The Disappearing Frame: A Practice-based investigation into composing virtual environment artworks

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ABSTRACT

Through creative art making practice, research seeks to contribute a body of knowledge to an under researched area by examining how key concepts germane to computer based, interactive, three-dimensional, virtual environment artworks might be explicated, potential compositional issues characterised, and possible production strategies identified and/or proposed. Initial research summarises a range of classifications pertaining to the function of interactivity within virtual space, leading to an identification and analysis of a predominant model for composing virtual environment media, characterised as the "world as model": a methodological approach to devising interactive and spatial contexts employing visual and behavioural modes based on the physical world. Following this alternative forms of environmental organisation are examined through the development of a series of artworks beginning with *Bodies* and *Bethlem,* and culminating with *Reconnoitre*: a networked environment, spatially manifest through performative user input. Theoretical corollaries to the project are identified placing it within a wider critical context concerned with distinguishing between the virtual as a condition of simulation: a representation of something pre-existing, and the virtual as potential structure: a phenomena in itself requiring creative actualisation and orientated toward change. This distinction is further developed through an analysis of some existing typologies of interactive computer based art, and used to generalise two base conditions between which various possibilities for practice might be situated: the "fluid" and "formatted" virtual.

METHODOLOGY

Material for the study is generated by exploring research issues through creative practice interwoven with insights from critical theory and other disciplines. Through this multilevel approach, a relationship between theory and creative work is established that may be described as elliptical, with interaction between the areas driving the overall aims of the study forward. This complementary or hybrid approach is both necessary and appropriate when confronted with the complex compositional issues presented by the hybrid media of computer based artworks: in order to establish context; enable an explication of technical issues; and enrich and expand on insights emergent from creative practice. The different theoretical and creative elements of research work in tandem, to produce knowledge, which would be of use to artists working with virtual environment media. By exploring the phenomena of interaction in virtual space a framework is developed to aid artists in the analysis and production of virtual environment works. It is also envisaged that this framework may be germane to areas of practice beyond the confines of this study, being both applicable to other computer based interactive artworks, and non computer based media which involve time based production strategies and degrees of audience involvement.

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Author declarations

During the period of registered study in which the research was carried out, the researcher has not been registered for any other academic award or qualification. None of the material contained herein has been submitted wholly or partially for any academic award or qualification other than that for which it is now submitted.

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Chapter 1: Introduction

1.1.1 Rationale

The reasons for undertaking this research were based upon a fascination with virtual environment technologies and the possibilities they offered artists as a creative medium. Coupled with this was a concern that a discourse which alternately characterised the technology as either utopian or dystopian, was obscuring debate as to how artists might productively utilise the medium.

Experimental artwork using the technology is in relative terms at an early stage; there is a dearth of published material specifically detailing the processes of making virtual environment artworks. As such, I felt there was a need to develop some strategies to aid creative practice. The intention was not to provide a "road map" or set of instructions that if followed would lead to the completion of "successful" artworks, but rather to contribute a usable body of knowledge, informed through practice, whose primary function would be to aid artists in the planning and construction of virtual environment artworks and which as a by-product would contribute an artist's perspective to a broader debate concerned with creative usage of the technology.

1.1.2 Research questions

Initial research was framed by two questions:

i) It is claimed that virtual environment technology "allows you to explore a computer generated world by actually being in it" (Sherman and Judkins 1992, p.19) the audience somehow being "inside" the representation. Immersion and interactivity are the "buzzwords" most associated with the medium, in relation to art practice how might these concepts be more fully explicated?

ii) Following this, how can the various interactive and spatial elements of a virtual environment be composed, and might some

general rules or guidelines be developed that would help facilitate this organisation?

These questions were not meant to be definitive or restrictive. The method adopted allowed for an adaptation or reformulation in response to research as it unfolded. Robson (1993) describes this approach as "naturalistic enquiry" in which "research design emerges...from the interaction with the study" (p.61), and research boundaries "are set on the basis of emergent focus of the enquiry"(p.61). A procedure, which as Malins and Gray (1995) have also noted, enables researchers to "individually 'tailor' the research project in response to the nature of practice", and "define and refine the research question in an iterative process" (p.5). A more detailed description of the study's methodology is given in the following section.

