function as one means by which immersion might be enhanced (Laurel, quoted in Meadows 162). New media, and games in particular, constantly strive towards ever richer audio and visual 'realism', and also towards convincing artificial intelligence. The increasing degree to which new media can accurately mimic the real world is, of course, a necessary factor in achieving the 'Holodeck Ideal' discussed in Chapter One. Placing the works studied in this thesis on a mimetic scale allows us to see where they are relative to the 'Holodeck Ideal'.

The Mimetic Scale

We would find Afternoon on one extreme of the mimetic scale. Hypertext fictions such as Afternoon are almost entirely text-only stories, where the reader navigates from one text fragment to another by hypertext links. These works demonstrate that text (the alphanumeric coding of meaning) is a very sophisticated way of communicating complex ideas. However, it is non-mimetic, since the text has to be decoded. Not only does it require the user to be able to read the particular language being used (English in the case of Afternoon), but it also requires that they understand the conventions of literary writing. It is anti-mimetic.

An interactive fiction such as Adventure would appear close to hypertext fiction on the mimetic scale, but some way towards where we currently regard video games, simply because it uses less literary language, and there is a clearly articulated world which can be freely explored, which is one of the criteria for an adventure game

(Montfort, Twisty). However, like hypertext fiction, it is still rendered in text, and is therefore non-mimetic.

The next thing we would find on the scale moving towards fully mimetic is the modern video game, and both Myst and Doom have become classic examples. Both of these games have present day descendants, and it would be reasonable to expect to find these later versions further along the scale towards ‘fully mimetic’, since they are more sophisticated in their audio-visual rendering.

Char Davies’ work Osmose derives much of its power from the dedicated interface hardware, notably the head mounted display. Despite the (now) low visual resolution of the early 1990’s display, the mimetic value of Osmose is undeniable. When you move ‘your’ head in a conventional game on a conventional screen by moving your hand on a mouse, keyboard or console, the game world moves inside the tiny frame of the screen. In contrast, with a head mounted display, when you move your head, your entire field of view moves, exactly as it should. This is much more mimetic, and we might describe this specific gesture of interaction as intuitive. So Osmose might appear to be quite close to the mimetic end of the scale.

Not Yet Mimetic

However, to place current virtual reality experiences at the mimetic end of the scale would be to deny the very definition of mimetic: ‘to copy or imitate closely, to resemble closely’ (Hughes, Michell and Ramson 716).

Even the most sophisticated game or virtual reality environment is far from ‘closely resembling’ the real world in its audio-visual rendering, the way we interact with it, or the way it behaves. Of these three aspects, it is certainly the audio-visual to which most improvement has been made. Further, it is important to realise that, relative to mimicking the real world, these improvements are very small. This may seem like a provocative comment, given that we live in a time of super-hype about bigger, deeper, richer imaging, but consider this for a test.

Go outside at sunset. Try estimating how many different colours there are in the sky as the eastern horizon darkens, even if there are no clouds. Examine the sun slanting

down through the leaves in the trees, and try counting how many different shades and hues of green result. Then observe the infinite combinations of colours of sky and leaf filtered light falling on the tree bark and the ground. If the day has been wet, notice the uncountable number of water droplets gently wobbling in the vegetation, sparkling the light. If you were a professional photographer, and you spent a lot of time preparing just the right equipment, you might be able to capture a fair rendering of this scene, and if you could afford to enlarge it to the size of a whole wall in a house, the photo might still carry some of the astonishing detail of the real scene. However, the photo will still be a poor visual only representation of a single moment of the experience you were having. It would serve to remind you of the real experience. But it would not directly convey any of the smell, texture, movement, sound, etc.

Now imagine the chunky, pixelated textures of a video game, on a computer or TV screen, and compare it to the wall sized photograph. Obviously, the visual rendering on a computer screen is a very long way behind the wall-sized photograph. The difference between actual reality and a virtual reality in the way they look, sound, feel, move, behave and interact, is enormous. Games are not, despite the advertising to the contrary, anywhere near close to being 'photo-real', and being real real is not yet on the horizon. And the audio-visual rendering is the most developed mimetic aspect of games so far. Games are still using almost exactly the same hardware interface techniques as they were in the 1980s, and the role of artificial intelligence and its relationship to the interactive possibilities of plausible automated characters remains highly problematic, as was explored in Chapter Four: Techno-Historical Limits.

Therefore all games, and also Osiose, are actually grouped very close together on the mimetic scale, and still quite close to the non-mimetic text-only rendered experiences of hypertext fiction and interactive fiction. As we move towards the mimetic end of the scale, there is nothing at all, until we get to the as yet unrealised dream of intuitive, seemingly unmediated natural language virtual reality that we know from science fiction, such as Star Trek's Holodeck, or the 'jack in' of cyberpunk fiction. Current games with their haptic 'rumble packs', and even the head

mounted display of Char Davies' Osmose work, are a clumsy gesture towards what might be possible, and what is actually mimetic, that is, like reality.

Summary

This chapter has extended the main argument of the thesis: that the gaps caused by techno-historical limits in new media works are overcome by a greater dependence on the reader/player/user's performance than other media forms.

This chapter examined the detail of how gaps actually manifest in specific works, and acknowledged that the area of interactive media design has been extremely skilful in developing techniques to overcome the lack of a dedicated technology. However, the point was also made that the accommodation of these limits has led to a culture of acceptance of these limits as natural, and to the inaccurate use of terminology. Practical limits of human endurance, time and money compound these technical limits and conventions to produce the gaps of embodiment that occur in the Text/interface.

The distinction between 'mimetic' on one hand, and 'immersion' on the other was made, and the works analysed in this thesis were placed on a 'mimetic scale' to demonstrate the difference between current works and the 'Holodeck Ideal'. While this chapter has identified that none of the works studied in this thesis is genuinely 'mimetic', all of these works are definitely 'immersive' in some way, as can be determined from their popular and critical success. An analysis of how readers/players/users of these non-mimetic new media works overcome frequently occurring embodiment gaps is the subject of Chapter Eight: Immersion and Natural Language.

Chapter Eight: Immersion and Natural Language

This chapter develops the main argument of this thesis by exploring how individual reader/player/users may overcome the many gaps in the Text/ interface to have rich, fulfilling experiences. Specifically, this chapter is an examination of the phenomenon of ‘immersion’. The concept of ‘natural language’ as it is used in human computer science, and by connection the field of new media, is adapted to include the cognitive processes used by reader/player/user to perform any particular explicitly interactive work. This adaptation is described as ‘interface language’. This leads to the proposal that there is no ‘natural language’ of interaction with computers, just learned and usual languages of interactivity. This chapter then reviews various notions of ‘immersion’ that are prevalent in current game, art and design theory/analysis, and identifies that there are a large number of influencing factors that impact on any one person’s ‘immersion’ experience. In exploring a phenomenon as subjective as immersion, I make use of my own experience of being immersed in works, utilising my background as both a designer and reader/player/user of new media experiences.

This chapter concludes by offering a re-definition of ‘immersion’ as something that is demanded by an experience, not produced by it. A willingness and competency to become immersed is the readers/players/user’s investment in an experience. It is their act of becoming immersed that creates the space where the game is played or the text read, the experience had, and the pleasure taken.

Immersion

“To play a game is to take part in a complex interplay of meaning. But this kind of immersion is quite different from the sensory transport promised by the immersive fallacy.” Salen and Zimmerman, The Rules of Play (453)

A simple web search for the term ‘immersion’ reveals that in the wider world beyond new media the term is used very frequently in two distinct areas of human activity. The first is to do with water sports, primarily scuba diving. A scuba diver uses highly specialised technology, and techniques, in order to transport themselves underwater, where amazing things are to be experienced, far removed from those that are normal above the water.

The other use of the term ‘immersion’ is to do with the learning of a foreign language. Students separate themselves from their native language, learning by having to make their way in the world exclusively with the use of a new language. It is significant to this study that both of these real world immersions involve learning a new interface/language in order to gain a new, or at least, alternative perspective on the world. It is this aspect of immersion that is often overlooked in discussions around new media experiences: their interfaces, and in particular, the notion of the ‘naturalness’ of the language of interfaces.

Two art works by Char Davies, Osmose (1995) and Ephemere (1998), explicitly and self-consciously position themselves in the practice of immersion. These works provide the starting point for this investigation of current notions of immersion in art and games. Osmose is described in some detail in Chapter Three. Ephemere (1998) is a later work utilising the same physical interface.

Interface to Immersion

“At its best, immersion can be an adventurous and invigorating experience comparable to taking a swim in a cool ocean with a powerful surf. The environment appears at first hostile, you enter reluctantly, but once you get wet and entrust your body to the waves, you never want to leave.” (Marie-Laure Ryan, Narrative 11).

In 1992, I was slightly lost in central London, wandered into a huge video arcade and discovered, unexpectedly, that a virtual reality game existed. A monitor was showing by-passers images that I presumed were from inside the virtual reality world. The head mounted display, gun and other bits and pieces were all stylishly (for the time) molded in plastic. It was too much to resist. I paid my money, stepped up into the special podium, put on the head mounted display, and took hold of my plastic prop ‘gun’.