1.1.3 Methodology

The basis of the study is a reflection on, and analysis of, the construction of virtual environment artworks and to a lesser extent their subsequent exposure in an exhibition context. The project is practice-led, with research material largely derived from creative work. As the "veracity" of artworks is not quantifiable in the scientific sense (what makes a single artwork more or less successful than another is not measurable), findings are implicative rather than testable. The construction of an artwork is generally undertaken without accompanying predictions or expectations, the process often divergent and unpredictable (Schön 1983). Methodology needed to be sensitive to the organic nature of art making, and flexible enough to allow for both the inclusion of disparate sources of information and the focus of the research to emerge out of creative practice.

The methodology chosen builds on that pioneered by Graham (1997) in her study of audience relationships with interactive artworks. Graham's choice of a "hybrid" process was predicated on the basis that the multimedia characteristics of computer based art required a correspondingly flexible and multi-disciplinary approach. Information concerning the specifics of this relatively new area of fine art practice, forms less a body of knowledge, than a number of free floating interrelated subject areas, describing a context which is fragmentary, rapidly evolving and subject to unexpected change. The methodology adopted reflects

this situation, hybridising and drawing upon a number of disciplines. Research techniques are described as pluralist, requiring that the artist/researcher adopt a multi-level role to synthesise an appropriate methodology. Processes used included:

- Making virtual environment artworks.
- Experimentation with materials, and the production of small scale models.
- Collaboration in the production of works.
- Documentation of creative practice through use of computer screen grabs, photography, video and drawing.
- Keeping an "artist's log" to reveal aspects of creative practice.
- Critical, and reflective writing, to place creative practice in a wider context.
- Exposure of artworks to peer review and analysis through application to exhibitions via jury based selection processes.
- Seminar-type discussions.
- Observation of audience response to works in exhibition contexts.
- Recording audience feedback and response to creative practice.

While the study is rooted in creative practice, it also became necessary to draw upon a range of knowledge from other disciplines: computer science, philosophy and critical theory. The study acknowledges the problems faced when employing specialist knowledge from other areas, i.e. terminology can appear similar but information may not be directly applicable outside of its original context. When employed it was not the intention to offer a commentary or enter into debates pertaining to the disciplines in question. The knowledge was used heuristically and metaphorically in order to explore the research questions, enrich and develop aesthetic themes arising from creative practice, and expand on the discussion of artworks in relation to a wider context. The relationship between creative practice and theory is a

reciprocal one that functions cyclically to inform and generate insight through interaction. Indeed all aspects of the research may be considered "practice" insofar as an integration of making, reading, writing and reflection (on/in practice) creates a "constructive assemblage", a singular mechanism orientated toward illuminating research questions and driving the overall aims of the study forward.

1.1.4 The presentation of research

The research is presented in three forms: an exhibition of artworks, video documentation of creative practice and a written thesis. Chapters 2 and 3 of the thesis site the study within historical and contemporary contexts and define the area of study. Chapter 4 is concerned with immersion. A number of "types" of immersion are identified and a series of "routes" or supporting conditions highlighted. Some commentary is then offered that relates its effects to some previous cultural models and discusses a number of approaches or ways of approaching the condition in relation to art practice. Chapter 5 examines the concept of interaction and virtuality. Following a discussion of interactivity and its relationship to identified representational paradigms for composing virtual environments, some alternative approaches are considered that both draw upon an alternative and broader consideration of the "virtual" and methodological approaches devised through creative practice. Chapter 6 describes the evolution of creative practice and documents the decision making process behind the development of artworks and supporting work produced during the study. In chapter 7 findings emergent from creative practice are furthered by a comparison with a number of identified forms of interaction specific to computer based arts and the findings related to immersion. From this a framework is developed that identifies and compares some methodological approaches for the development of artworks and relates them to the other strands of research. Some further discussion is then offered that examines the identified methodological approaches in relation to other metaphors, and considers the differing demands they place on the role of the artist. Chapter 8 assesses the implications of the research, discusses findings and identifies further areas of study.

Chapter 2: The contextual review

2.1.1 Introduction

This chapter reviews historical and contemporary sources of information in order to establish the context within which the study is situated. The term *contextual review* is considered more sympathetic to the visual arts bias of the study and is used in preference to *literature review*. While a great deal of information was gleaned from traditional sources — periodicals, conference proceedings, theses etc. other forms of information were considered equally important in reinforcing the contemporary context of the study (e.g. attending exhibitions of artworks, participating in conferences and seminars and garnering material through Internet searches).

2.1.2 The structure of the review

Articles examining creative use of the technology where found in such diverse publications as *Opera News* (Malitz 1992), *Domus* (Capucci 1996), *Diogenes* (Bartels 1993), and *The Science Fiction Review* (Fischlin and Talyor 1994) — reflecting widespread interest in the technology across a range of creative disciplines. Commensurate with this, much literature concerned with broader areas of discourse surrounding "cyberspace" (Benedikt 1994); the destructive effects of technology on perceptions of time and distance (Virilio1998); the crisis of subjectivity described as "hyperrealtiy" (Baudrillard 1994), and critical treatise on the wider socio-cultural effects of the technology were discovered (Gigliotti 1993, Heim 1993, Penny1995, Morse 1996, Lévy 1998). While some of this material is touched upon in the following chapters, the extent of the literature and breadth of the subject areas pertaining to it, preclude lengthy discussion within the confines of this particular study.

With a few notable exceptions (Shaw 1992, Hoberman1996, Davies 1998), literature germane to the specific area of study is sparse. This should not be considered surprising. While PhD level

research by Bell (1991) and Graham (1997) has done much to raise the general level of debate concerning computer based interactive art in general terms, creative practice employing virtual environment media has only occurred since the late 1980s and has been intermittent at that. Subsequently the total corpus of projects produced to date, in comparison to even the yearly output of video, CD-ROM or Internet based artworks is small.

Being a relatively new and under-researched area of fine art practice, information concerning the specifics of the subject area forms less a body of knowledge, than a number interrelated subject areas describing a rapidly changing terrain. In researching the study, it was found that a great deal of cross disciplinary material existed forming a significant body of work. Examination of such areas as interface design, artificial intelligence, and presence reflected the fact that the technology is in itself the product of a range of specialist areas, but proved essential in providing an in-depth understanding of the technology.

The purpose of the review is to fix the context, within which the artist/researcher is working. Its thematic structure may roughly be described as the "when", "how", and "what"

- *When*: the historical context supplied by previous art forms and the cultural and scientific development of the medium.

- *How*: sites of production and exhibition.
Mechanisms for achieving practice.

- *What:* emerging themes, artworks and practitioners.

The areas of the contextual review inevitably overlap with much of the material falling into one or more interrelated categories. As a hybrid subject area the contextual review provides a locus for synthesising an image — however temporary of a rapidly changing context informed by many different histories, disciplines and discourses.

2.1.3 Fine art criticism

The main difficulty arising from writing about virtual environment technology is that access to equipment and real "hands-on" experience is difficult to obtain. Much of the material

published in the mainstream art magazines and periodicals proved to be disappointing preferring speculation to informed analysis.

> The discussions surrounding virtual reality exemplify a discourse that often seems entirely removed from any conception, much less comprehension, of computer graphics technology. Why discuss the economical use of graphics primitives or the intricacies of interface design when you can wax rhapsodic about teledildonics. (Lunenfeld 1996, p.17)

Many articles reflected a widespread tendency to label anything vaguely to do with computers or that took as their theme post-modern concerns with the image and simulation as being about "virtual reality" (McNeill in *Art and Text* 1995, Eagle in *Art and Australia* 1994). In reviewing the exhibition *V-Topia: Visions of a virtual world* for *Art Monthly,* Masterson comes clean and states "in truth, few of the works presented had anything to do with a Virtual World" (1994, p.34). Not surprisingly the fate of the body and a concern with what happens when humans interface with such a potentially intimate technology has been the cause of much comment. McKensie, in *The Drama Review* notes that virtual environment technologies appear to embody values of "absence, inorganicism, inauthenticity, derivativeness, and mediation" that appear opposite to much of what many art practitioners hold dear — "presence, organicism, authenticity, originality, and immediacy" (1994, p.92).