My experience was awful. My eyes strained to focus on the tiny screen or screens only centimetres from my eyes. The resolution of the images I saw was extremely low (relative to my expectations) and the refresh/frame rate was also very slow. Amplified by the time lag between my real body moves and my avatar’s moves, the overall image quality was so bad that I didn’t immediately recognise ‘my’ own hand and gun sticking out in front of me. The head mounted display did not exclude the roar of electronic noise coming from the rest of the busy arcade. I finally managed to interpret that I was supposed to shoot a pixilated blue-pink blob that was hiding behind an equally pixilated red rectangle. My session ended just as I was turning my cognitive powers to solving the problem that the virtual gun I saw strobing in front of me was not pointing in the same direction as my ‘real’ prop gun. It had cost me the equivalent of lunch to be confused and disoriented for a few minutes. I felt ridiculous, and noted as I left that there was no queue of people lining up for the experience. All of the other, more conventional, arcade games were doing brisk business. This game was Dactyl Nightmare, produced by the company Virtuality (Keinzer). Virtuality ceased trading in 1997, and the few systems actually produced are now available to hire as a children’s party novelty (Arcadian Virtual Reality).

In light of this experience, I viewed Char Davies' works Osмосe and Ephemere with some skepticism in 2002 when they were part of the inaugural BEAP (Biennale of Electronic Arts in Perth) exhibition in Perth, Australia [BEAP]. The two virtual reality artworks use fundamentally the same set up as my London experience, and some of the hardware components date from exactly the same time. The most conspicuous difference in the hardware set up is that in Osмосe/Ephemere, there is no hand held pointing device of any kind.

Becoming Literate

Char Davies gave an artist's talk in the gallery, before I had my own immersion, and of course, I attended her presentation. I watched Char 'immerse' herself in Osмосe, describing it as she moved around. She came out for a face to face chat with the audience, and then 'immersed' herself once again, this time in Ephemere. Char explained that she had been inspired in the mode of movement for both works by her experiences scuba diving.

In scuba diving, you adjust the amount of air in your diving vest to achieve a state of 'neutral bouyancy', in which you do not float up or down. If you master this delicate balance, you can then move slowly up and down in the water merely by breathing in or out slightly.

Davies has reproduced the same effect in her two works, using a vest that the immersant wears, that measures the expansion and contraction of their chest as they breath. The vest automatically 'finds neutral buoyancy' for the immersant as it calibrates at the beginning of each immersion. Since my London experience in 1992, I had become an experienced scuba diver. Having equipment strapped on me, wearing restrictive head gear that alters the acuity of my vision and hearing, and moving up and down by breathing, is all quite normal for me. I had a head start in learning Davies' immersive interface.

Despite the fact that the BEAP 2002 exhibition was running for several weeks, every available 20 minute session for Osмосe and Ephemere was filled only a few days after the opening of bookings. I managed to get only one spot, two weeks after Davies' talk and demonstration. During the two weeks wait, I become friendly with

Jeff Khan, the work's attendant for the duration of the exhibition. When my turn finally came, and as he was strapping me into the vest for Osmose, he realised how comfortable I was, and let me in on a little secret. If you bend your knees, you go faster. He kept this from most people, since they had enough problems controlling themselves without the added problem of more speed.

I was positively struck by the experience of being immersed, and I felt that I could move easily. As soon as my immersion in Osmose began, I immediately floated down past the big tree into the pond and discovered the little fish. From there, it just got better. I had been transported to an alternative, amazing world where I had agency. I was intrigued, enthralled, and I wanted more.

So why was there such a difference between my London and Perth experiences? In part, because Davies and her team had solved many of the frame rate and image quality issues. There was also no audio pollution, so I could hear the rich, subtle sound rendering. In addition, what Davies had created was thematically much more interesting to me than a shooting game. However, the key difference was that in London in 1992, I accidentally stumbled onto the virtual reality game, with no preparation or experience. However, at BEAP in 2002, I was totally prepared. With my scuba diving head start, a training session from Char Davies herself, and insider advice from the attendant, I was as well versed in the required interface of the experience as anyone could be without having done it before.

However, not everyone had as good a time as I did. The woman before me came out motion sick, and had to sit down for ten minutes to recover. Some other people are effectively paralysed by the interface. The person after me stood completely still, and 'floated' in one place for the entire duration of his session. The experiences of unprepared users of "Head Mounted Display" virtual reality compared to my own appreciation of the technique made it clear that the interaction with such experiences is far from normal, intuitive or natural.

A New Definition of ‘Natural’ language

“Thematically patterned after the TV soap opera, *The Sims* is played on a PC, and it is designed for lengthy playing sessions that create never ending stories. The principal mode of interaction is the selection of items from a menu... While menus are a far more restrictive, and far less immersive mode of participation than natural language, they present the significant advantage of allowing a coherent response of the system for every choice of the user.” (Marie-Laure Ryan, Peeling the Onion)

In linguistics, the term ‘natural language’ describes a language that is commonly used, and which has evolved without being formally defined. As described in Chapter Four, the area of artificial intelligence that attempts to meaningfully understand typed or spoken natural language (variously described as natural language processing, parsing and also computational linguistics) continues to be extremely challenging, since natural language is full of ambiguity, nuances and context dependant variation.

Ryan’s assertion is a good example of the continuing, common and possibly unconscious presumption in the discourse about digital experiences that the ideal state of immersion is more likely to come about with the lack of an obvious interface. Ryan’s use of the terms ‘more restrictive’ and ‘far less immersive’ are perhaps at odds with her recognition that, in the case of The Sims at least, menus are highly functional, compared to ‘natural language’ parsing, where the user types their own words into the keyboard, and the computer tries to understand it (in this case in Facade by Michael Mateas and Andrew Stern).

This tension in Ryan’s observations leads me to recognise two things. The first is that The Sims is only one of many very successful games with cluttered, visually disruptive, ugly menu system interfaces (another example is Everquest). So it is clear that they are not in need of whatever kind of immersiveness it is that comes out of a more transparent interaction system.

Secondly, it tells us that the WIMP (Windows, Icons, Menus and Pointers) computer interface continues to be regarded as a relatively new arrival, which is 'restrictive'. In fact, the WIMP interface is now ubiquitous. Not only is it found as the interface to the operating system of almost every computer in the world, it is also the standard way of interacting with almost every application you can run on those computers. While these interfaces may still seem problematic to those who remember adult life in the early 1990s before the computer, they are the way of operating personal computers, and other devices such as mobile phones and automatic teller machines. To millions of younger adults who were children when the Internet boom happened, WIMPS are the naturally developed language of interaction to a part of the environment that has always been there. Menus, buttons, point and click, and all the visual devices that go with them, are the common language of the digital age. There may be potentially better ways to communicate with a digital device, but they are not currently more common or natural.

It may not be very obvious to those of us who work in scholarly and academic circles, but every Western/ised city in the world has people who are not able to read and write. There are countries where literally millions of people cannot do so. The phenomenon of illiteracy reminds us that reading and writing is not a natural attribute of individual humans. Likewise, while it clearly is a natural human capacity to learn a verbal language, it is not natural to learn any specific language. A language seems 'natural' only because an individual is extremely familiar with it, having spent a long time learning it.

The use of WIMP interfaces for complex productivity purposes by hundreds of millions of people world wide makes it the perfect interface to complex environments like The Sims and Everquest, e-mail and websites, and mobile phones, because they have already learned it. It is only as natural and as artificial as any other specific language or alphanumeric coding system. Perhaps it would be more accurate if we renamed the notion of 'natural language' as 'familiar language'. Likewise, 'invisible interface language' should be replaced with 'familiar interface language'.

If our ‘familiar interface language’ is not the one being used in the interface to an interactive experience, then we are illiterate. We need look no further than the difference in literacy required between desktop personal computer games and consoles games. For example, I can play Counterstrike passably well on a personal computer, since I already know how to use a mouse and keyboard. But when I try to play it on an Xbox, I am illiterate. I have never learned the language of the multi-fingered, multi-buttoned modern game console. I cannot walk, or turn, or aim. I am so inept that by the time I have fumbled through choosing a weapon, my team mates have already disappeared from sight. I stumble along, looking backwards over my shoulder at the sky, banging into walls and falling into ditches. Like the man who just floated paralysed for twenty minutes in Osmose, I am interface illiterate and so, crippled.

Not Intuitive

Oliver Grau discusses Osmose in his book Virtual Art: From Illusion to Immersion, in a chapter titled ‘Virtual Art-Digital! The Natural Interface’. He frequently refers to the interface of Osmose as ‘natural’ and then says: “Because the interface technique of Osmose utilizes intuitive physical processes, the observer’s unconscious connects to the virtual space in a much more intense way than with a joystick or a mouse” (Grau 198).

This interpretation is very questionable. One of the many reasons Osmose and Ephemere work so powerfully is that they draw attention to the body by deliberately removing the natural, usual, intuitive ways of moving, and remove all visual representations of the immersant’s body, as Davies herself has stated in her many essays on these works (Davies, ‘The virtual’) (Davies, Osmose). The immersant is therefore constantly aware of their body, because of the new way it must be operated. Is the interface to Davies’ works bodily? Yes. Successful in its objective? Certainly. In masterful harmony with the theme of the work? Undoubtedly. But is it intuitive? No.

One particular aspect of the Osmose/Ephemere interface that is completely intuitive and natural is the way you see and hear things. The image fills your vision, and as

you turn your head, it moves in instant response. The sounds also maintain their own position in the virtual space. However, the way that you yourself move is completely non-intuitive. Learning to go up and down underwater by breathing in and out is a devised, learned technique that takes at least some practice. It is not even intuitive to other animals, since the technique requires a supply of air underwater to do it. Similarly, moving in a direction just by leaning that way is not intuitive. Skiing, skating, skate boarding and bicycle riding use this technique, but they are also learned techniques, and all utilise technological extensions to the body. In Osmose/Ephemere, immersants who lean too far one way often take a real step sideways to stop themselves toppling over, and if they take more than two or three real steps in one direction, the attendant has to gently push them back into the sensor zone. Likewise, accelerating by bending your knees is not intuitive. It is also not intuitive to immersants that in Ephemere, it is possible to make certain objects change merely by gazing at them for long enough (Davies, 'Rethinking VR').

I only know these things because I was told them, either by Char Davies (at her gallery talk) or by Jeff Khan, the work's attendant for its time at BEAP. The very fact that there is an attendant demonstrates the inherent non-intuitiveness of the mode of movement in the works. Unlike most art gallery contexts, where there might be an attendant to make sure that people do not touch the works, Osmose/Ephemere needs an attendant to explain to you how to engage with the works. Even if you were already aware of the basic movement techniques, there isn't really time to get used to the interface. Most 'immersants' have had a total experience only fifteen minutes long in an exhibition setting, and without my significant advantages. One of the designed aspects of the later Ephemere addressed the problem of some of the immersant being paralysed by the interface. Ephemere has an automatic movement function, so that even if the immersant remains motionless, they witness a dynamic environment (Davies, 'Ephemere').

These 'bodily' means of movement in the artworks are certainly different from the use of the 'pointing device' model of the hand, joystick, data-glove and cursor, which was one of Davies' intentions. However, it is easy to argue that the 'pointing device' model is enormously more intuitive, and just as bodily, since it is something

we do in everyday real life with our hands, as well as very often in the now ubiquitous virtual environments on personal computers and other digital devices.

A common observation made of Osmose/Ephemere by its immersants is that they had a strong feeling of presence, of ‘being there’ (Grau 199). I had this feeling myself, but it is clear that even without literally involving the whole body, it is possible to create a feeling of presence. An example of this is the comment below from a player of Myst, which uses the keyboard and mouse combination on ordinary personal computers: “Like most Myst players, I think of the islands in the game not as an assembly of digitally rendered paintings but as places I've actually visited ” (Miller, ‘Riven Rapt’).

I can find something I admire in almost any interactive work I examine, even if it doesn’t appeal to me personally, but I am particularly impressed with Char Davies’ works. They are innovative, beautiful, masterful and compelling. I agree completely with Grau’s claims about how significant these two works are. But their interface is not intuitive. We must be very careful how we use terminology, particularly in connection to works that have become a key reference in the field (Thwaites) (Tofts).

All Kinds of Immersion

The learning of the necessary language of interaction with a particular work will empower a reader/player/user with the ability to engage with a particular new media work, but the process by which they learn is driven by their individual motivation.

“I’m a senior design engineer. I spend all day solving problems that if I get wrong, will probably cause the death of real people some time in the future. I have to do this to a deadline, and a budget. So, when I get home from work, I don’t want to solve more problems. I just want to immaturely and irresponsibly blow stuff up. So I play shoot ‘em ups, with all the cheat codes turned on!” (Anecdotal comment by Larry, a forty-something year old civil engineer.)

Anecdotal evidence like this tells us that people who play games are highly varied in their motivations for playing a particular game (or genre of game) in a particular way. Newman has noted the ‘almost impossibly diverse range of technologies, experiences, game types and aesthetics’ (Newman 72). We can see that players and games come in far too many permutations to be able to accurately or usefully define them, and this presents a major problem for game criticism and future game designers, as well as for the whole field of new media. The inherently variable nature of the experiences has allowed, and created, a readership for new media that is extremely hard to identify compared to the audience for broadcast, linear, static media. Nevertheless, we can consider some of the processes of immersion that might contribute towards, or detract from, any given reader/player/reader’s state of immersion.

Immersion by Ritual

“Ritual - A state or condition characterized by the presence of established procedure or routine.” (Hughes, Michell and Ramson 988)

As outlined in Chapter One, discussion about the value and role of cut scenes and introductory sequences has been a part of the ‘narratology vs ludology’ debate in game studies. One of the allegations brought against non-interactive narrative ‘bits’ of games is that they reduce immersion by interrupting the flow of gameplay. I am proposing that we can consider them, especially the introductory sequences, as a ritualised preparation for the immersion. When someone decides to play a game, they go through a series of steps, each one bringing them closer to the actual gameplay. A game is acquired, installed and loaded onto a system. Sometimes, if playing on a personal computer, the computer’s settings must be changed in order to optimise the experience. If the game is a recent advance in visual rendering, the computer may even need to be upgraded.

This process is a ritual: a long series of steps that must be undertaken in a certain order to achieve a certain state. The introductory sequences of games make up the last stage of this ritual before it becomes interactive. The introduction sequence obviously provides exposition, but it also allows a literal tuning of the senses to the

imminent experience. As I ride the train into Black Mesa in Half-Life, I am experimenting with my ability to control ‘my’ self. My eyes and ears adjust to the stylistic character of the audio-visual rendering. I get a feel for the flow. I have time to notice that I do not have a gun, and this is obviously not a good situation in a first person shooter. But I remember that this is the challenge that I have undertaken. I like it this way. Why else would I be playing this game? I am both calmed, and attentive. I am getting ‘in the groove’.

The ritual of engagement with Osmose and Ephemere is much more elaborate. Firstly, it is experienced in an art gallery, or other, gallery-like institutional space. Such places have their own ritual. They are in big, important, cultural buildings. You have to leave your bags at the door. You must not touch anything and you should be quiet.

Because Osmose and Ephemere are ‘single player’ experiences and very popular, you also have to book an ‘immersion’ session well in advance. Not only that, but before it is your turn, you probably watch the ‘immersant’ before you having their experience. You can watch their silhouette on a screen as they perform (or not, if they are paralysed by the experience), and also see what they are seeing on a separate screen. As they finish and emerge from the immersion, they usually look slightly dazed as their senses re-adjust to the light and sound of the real world. Then you disappear behind the screen yourself. An attendant helps you put on a body harness and head mounted display and explains how you operate the interface.

These rituals are part of the investment that we make in order to make the experience work. They get us in the mood and allow us to anticipate and interpret the particular interface language of the experience. Even if we already know the language, it might be spoken with an exotic accent.

Immersion by Exclusion

“Riven was designed to be an immersive experience. So, shut the door, turn down the lights, turn up the sound, sit in a comfortable chair, and let yourself be drawn into the word of Riven. And, for goodness sake, use a

pair of headphones or a good pair of speakers!” (page 3 of the User’s Manual for Riven: The Sequel to Myst, 1997)

These insistent instructions from the design team at Cyan illustrate the need for what Meadows has called the ‘immersion of exclusion’ (Meadows). Clearly, if we are to take this advice seriously, the start of immersion is the removal of all distractions of sound, sight, or ergonomic discomfort. This reminds us that the interface to the experience includes its actual, physical location. For games, this may well be the living room floor (in the case of a console game), or the potentially more isolated bedroom or study (for desktop computers). These are highly variable settings in terms of ergonomics, sight and sound.

Maintaining the necessary environment is part of the function of the virtual reality headset, icon of 1980s virtual reality. It is not only placing you inside another world, it is excluding all others (McMahan). This is certainly the case with Osmose and Ephemere. The actual image screens used in the headset are quite low resolution, and some immersants are disappointed with this. However, the compelling nature of your head movement (the world does not move in a frame, and it moves as you move your head, not your hand), combined with the exclusion of all other images, makes it work. The physical environment can be relied upon to be consistent, since the experience is had in a dedicated, custom built, light and sound proofed room in a gallery setting. However, even in a specialised setting, this exclusion of other worlds can be a fragile state of affairs.

During BEAP 2002, once I’d had my Osmose immersion, I was very keen to experience Ephemere. After waiting unsuccessfully for a couple of weeks for a cancellation, and becoming friendly with Jeff Khan (the work’s attendant), he offered to let me ‘have a go’ in Ephemere just before the usual opening time. I readily agreed, of course, and turned up early in the morning. About halfway through my ‘immersion’ in Ephemere, I heard sounds that seemed out of keeping with the surreal, yet naturalistic, soundscape. I thought I heard familiar voices. Then they disappeared, returned and grew louder, and I realised there was a conversation going on about Ephemere itself. I was surprised at this self-referential aspect of the

work, and as I ‘flew’, I wondered how and why it was done that way. After some time, I realised what was actually happening.