Although there is a long tradition of artists using (or commentating on) technology from the Futurists to the experiments in the Arts and Technology group in the late 1960s (Bell 1991, Popper 1993, Kluver 1995, Dinkla 1996), the art world has at best positioned itself tangentially toward these forms of art and has questioned a lack of seriousness underpinning interactive computer based art. Cornwall (1996) suggests that the similarity of such work to computer games represents a broader dynamic at work in society and contributes to a "dumbing down" in cultural and educational practice. Similarly Cadwallader (1996) notes that there is a perceived split between the world of computer based art and the wider art world. She differentiates virtual reality artworks from wider arts practice in terms of history, language of discussion, context and operation, and criticises practitioners for concentrating on technology at the expense of wider aesthetic and social concerns.

2.1.4 New media technologies and interactive art

Generally shunned by the wider arts world, production possibilities for virtual environment artworks have until recently almost exclusively occurred within the auspices of specialist organisations dedicated to electronic/new media art such as the *Ars Electronica Centre* in Austria, which commissions artists to develop projects using their CAVE system, the *Zentrum für Kunst und Medientechnologie* (ZKM) in Germany, *The V2 Laboratory in Holland*, *The InterCommunication Center* (ICC) in Japan, and *The Banff Centre for the Arts* in Canada. Festivals associated with these and other specialist media organisations also provide the main outlet for public exhibition of works, (e.g. *The International Symposium for Electronic Arts (*ISEA), *Prix Ars Electronica*, *The Dutch Electronic Arts Festival (*DEAF*)*, *Multimediale*, *Imagina* and *Siggraph*). A series of publications concerning work produced at these centres have been published (Moser and McLeod 1996, Duguet 1997, Klotz 1997, Schwarz 1997, Boyd, Brickwood, Broeckmann *et al* 1999, Druckery 1999) which while providing little in the form of extended coverage concerning production strategies for virtual environment artworks, have succeeded in raising the profile of the medium and introducing it to a wider public. Much relevant material was also found in periodicals that focus on expanded art forms such as video, photography and interactive art: including Dove's (1994) description of her installation *Archaeology of a Mother Tongue*, in *Leonardo*; Lunenfeld's critiques of received notions of increased audience participation in virtual environment artworks (*Afterimage* 1993, 1996); and Morse's examination of interactive metaphors (*Video Networks* 1993).

Issues long associated with expanded art forms (the movement of image over time, immateriality of object, and direct engagement of the audience with the artwork through environmental or conceptual devices) have migrated as theoretical concerns to interactive media and a general blurring of boundaries has occurred whereby exhibition coverage is undifferentiated between video installation and interactive computer based art forms. This is particularly noticeable in the emergence of periodicals with a specific bias toward electronic culture such as *Mediamatic, Coil* and *Mute*, whose often provocative reportage has done much to enliven debate — the attack on Char Davies's *Osmose* in *Mute by The Bureau of Inverse Technology* (1995) being a particularly controversial example.

2.1.5 Popular technology

Beyond fine art, theoretical and media art contexts, a wide range of populist books give overviews of the medium. Woolley's (1992) *Virtual Worlds: A Journey in Hype and Hyperreality*, is rare in that it offers a comprehensive historical and theoretical survey of the technology, tracing the relationship between virtual reality, hypermedia, philosophy and artificial intelligence. However, the majority of literature of this kind, including Cotton and Oliver's (1993) *Understanding Hypermedia* prefer to focus their efforts on lifestyle, graphical and hardware issues. A number of publications do include chapters which examine the aesthetic or creative implications of the technology but are variable in quality, e.g. Rheingold's (1994) speculations concerning the medium's potential to regenerate ritualistic practice, or the more prosaic proposals for virtual sculpture offered by Sherman and Judkins (1992).