Chris Malcolm, the John Curtin Gallery’s installation manager, was showing a group of VIPs through the physical setup of the work. In order to avoid disturbing a scheduled immersion, he had organised to bring the VIPs through before the start of the day. Of course, since my own immersion was unscheduled, we collided, and he had no choice but to proceed. Although he was talking as quietly as he could, he was leaking into my experience of Ephemere. Although I could not see Chris’s party, I was aware that they were watching me, and I continued to listen to their muffled conversations. The unexpected soundtrack and audience to my performance split me into a simultaneous presence, both in the work and out of it. Extending Juul’s notion of the ‘half-real’, it is possible to describe this condition as ‘double-real’, since I was in confusion about where the division was between the virtual and the real.

That I found it so distracting informs us of just how ‘transportational’ virtual reality works can be, and indicates that, sometimes, a higher level of exclusion does equal a higher level of immersion. But it also indicates just how delicate immersion can be, and this may be a real practical problem for mimetic systems in actual real world application. Is there any point in striving for ‘total immersion by exclusion’ if it cannot be sustained consistently?

This need for the exclusion of other sights and sounds is evident to anyone who has spent a lot of time in the first person shooter Quake Three: Arena. Even the easiest setting of difficulty can be quite a challenge for someone who is not experienced in first person shooters, or who, like me, is not devoted to the genre. After being killed and re-spawned dozens of times, I realised that I was missing something, that winning in Quake Three: Arena is not just about running around in corridors and shooting. I decided to study how to win. I developed a plan, and became what is known in first person shooter gaming as a ‘camper’. Slow on reflexes and not good at aiming while moving, I decided to sit in one spot and wait for the enemy to run on by me. It turns out that there are excellent places in each level to camp where nobody can approach you from behind, you can see all approaches in one field of view, and you can pick up extra health and weapons with just a few ‘steps’ out of

the safe position. These are often right next to the magic icons that regularly appear, adding special powers that dramatically increase the efficiency of your killing others.

Camping has another benefit, which is that you become aware of just how carefully designed the audio is. It is not just the richly textured sound effects of the weapons firing or the bodies exploding. If you are a camper, you can hear your enemies coming. You can actually hear the sounds of the doors opening ahead of them, the sound effects of them collecting their weapons, and even their footsteps. This observational, thoughtful, contemplative approach to Quake Three: Arena leads to other realisations, such as an appreciation for the variations in weapons. The design of each level suits a different weapon. Lots of corners mean that you are better off with a shotgun, since encounters will happen at short range. Long corridors means a pulse rifle is the weapon of choice, a rail gun is the only weapon that has any killing power over a long distance, etc. Some opponents are more easily killed with one weapon than another. Thus, hearing the audio announcement of the opponent's names at the beginning of each round is important in making weapons choices. Half Life features similar use of subtle audio clues to allow the player to anticipate trouble, such as the radio-chatter by the 'special forces' bad guys. Significantly, if you do not have the correct left to right stereo setting on your speakers or headphones, you will be shooting the wrong way.

Realising the value of careful contemplation of the environs of first person shooters makes them seem unexpectedly like Myst and Riven. The quote above from the designers of Riven shows their frustration that many players were never aware of just how detailed and sophisticated the worlds they had created were, a problem that I have experienced with my own interactive media work. The beginning of Riven goes to the trouble of making players actually calibrate their monitor and speakers with test images and sounds before the gameplay starts.

This kind of attention to detail highlights the indivisible tissue of the interface, which goes all the way from the virtual meaning created in the player's brain, through the 'outside world' and digital hardware of the Text level, back into the other virtual world of the game that exists as data. Critically, the images and sounds

that cross the real world in this link must do so in a 'clean' space where they will not be overwhelmed by extraneous light, sight, or sounds.

Immersion by Challenge

The original Macintosh release of Myst (1993) was before the Internet explosion, and the Myst CD-ROM came packaged with real envelopes in which there were hints of how to solve the more difficult puzzles. Players who found the puzzles too challenging could open the 'hints' whenever they felt it necessary. Every copy of Myst had identical solutions to identical puzzles. However, later releases of the original Myst dispensed with the hints envelopes. By this time, the Internet had established itself as a powerful means of one to one (e-mail) and one to many (website) communication. This 'out of game' help to the primary experience had been replaced by the official 'strategy guides', work of mouth/e-mail help, and a huge number of unofficial web sites offering 'walk-through' solutions, which Aarseth calls 'paratexts' (Aarseth, Cybertext 113).

During the design of Riven (the 1997 sequel to Myst) the designers must have been aware of just how quickly these walk-throughs would appear on the Internet. This may be why they felt free to make Riven extremely difficult. While it is certainly true to say that it is not beyond the ability of one intelligent person to solve it all, it is safe to say that it is extremely improbable that many people would have the time and the aptitude and the patience.

Some of the puzzles in Riven are programmed to have varying specific solutions with each install of the game from the CD-ROM to a specific computer. The result is that while the walk-throughs can provide an overall logic of solution, the specific arrangement of objects, colours, marbles and levers, etc will vary for each player, requiring them to still undertake the journey of exploration and discovery. This is how Cyan's designers ensured that Riven could not be simply 'walked-through' in the post Internet age. However, I found it confusing and difficult even using the walk-throughs.

I carefully mapped out the series of events needed to achieve just one critical plot point (the code to break the seal to the fissure). This is found in Katherine's diary. In

order to get the diary, you must go to the ‘age’ called ‘Tay’. To get there, you must choose five particular stones from a circle of dozens of stones. Your choice is based on identifying abstract carvings of unusual animals, and selecting them in a specific order. The order can only be known by reference to animal sounds you encountered separately elsewhere in the game, in association with written numbers. The numbers are written using a non-alphanumeric symbol system. Further, the numbers are not ‘base ten’ numbers, but ‘base twenty five’ numbers. If you didn’t even know there was such a thing as base twenty five numbers, then you join a long list of reasonably intelligent, hard working but mathematically challenged and frustrated players like myself who resorted to the Internet for the solutions. Even more maddeningly, the game itself gives a clue that the maths system used is base five, which it (apparently) is not, so even if variable base maths is your thing, you will fail. This chain of solutions must be extracted without having the overview of what the objective is, and all of these clues have to be drawn together from the mass of other puzzle clues you have discovered that are parts of solutions to other puzzles in the game.

Given the improbability that any significant number of people can complete the game without using walk-throughs, in opposition to Aarseth’s notion that walk-throughs are ‘cheating’ (Aarseth, *Cybertext* 117), it is clear that the separately sourced ‘walk-through’ is a part of the designed experience. Aarseth also acknowledges that walk-throughs provide ‘many’ users with an experience they would not otherwise achieve, but I am proposing that for the majority of players, walk-throughs are the norm, not the exception. People with the time, inclination, aptitude and patience will do it all without any outside help, and those who can’t, and I suggest that most of us can’t, will use the walk-through to overcome the most difficult parts, and still enjoy the overall experience. Walk-throughs make a particular game infinitely variable by any one user to match their specific immersive limits of time and aptitude. For many games, these important para-texts make them work. Far from ‘cheating’, they are an integral part of the design of the experience. This helps explain the existence of a huge range of official and unofficial walkthroughs, hints and cheats that are endorsed by the game developers ([Prima](#)).

A question that arises from this realisation about the need for players to have this help, and particularly in the context of immersion, is why the game designers don't just make the game clever enough to vary the difficulty to suit the actual immersive investment of the player, without drawing their attention to it. Many games automatically assess the computer system to make the game run optimally. Why not implement the game problems so that each user spends approximately the same amount of time in the experience? This seems like a much unattended to avenue of design in games. Perhaps the limitations of artificial intelligence (discussed in Chapter Four) are the reason why 'in-game' help is in a pull down menu, as in realMyst (2000), or as contrived characters who operate as helpers, as in Half-Life 2 (2004) or Myst V: End of Ages (2005). If so, then until artificial intelligence is better, walk-throughs will provide the agency that allows individual players to vary the amount of time that is required down to the level they can, or are able, to invest.

Immersion of Appreciation

In 1995, I introduced a group of undergraduate students to Myst. Their collective response could be summarised as 'It doesn't do anything!'. By then, games such as Sonic the Hedgehog (1991) and Doom (1993) had already established what a computer 'game' was for many people. Players expected fast cycles of automatic action to occur, and that they would respond to these challenges. Myst and its like, on the other hand, demand a long term pro-active intellectual investment, and literal note taking. The 'action' that occurs merely by being there is the process of discovery and observation of the virtual environments. But for my students, it was simply too slow to be a game. Although they were certainly aware of games, they were not appreciative of the specific gameplay style of Myst.

Around the same time as my students failed to appreciate Myst, I gave a presentation as a multi-media designer to an association of film and television producers. I explained the fundamental aspects of new media over old media, as I understood them at the time, and had Myst available on a computer for people to explore during a following informal session. Like my students, they were completely unimpressed with Myst, though for different reasons.

The late 1980s and early 1990s were a time of widespread media hype about ‘virtual reality’ (Laurel, Computers) and the film and television producers were massively underwhelmed by the tiny, pixelated introduction video, and the not much bigger, almost static images that made up the main screen. They stood watching the computer screen, not interacting with it, expecting it to ‘happen’ as it does with a demonstration of a TV programme or movie. They were not accustomed to physically interacting. It satisfied neither their expectation of their own craft’s own existing ‘immersive’ capacity with its highly evolved hundred year old ‘natural’ language of the cinema, or the outrageous promises of virtual reality hype. These film and television producers did not have a sufficiently well developed appreciation of the interactive form.

What is lost from representations when they move to more explicitly interactivity is the conspicuous ‘painterly’ or ‘photographic’ sense of the perfectly composed image produced by the artist/author. This fixed stillness is what old media sensibilities expect from artworks, and carefully designed artefacts in general. Even the Myst series developed a lot of its appeal from this ‘still’ advantage, despite its low resolution and small size. Every single screen in Myst is uniquely composed, has a function, and there are hints and clues presented, some obvious, others subtle. It is a trait that we might admire in Renaissance or Old Masters paintings. But we still need to accept the small size, and that we have to move from image to image.

In particular, real time 3D environments do not have this advantage of fixedness, or stillness. And so an aesthetic sensibility developed on still, fixed, non-interactive media will obviously not find much to appreciate in virtual environments, where everything is variable. Discussions about new media that are predicated on Benjamin’s notion of the loss of the mystique of the original artwork in the age of mechanical reproduction miss an important point, which is that the age we are in is conspicuously digital, not mechanical, and as Manovich has pointed out, digital means having the characteristic of being variable (Benjamin) (Manovich).

It is precisely the subtlety and complexity of digitally created works such as Riven and Quake Three: Arena that so many art, cinema and literature oriented critics of games do not appreciate, since they have not invested the time, or had the

opportunity, to become appreciative of these creations. Being inherently variable, new media works embody a completely different kind of mastery for their interactive audiences to appreciate. This quality is very hard to see for those who have undeveloped sensibilities for the tactile, kinetic, interactive aesthetic of moment to moment variability inside dynamic digital experiences. This problem is self-correcting of course. The Playstation revolution of the 1990s created a mainstream acceptance of games as adult fun (Newman 93), and younger generations have unconsciously developed an inherent appreciation for digital forms. And as identified in Chapter One, a whole new generation of new media scholars are more attuned to new media by their lived experience of it.

Investment in Immersion

It is easy to identify other obvious factors that vary one person's capacity to become immersed. Stylistic objections, as in art, furniture and clothing, play their part. Different people like different things. While I appreciate that Doom 3's (2004) 'US Marines in Space' references from the movie Aliens (1986) appeals to millions, I personally prefer Half-Life 2's deep, Orwellian, dystopian world. I find the conspicuously North American accent of the character 'Savero' in Exile very obtrusive, but North Americans won't even notice it. I also found the heavy background music in Exile distracting, but others appreciated it (McMahan).

Too predictable a challenge curve also causes me to lose interest. While I know people who played Quake 3: Arena through all the levels on ever increasing difficulty settings, I am happy to leave the game behind after the first, easiest level of difficulty. I know I could eventually develop the sheer speed of reflexes to exhaust the game's capacity to challenge me, because I did it with Galaga (1981) in arcades in the early 1980s.

Many people simply don't have the time to play some games. Simulators like The Sims (2000) can soak up a lot of time, and in the case of on-line role playing games, the time demands are not just in quantity, but in scheduling as well. Not everybody has the free time in their life to achieve immersion in these games.

It is certainly the case that issues of difficulty, expectation, appreciation and taste are operating simultaneously in every interactive experience. Thus we see the totally variable nature of immersion, due to the individual's desires and circumstances. Therefore, it is possible to define 'immersion' as something that is demanded by an experience, not produced by it. This preparedness and competency to become immersed is the readers/players/user's investment in an experience. Immersion creates the space where the game is played or the text read, the experience had, and the pleasure taken.

Summary

This chapter has extended the main argument of this thesis by exploring aspects of the interface between a reader/player/user and a specific work that affect any individual's ability to become 'immersed' in that work. This exploration led to the conclusion that there is no 'natural language' of interaction with the interfaces new media works present to an individual, only 'familiar interaction languages'. Further, this chapter has offered a re-definition of 'immersion': that 'immersion' can be considered a state that a reader/player/user must create or achieve in order to perform a specific new media work, rather than the work creating the immersion for the individual. The competency required to achieve this immersive state is that the reader/player/user must be literate in the specific interaction language of the experience.

I am convinced from my own experiences that the 'mimetic' function, the one to one correspondence of virtual environments to a notion of realism, is a vitally important aspect of the immersive potential of digitally encoded environments, even if 'incoherent' in Juul's terms (Juul). Despite their lack of a genuinely mimetic nature, and the current practical problems, works such as Osmost and Ephemere do hint at what might be possible in future virtual reality systems. In debunking the 'immersion fallacy', Salen and Zimmerman acknowledge that the rendering of an interactive experience is still an important part of its engagement (Salen and Zimmerman). Others agree that the sensory aspect of the rendering, while not exclusively important, is a big part of the experience (Ermi and Mayra). And this agreement is

one reason why the 'Holodeck ideal' will remain part of the discussion about the future of interactive designed environments, either as a literal ideal for hardware/interface, or as a model for deeper 'immersion' on more familiar hardware systems (Murray). Chapter Nine is not part of the main argument of this thesis, rather it is presented as a postscript that considers why we don't have 'mimetic immersion' virtual reality systems that would fulfil the 'Holodeck Ideal' that this thesis has used as a reference point. It explores what changes might have to occur in society and culture for 'Holodeck Ideal' virtual reality systems to come about, considers what such systems might be like, and whether or not they are actually necessary.

Chapter Nine: New Virtual Reality

This chapter is presented as a postscript to the main argument of this thesis, rather than as part of the argument itself. It considers why we don't have 'mimetic immersion' virtual reality systems that would fulfil the 'Holodeck Ideal' that this thesis has used as a reference point. It explores what changes might have to occur in society and culture for 'Holodeck Ideal' virtual reality systems to come about, considers what such systems might be like, and whether or not they are actually necessary. These speculations do not use the methods described in the methodology chapter, but do extend some of the realisations that have informed the main argument of this thesis. In particular, the identification in Chapter Five of the 'borrowed technology' nature of new media's underlying techniques, and the Chapter Eight identification of the need for readers/player/users to have the necessary 'interface language', are utilised.

The Absence of Virtual Reality

The unfulfilled 'Holodeck Ideal' of new media that was identified in the Literature Review is a combination of the ideal of 'unmediated immersion of the senses', and the ideal of 'interactive narrative'. These two ideals are manifested in Janet Murray's Hamlet on the Holodeck: The Future of Narrative in Cyberspace (1997). Following Murray's example, this thesis adopted the Holodeck from the Star Trek TV and movies series as a reference point, particularly in Chapter Eight: Immersion and Embodiment, where the distinction between 'mimetic' and 'immersive' was identified. As discussed in detail in Chapter Five: Borrowed Technology, 'immersive head mounted display' virtual reality has constantly defied both popular and expert prediction of its imminent arrival since the 1980s. At odds with this fact is that the case for the value of mimetic immersive systems has been well made, over a long period of time, by experts in the field such as Brenda Laurel:

“First-person sensory qualities are as important as the sense of agency in creating satisfying human-computer experiences. Quite simply, the experience of first person participation tends to be related to the number, variety, and integration of sensory modalities involved in the representation. The underlying principle here is mimetic; that is, a human-computer experience is more nearly ‘first-person’ when the experience it represents unfolds in the appropriate sensory modalities. The intuitive correctness of this notion is witnessed by the directions of technical evolution in the area of simulators and games—towards higher-resolution graphics and faster animations, greater sound capabilities, motion platforms, and mimetic input devices like force-feedback controllers.” (quoted in Meadows 162)

However, we are yet to see the audio-visual component of widely available digitally facilitated new media experiences move outside the rectangle of the static screen of ‘desktop’ virtual reality. The Nintendo Wii game system (2006) is the first significant, successful haptic/tactile interface development since the 1970s.

An obvious reason for the lack of mimetic immersion virtual reality is the practical problems. For example, the technical quality of currently affordable virtual reality head mounted displays is very poor, with concerns about the long term health effects (Pesce, ‘VR Hurts’ 25). Also, head mounted virtual reality works on the exclusion of other images and sounds, and as noted earlier in Chapter Eight: Immersion and Language, this is very difficult to achieve outside of a closed environment. Chapter Six: Comparisons identified the ‘borrowed technology’ character of new media, and described just how expensive it would be to make mimetic immersion virtual reality practical for everyday use.

The question that logically arises is: why hasn’t Western culture made the investment to make ubiquitous mimetic virtual reality possible. An obvious answer is that we do not need this kind of mimetic immersion. This in turn suggests that reader/player/users are currently getting their mimetic immersion needs fulfilled in other ways.

Thought and Text as Virtual Reality

Thought is a technology (Grey). The ability to form and remember complex abstract knowledge may be a specifically human technique, and as far as we know, the ability to use speech to transfer complex, abstract thoughts to another individual's understanding certainly is unique to humans.

Writing is the process of 'hard coding' these thoughts and speech into text, turning them into a tangible, physical, visible embodiment that has the effect of allowing thoughts to exist across time, recorded accurately beyond the limit of a single person's mental processes, and even the loss of the original culture that created them, as long as somebody has the literacy to read them. The storing of text in codex/book form has created vast libraries of human knowledge.

As established in Chapter Five, unlike film and television, phones or music players, the Internet did not have a significantly dedicated technological development. The speed of the Internet/World Wide Web explosion of the 1990s was made possible because the Internet inherited its foundation software from a large 1960s US military research project (ARPANET), and its global networking links from the existing telephone system (Leiner). It would be ridiculous to try to simplify the social and economic phenomenon that the Internet has become, but it certainly originally worked as a communicator of textual information, and can be considered as a vast library. Hypertext linking, though a significant technical development, is certainly not a technique new to humans. When we use the table of contents or index of a paper book to find a particular page, we are undertaking the same mental process. Hypertext linking is no more cognitively interactive than turning the pages of a book. What hypertext linking (and search engine linking) has done is to make this almost effortless, vastly increasing both the speed of access, and the volume of information. But significantly, it is the pre-existing text reading and writing skills of its users that enables the Internet.

The critical fact that the cognitive process of reading and writing of text is the primary means of recording and accessing the collective virtual world of human

thought was recognised by many of the pioneers of the digital age. Vannevar Bush titled the essay describing his Memex system ‘As We May *Think*’, (my emphasis) (Bush). Douglas Engelbart, famous in the HCI community for creating the mouse, keypad, screen, and menus in the 1960s, called his project ‘Augmenting Human *Intellect*’ (my emphasis) (Engelbart).

The specific notion of literature as virtual reality has been thoroughly explored by Marie-Laure Ryan, among others (Ryan, Narrative). Arguments have been convincingly made that paper based literature provides a very powerful means of transportation to, and immersion in, fictional worlds. Those who enjoy reading fictional literature will certainly agree with this idea.

But this kind of immersion suffers from two distinct drawbacks, compared to an ideal mimetic immersion virtual reality like the ‘Holodeck’. First, textual virtual reality is not physically interactive or visually mimetic, and secondly it is not unmediated. Text, reading and writing are a highly abstract system of coding information. As discussed in Chapter Six: Immersion and Embodiment, the power of text as a system is limited by how skilled you are, that is, how literate you are. ‘Thought and text’ virtual reality is the opposite of what ‘mimetic’ virtual reality would ideally be, where everything is dynamic, intuitive, experienced first hand, uncoded, and apparently unmediated. In this regard, both ‘thought and text’ virtual reality and the only slightly mimetic ‘desktop’ virtual reality are very similar. They both suffer dramatic limitations in artificial intelligence, audio-visual resolution, and multi-sensory feedback – when compared to the ideal(ised) ‘mimetic’ virtual reality of the Holodeck ideal.

The dream of mimetic immersion virtual reality systems in entertainment is that amazing technology will easily transport us into alternative, novel places. These places will be populated by interesting and exotic people and creatures, and we will be able to freely experience these worlds without getting hurt. This dream is a modern version of the Arabian folk mythology of the ‘magic carpet’ (‘Magic’).

But far from being a fairy tale, we do actually have a widely available form of interactive entertainment that fulfills the magic carpet myth, and in many ways also

fulfils the mimetic, sensory ambitions of the 'Holodeck'. It is possible that because of its wide availability, it has reduced our cultural need for any mimetic immersion virtual reality system. It utilises Real Reality, not Virtual Reality, and the interface infrastructure that we use with it is called 'tourism'.

The Magic Carpet Ride

By using the magic carpet of a jet aircraft, we can be almost anywhere on the planet very quickly. We often complain about the hardships of flying long distance. If the plane is 20 minutes late, or if we have to queue up at immigration/customs controls, we feel this has inconvenienced us. But consider the temporal, geographic and cultural distances that we are covering in only a few hours. It took Western civilisation ten thousand years to reach Australia. In the 1700's, it took months of sailing on a ship to reach Australia from Europe, and travellers were much at risk of dying of disease or shipwreck. Now we can get from London to Perth (the most remote city in the world) in less than twenty-four hours. This amazing, world shrinking technology called 'air travel' is now so normal that it has become taken for granted.

It is still less than forty years since the introduction of the Boeing 747 made it economically possible for those of us fortunate enough to live in developed countries to go on holiday in another continent for the weekend. It is now very commonplace that families are spread out over the globe, knowing that they can get on a plane and be 'back home' in a few hours. This astonishing mechanism means that those of us who live in modernised societies have the whole world available to us. By holidaying in locations far from our normal homes, we can experience more real reality sights, sounds, smells, food, and interactions than we can possibly consume (although of course, we are still interpreting our physical experience through our cultural expectations). We are having these experiences with our physically unmediated bodies. Thus, our need for fully mimetic, unmediated immersion is already fulfilled to a significant extent.

End of the Magic Carpet Ride?

'Peak Oil' is the term used to describe the time when the rate of world oil production falls behind world demand (Seager). The obvious result is a rapid and massive increase in fuel cost. There have been previous times when oil costs have gone up, but the causes of these have been political in nature. In those cases, the cost of oil has declined following the easing of political tensions. Peak Oil, however, is a geological problem, since there is no more oil that can be easily extracted. Serious Peak Oil effects may be only years away. This is of enormous concern, since almost all of our transportation infrastructure is based on this single source of energy.

The end of oil, or rather, the increasingly impractical cost of oil, will not bring about the end of civilisation. Alternative sources of powering the production of electricity that can heat houses, power cars, trains, etc are easy to identify, whether they are nuclear, solar, wind or tidal, derived from plants bio-fuels or even using other, lower grade fossil fuels. All of these sources can be used in these ways, and there are plenty of examples and prototypes already in use.

Similarly, there are alternatives to oil for fueling airliners, for example, bio-fuels, and 'gas to liquid' petrochemical processes (Sasol Chevron). But it is not yet clear that these will be as cheap as oil has historically been. And so the Peak Oil phenomenon may well mean that the cost of flying becomes unsustainable for the casual, recreational purposes that we now think of as normal (Kuhlman).

And even if a cheap alternative fuel source for aircraft does become available, there are now concerns about the impact of jet aircraft emissions on the upper atmosphere. Flying as high as they do, aircraft emissions have a disproportionately large impact on climate change (McCarthy, Woolf and Harrison). As the world becomes more aware of the dangers of climate change, there may be legislative traffic limits imposed. And there are other threats to the magic carpet, such as terrorisms and disease (Armstrong, David). Therefore, even if we can fly cheaply, the tourism infrastructure we use to interface with Real Reality may fail, as borders are shut, or entire nations are quarantined (Associated Press).

So it is possible that, for a variety of reasons, our now normal ability to go almost anywhere at any time will cease, be severely restricted for most people, or will become much less desirable. What this means is that our access to extra-ordinary Real Reality will also be diminished. What would happen if modernised people could not travel easily for holidays, work and family reasons? What if we lose this physically un-mediated, uninterrupted, bodily, immersive experience?

Will this be our society's motivation to spend billions of dollars to develop truly mimetic, bodily, multi-sensory, immersive virtual reality systems, far removed from the clumsily mediated, borrowed-tech efforts of today? And if so, what might these be like?

The Future of Virtual Reality Systems

The potential future of virtual reality systems could be fulfilled by two different categories of technology. Those that utilise 'digital' technologies essentially similar to the ones we are familiar with now, and those that utilise 'future' bio and nano technologies. Both of these appear to have practical feasibility.

Digital Virtual Reality

There are in fact already existing digital technology sensory feedback systems for all of the senses, including touch and smell (Baker) (Zybura), (Eskeland and Gunnar) (Harel). It seems beyond doubt that if enough money were spent, these could be developed into a much more integrated and usable system, as has already occurred with mobile phones. For example, current virtual reality head mounted displays could be replaced by a much more sophisticated system that projects images directly into the eyes, even while the user moves around. Such a system would allow the virtual world to be mixed with the real world with no loss of quality, or physical impediment to the user. While this system was described in Neal Stephenson's 1992 cyberpunk novel Snow Crash, it is now expected to be a commercial product (as a spin off from a US military research project) in the near future (Microvision). Systems that mix virtual reality with real world elements are broadly referred to as 'augmented reality' (Azuma).

Haptic feedback has reached high levels of sophistication in medical surgery simulators, allowing the distinction between different textures of material as felt with hand-held/pointing devices (Polhemus). Kinetic feedback has been provided in ‘treadmill’ simulators, for example, the work of the Time’s Up artists’ collective (Nitzsche, Hanebeck, Uwe and Schmidt).

While it seems very likely that these various techniques can be combined into a single, ergonomic interface system, it is an interesting question as to whether or not these electro-mechanical devices, however ‘digitally’ driven they might be, could provide the subtlety, or power, of combination of sensory stimuli in real life such as the experience of diving into a pool of cool water, or the difference between the texture on the leaves of two sperate species of plants. It also remains possible that such a system, however mimetic it could be, would remain far too expensive (or dangerous) to be practical in everyday use.

Bio-Nano Virtual Reality

The use of drugs, cyborg-like wire implants, or ‘nano-bots’ that can ‘jack-in’ a user to a virtual experience have been extensively explored in cyber-punk literature, a conspicuous and early example being William Gibson’s 1981 Johnny Mnemonic. The key feature of these systems is that they really would be un-mediated interfaces, literally by-passing even the human body’s own senses of sight, sound, touch balance, smell, etc. While this kind of virtual reality interface has been in the realms of science fiction for a long time, its real world potential seems closer due to recent practical development in the fields of bio and nano-technologies, particularly in the area of medical technologies.

For example, partially successful attempts have recently been made to treat people with nervous dysfunction by directly stimulating their spinal cord with inserted electrodes connected to a portable control box (ABC). This is an example of how medical technology can ‘hack’ the body’s nervous system. If we imagine the potential of bio-medical and nano technology to connect even more directly to our nervous systems, then a whole new range of ‘virtual reality’ possibilities emerge.

But it also raises very obvious concerns. The physical dangers alone would seem enough of a deterrent. The potential for discomfort, disfiguration and death to occur if self-replicating ‘nano-bots’ turn into a runaway virus inside your body is clear. Many prescription and illegal drugs have had long-term harmful effects, unanticipated when first added to the body. Who would take these risks just for a ‘virtual reality’ experience?

However, our society has a poor track record of allowing and even endorsing this kind of practice. Let us keep in mind that all over the affluent Western world, people are paying hundreds of dollars to have botox vaccine injected into their faces to deliberately paralyse certain face muscles in the hopes of reducing wrinkling (Schaefer). The Dow Corning silicon based breast implants controversy shows us that the intuitively obvious danger of including foreign objects inside the body is not an impediment to people modifying themselves (Renwick).

In this context, it seems reasonable to assume that people will use these other modification technologies if they become available, regardless of the possible consequences, particularly since they are administered by ‘experts’. People already use digital technology in ways that may well be unsafe, such as the potential radiation hazards from mobile phones, and eye strain from long monitor use. Millions of people modify their nervous systems everyday with caffeine, alcohol, nicotine, etc. So in fact, if we are to take recent history as an example, we would be naive not to expect that when and if these technologies become available, people will use them to enhance and modify their experience of life.

Artificial and Real Intelligence, and Augmented Reality

But even if either the digital or the bio/nano pathways, or some combination of the two, produce the seemingly ‘unmediated’ interface to the ‘Holodeck Ideal’, it will still be faced with a major problem, and that is the lack intelligent characters and the dynamic storylines of the Holodeck dream. Brenda Laurel has said: ‘the interactive story is a hypothetical beast in the mythology of computing, an elusive unicorn we can imagine but have yet to capture.’ (Laurel, Utopian 68)

Chris Crawford, another veteran of game design, continues to believe it is possible, while warning that it is even harder than we once imagined (Murdey). As this thesis has explored in relation to the game Everquest, the current lack of compelling characters in games is dealt with in on-line role playing games by bringing real players together (Dobson). With a few crude props and a stage to play on, they create their own interactions and stories, which are never recorded. Perhaps it is time to acknowledge that MMO games such as World of Warcraft are already a very successful and commonly used form of 'augmented reality'. Hinted at by Laurel's Placeholder project of the 1990s, the use of actual peoples' intelligences, images, voices, and even real locations can overcome many of the artificial intelligence limitations of virtual reality systems (Ericsson) (Christensen and Jørgensen). If these were to be combined with a more mimetic interface system derived from digital and/or bio/nano developments, they may approach the fulfillment of the 'Holodeck Ideal' of new media.

The connection between the desire for interactive narrative, the enormous technical difficulty of it, and the fulfilling of this lack with other, real people, is a revealing one. This desire for rich, deep interaction in narrative experiences may be a symptom of a need to return to a more interactive, social, face to face way of engaging with the world.

The dominance of linear media such as books, film, TV and radio is still only a hundred years old. Even two hundred years ago, very few people had the time, money, literacy, or artificial light with which to read books. Before there were mass-produced, professionally-authored, fixed-storyline media, people participated in nursery rhymes, games, singing, playing of musical instruments, and verbal storytelling. All of these activities are highly playful and interactive. Thus, it is possible that World of Warcraft style augmented reality provides a means of fulfilling a fundamental human need. Indeed, the case for the social value of MMOs (as opposed to merely being a game) has been convincingly made (Mortensen).

Mimetic Engines

The fictional Holodeck can be described as a ‘mimetic engine’, massively superior to the current ‘game engines’ of ‘desktop virtual reality’ in its ability to mimic all of the aspects of the real world. However, the Holodeck is not just a virtual reality generator. In the story world of Star Trek, it has a real physical component. Several plot lines involve the ‘safety off’ feature, most notably in the movie Star Trek: First Contact (1996), in which Captain Picard shoots real aliens dead with a machine gun from an interactive drama. How this could be achieved in principle in the real world with future nano-technology has been described (Pearson). In this case, the virtual reality of the Holodeck would no longer be virtual reality, but in fact, an artificially constructed real world, in which you can get shot, or be burned, and be wounded or die. This would place it well beyond simulation, or game, or story, as the terms are used in our current discussions, and into a realm of philosophical questioning about the nature of artificially constructed real reality.

One of the problems with using the Holodeck from Star Trek as a model is that the Holodeck was developed by the creators of Star Trek to fulfill a very particular function in the longevity of the TV series. A TV series must keep viewers coming back week after week. Because of the basic premise of the storyline (the characters are essentially marooned in space), and the delicate dramatic potential between the characters, by the end of each episode they must all return to essentially the same state in which they started. The Holodeck allowed the writers of Star Trek to introduce all kinds of characters and situations (for example, Captain Janeway develops a long term relationship with a man who is not part of the regular character list) and then conveniently dispose of them because they are just ‘virtual’. Quite apart from the fact that Star Trek can create the Holodeck using fictional technologies that do not (and may never) exist, it is also not likely that people would actually use a Holodeck as the Star Trek characters do. Star Trek is no evidence of the value of interactive narrative, even if it is one day possible.

These observations are not intended as a criticism of the Star Trek series, or of science-fiction generally, but as an illustration of the problems that can occur for enthusiasts/theorists who use science-fiction as a model for actual development. We

can re-orient our ‘mimetic immersion’ Holodeck model by referring to our best, actual, practical example, Char Davies’ works Osmose and Ephemere. They are actually very similar to existing industrial and scientific virtual reality systems in that they utilise a hardware set that was uniquely put together specifically for the experience, and hence, there is a particular harmony between the subject and the interface of the experience. In this regard, Osmose and Ephemere are quite unlike the Holodeck. The Holodeck is not in itself an immersive experience, rather it is just a platform for many different applications. In the world of Star Trek, the Holodeck has been used as a simulator for training and hobby skills, a counseling tool, for holidays, as a design aid, as well as for ‘interactive narrative’. The Holodeck is not just the Playstation of the far future. It is, or rather would be if it existed, a much more versatile platform for many applications. It is the personal computer of the future.

However, the Holodeck style immersive systems of the future are not going to be more mimetic or immersive if people do not have the literacy or competency to operate the interfaces and appreciate the experiences. Unless the mimesis is so complete that the dream of actual, ‘natural language’ interfaces are possible, each application will have to have its own language, to achieve its intended experience. This issue of workable interface languages will probably mean we see an evolution through a series of generations, as cultural literacy, expectation and appreciation evolves.

Therefore, if such totally immersive sensory systems become feasible, like the computer and game console before them, they will still be in need of ‘killer apps’ (Lunenfeld 80) in the same way that Myst, Doom, Everquest, e-mail and mobile phones were for the digital 1990s. A part of this evolution would be the development of new mimetic applications that are applicable not only to the experiences of new media as we now understand them, but to applications that can/will emerge in the future of narrative, games, art, performance, and whatever else we develop (Woods).

Summary

This chapter has presented a postscript discussion to the main argument of this thesis, rather than forming part of the argument itself. It has considered why we don't have 'mimetic immersion' virtual reality systems that would fulfil the 'Holodeck Ideal' that this thesis has used as a reference point. It explores what changes might have to occur in society and culture for 'Holodeck Ideal' virtual reality systems to come about, considers what such systems might be like, and whether or not they are actually necessary. It has utilized important concepts that were also part of the main argument of this thesis, in particular, the identification in Chapter Five of the 'borrowed technology' nature of new media's underlying techniques, and the Chapter Eight identification of the need for readers/player/users to have the necessary 'interface language' in order to perform new media experiences, both current and future.

Chapter Ten: Conclusion

Summary of Chapters

The Introduction outlined my motivation for this study, principally my own practice as a designer of experimental new media experiences, and in particular, my experiences producing the Juvenate project. This motivation found expression as the main question of the thesis: how is the reader/player/user's participation in interactive narrative experiences influenced by the techno-historical limits of the interface with the experience. My basic approach in answering this question has been to study a wide range of new media works in which there is some 'narrative' element, deliberately choosing from across games, art and literature genres, to reveal what is fundamental in them all.

The main argument of this thesis has been that the technical limits of new media experiences cause significant 'gaps' in the reader's experience of the work, and that the cause of these gaps is the lack of a dedicated technology for new media, which instead utilises 'borrowed' technology from other fields. These gaps are overcome by a greater dependence upon the reader's cognitive abilities than other media forms. This greater dependence can be described as a 'performance' by the reader/player/user, following after Eco's definition of an 'open' work (Eco 21).

In Chapter One (Literature Review) I described the relevant theory and research on interactivity, performance, narrative, immersion and interface, the key concepts of the research question and argument of this thesis. I also identified that discussion around new media has been strongly influenced by two important ideas. The first of these is 'interactive narrative' that includes credible, dynamic story and characters, and the second, of 'unmediated immersion'. The best illustrations of these ideals are often drawn from science fiction, rather than practical working examples. I have

described these two ideals together as new media's 'Holodeck Ideal', and adopted it as a reference point for the developing argument of this thesis.

In Chapter Two (Methods) I developed an approach that was appropriate to investigate the main question of the thesis: how is the reader/player/user's participation in interactive narrative experiences influenced by the techno-historical limits of the interface with the experience. This was a structured, comparative analytical model produced from a blend of existing structuralist, literary and new media theory. I adopted the narratological approaches of Mike Bal, which were already suitable for application to any designed artefact, and non-reductive in their intention. I significantly modified Bal's model with aspects of new media specific theory, specifically, Aarseth, Eco, Juul, Manovich, Ryan and Shredroff. This model was then applied to the specific works that were the subject of this research, in order to derive important individual and common characteristics.

Chapter Three (Case Studies) established an historical context for each of the specific works chosen for analysis, describing both their creative and technical aspects. This developed the investigation of the main question of this thesis by creating an awareness of the practical issues affecting the development of the works. This awareness was an important perspective when considering how the reader/player/user's performance in various new media works is facilitated within the technical limits of the interface to the work. Further, some features of each work that were of particular relevance to the question of this thesis were highlighted.

Chapter Four (Techno-Historical Limits) presented a detailed comparison of two new media works (the computer games Myst and Doom) to demonstrate how fundamental 'techno-historical' limits operate on both the audio-visual rendering and artificial intelligence capacity of new media experiences. It showed that improvements in both image quality and real time rendering have improved the audio-visual aspect over time, but also demonstrated that there has been very little improvement in artificial intelligence, either in the characters or storylines that make up part of the interfaces of these experiences.

Chapter Five (Borrowed Technology) demonstrated that ‘techno-historical’ limits also affect the physical interface of the works, as well as the audio-visual and artificial intelligence aspects identified in Chapter Four. This chapter further established that the common cause of all of these limits is a lack of a dedicated technology for new media, which instead is utilising ‘borrowed’ technology from other fields. A consequence of this borrowing is that many current new media users and designers think that these limitations are natural. Together with the case studies of specific works in Chapter Three, and the limits discussed in Chapter Four, this chapter established a techno-historical context for the comparative analysis of author-reader contributions for all of the chosen works.

Chapter Six (Comparisons) presented the results of the application of the modified Bal model, and found that the works could be categorised according to patterns of contribution by their author/designers and reader/player/users. These categories were Highly Realised, Highly Undetermined, and Significant User Contribution. These patterns shed light on the unique way in which each work overcomes the techno-historical limits identified in Chapter Four and Five, and accounted for the outstanding characteristics of each work found in Chapter Three. Acknowledging that the theoretical ‘Text’ level of the works equate to their practical interfaces led to the realisation that significant ‘gaps’ in the Text/interface of new media works are caused by the techno-historical limitations to the author’s intentions for the work. Therefore, as the main argument of the thesis, this chapter proposed that the gaps caused by this borrowing of technology are overcome by a greater dependence on the reader/player/user’s contribution to the interpretation of new media works than other media forms. This greater dependence can be described as a ‘performance’ by the reader/player/user, following after Eco’s definition of an ‘open’ work (Eco 21).

Chapter Seven (Immersion and Embodiment) made a detailed examination of commonly occurring failings in the manifestation of the reader/player/user in specific new media experiences. It was established that these ‘gaps’ in embodiment are often not caused by current technical limits, but are often oversights by the author/designers that have arisen as a consequence of a craft culture that has been subject to serious technical limitations in the past. Features that once existed to overcome technical limits have become conventions of the reader/player/user’s

interactive literacy, even though they impinge on their experience, and are no longer necessary because of subsequent technical advances. This chapter extended this realisation to draw a strong distinction between the 'immersive' function of a new media work on one hand, and its 'mimetic' nature on the other. This is a very important distinction for both analysts and author/designers to be aware of. This chapter concluded that even the most advanced new media works are non-mimetic.

Chapter Eight (Immersion and Natural Language) continued to develop the main argument of the thesis by exploring aspects of the interface between a reader/player/user and a specific work that affect any individual's ability to become 'immersed' in that work. This exploration led to the conclusion that there is no 'natural language' of interaction with the interfaces that new media works present to an individual, only 'familiar interaction languages'. This chapter concluded by offering a re-definition of 'immersion' as something that is demanded by a new media work, rather than created by it. This preparedness and competency to become immersed is the readers/players/user's investment in an experience. The reader/player/user must achieve immersion to create the space where the game is played or the text read, the experience had, and the pleasure taken.

Chapter Nine (New Virtual Reality) presented a postscript discussion to the main argument of this thesis. This discussion utilised important concepts that were part of the main argument of this thesis, in particular, the identification in Chapter Five of the 'borrowed technology' nature of new media's underlying techniques, and the Chapter Eight identification of the need for readers/player/users to have the necessary 'interface language' in order to perform new media experiences, both current and future. It considered why we don't have 'mimetic immersion' virtual reality systems that would fulfil the 'Holodeck Ideal' that this thesis used as a reference point. It explored what changes might have to occur in society and culture for 'Holodeck Ideal' virtual reality systems to come about, considered what such systems might be like, and whether or not they are actually necessary.

Outcomes and Observations

The specific question of this research has been: how is the reader/player/user's participation in interactive experiences with narrative elements influenced by the interface to the experience? The critical role of the interface, and its technical and historical limits, has been a particular focus.

Two aspects to the interface have emerged as very significant. One is that any interface is strongly restricted in the 'mimetic' quality it can have, due to the current limitations of the technology. The other is that these limits can be, and often are, overcome by the capacity of the reader/player/user, depending on their level of motivation to become immersed, and their level of literacy in the necessary interface language.

I feel it is clear that the limitations of the interfaces we currently have, and the enormous complexity caused by the variable, interactive capability of new media, put very high demands on the reader/player/user. Like other media forms, the new media works analysed in this thesis ultimately depend upon the reader's making meaning in their own mind. However, these cognitive demands are much greater than for linear media such as books, TV and movies, because the reader/player/user is simultaneously learning and/or overcoming the idiosyncrasies of the interface, interpreting the often low resolution images and sounds, and making decisions about what to do, where to go, how to respond. In the case of some computer games, this all has to be done very, very quickly. Therefore, this thesis has argued that the gaps caused by this borrowing of technology are overcome by a greater dependence on the reader/player/user's contribution to the interpretation of new media works than other media forms. This greater dependence can be described as a 'performance' by the reader/player/user, following after Eco's definition of an 'open' work (Eco 21).

This thesis began with my own motivation for undertaking this research, realisations about the unintended characteristics of the Juvenate project, an experimental new media work I designed and implemented. Juvenate's theme was of memory, illness, and rejuvenation. An evocative, unusual audio-visual style was employed, challenging the user to investigate and inquire. Imagery was constructed from photos

of real objects, but the perspective was unnatural. Heavily textured with supersaturated colours and enhanced sounds, and a non-linear structure, Juvenate sought to convey a dreamlike feel that the seriously ill often experience. Dialogue and text were largely avoided, to enable the work to cross language barriers, as well as to require the user to make cognitive connections themselves. In particular, an alternative interaction mode was used, moving away from the 'point and click' behaviour ingrained in most computer user's expectations. Instead, feedback was provided using a deliberately indefinite 'incrementing proximity' technique. The project was very well received in the scholarly and art community, but very few 'ordinary' people who encountered it found it to be a satisfying experience. This thesis has argued that techno-historical limits and designer's mistakes cause gaps that are overcome by the reader/player/user's performance, but that this performance is dependant on the use of an interface language the reader/player/user is already familiar with. Given that Juvenate was specifically intended to be an 'open' work in the sense used by Eco, but that it failed to engage many of its intended users, it seems appropriate to then describe the potential for gaps to make a work so 'open' as to make it impossible for the user to 'close' it. It seems that the 'ordinary' reader/player/user simply did not have either the motivation to become immersed and/or the literacy of novel interactive works to 'close the gaps' in our 'open' work, while the scholarly and art readers/player/users did. In the case of the immersive art works Osmose and Ephemere by Char Davies and team, I was the ideal reader, since I had both the motivation and literacy to perform these works, but as with the Juvenate project, this was not the case for many individuals who encountered it.

The overall experience of being both a maker of new media works, and then a relatively objective analyst, convinces me that those who study new media need to be aware of the importance of the limitations of technology, the economic context, and the speed of change that affects the design and designers of new media. Things are very often not the way the designers wanted them to be. Nobody becomes a new media designer because it is a safe, secure, well understood craft. Such people love challenges, and in particular, the challenge of making the borrowed, limited technology work in new, compelling experiences. It is this 'hacker' spirit that has given much to each of the works studied in this research project. But in doing so, practitioners can become technology focussed. They need to draw themselves away

from the trap of conventions and look at the bigger picture of the reader/player/user experience in order to squeeze the most out of the limited interfaces we have (and probably will have for the foreseeable future). At the same time, they need to be careful not to lose touch with the reader/player/user's immersive limits and interface literacy as my own Juvenate project tended to.

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