A common problem found with publications was the speed with which they became obsolete. For example, books published before 1996 — *Virtual Reality Primer* (Larijani 1994) and *Virtual Reality Playhouse* (Lavroff 1992), rarely mention the Internet, whilst *Moving Worlds* (Adams and Doherty 1996) concentrates exclusively on the construction and usage of on-line virtual environments. A number of the more recent publications — influenced by falling production costs and the migration of the medium to the Internet are concerned with promoting a "DIY" approach to "building your own" environments. Some of these publications offer useful insights into the pragmatics of design — such as O'Neill and Muir's (1998) *Web Developers Guide to Creating 3D Worlds,* Best's (1994) *Idiot's Guide To Designing Virtual worlds*, and Bertol's (1997) *Designing Digital Space*: *An Architects Guide to Virtual Reality.* While generally aimed at architects rather than artists, these publications offer evidence that medium is becoming integrated in wider cultural practice, and that a creative skill base is beginning to emerge.

2.1.6 The Internet

The rapidly evolving digital environs of the Internet provides an ideal arena for communication and disseminating knowledge

concerning hybrid computer based media. Web sites news groups, and mailing lists concerned with the subject area are numerous providing a rich source of material and information. Useful bibliographies, and links to ongoing research where found at the *Artistic Representations in Virtual Reality* site, maintained by Toni Emerson and Debra Revere at the *Human Interface Technology Laboratory.* Electronic versions of conference proceedings and essays were also found at Web sites maintained by media arts organisations. These included *Ars Electronica's* extensive online archive of video documentation and festival catalogues; ISEA's archive of conference essays from 1988 onward, and the ICC's electronic holdings of exhibition catalogues and video.

While the above organisations exist both in a physical and a virtual sense, a number of purely virtual forums also exist taking the form of both Internet mailing lists and Web sites. *Rhizome, The Fine Art Forum, Nettime, The Thing* and *Teleopolis* describe a range of networked projects dedicated to disseminating ideas about computer based art and may be differentiated from the above organisations in that the user community many of whom are artists, provide the bulk of the material published. Sites offering pragmatic advice concerning production tools and links to other active researchers usefully supplement such artist-oriented networks. These include the now defunct *Networked Virtual Reality Centres for Art & Design* project *(NVRCAD),* an academic initiative that provided resources and support for artists and designers using the medium, and the *Web3D Consortium's* online holdings of references, reviews and listings of modelling and viewing tools.

2.2 The historical development of virtual environment media

2.2.1 Introduction

Being the product of accumulated research efforts spanning many disciplines the origins of virtual environment media are not easily traced. The breadth of the subject area puts extended coverage beyond the scope of this study, by necessity any attempt to describe such a history must be partial. By cross-referencing the medium's instrumental history to parallel forms of art activity, this section of the thesis hybridises a history in order to provide some brief historical context for following research.

2.2.2 The early history of virtual environment media

While recent historical research has described a genealogy of immersive media that has included Roman Pompeii, 19th century panoramas (Grau 1997), and Wagnarian concepts of the *Gesamtkunstwerk* (Nechtvatal 1997) we will limit ourselves to the 20th and 21st centuries. Between 1963 and 1965, computer graphics researchers (notably Steven Coons and Larry Roberts) published a series of papers outlining the mathematics for modelling perspective views of geometric models using the computer; an event, according to Mitchell which was "as momentous, in its way as Brunelleschi's perspective demonstration" (Mitchell 1994, p.118). While initial results were crude, yielding simple wire frame images of objects, the appreciably three dimensional qualities of the representations were convincing enough for Boeing to begin to employ computer generated representations for animated simulations of aircraft landings (Manovich. 1996). While not interactive the Boeing simulations represent some of the first three-dimensional computer generated simulations in which time becomes an active component in the experience of the generated image. The animations were subsequently exhibited at the *Institute of Contemporary Arts* in 1968 (Reichardt 1968). In 1963 just prior to Robert's publication of the first papers detailing the perspective-generating algorithm, Ivan Sutherland had established the principle of direct manipulation of virtual graphical elements

through a process of human computer interaction. The *Sketchpad* system (1962) allowed a user to draw and manipulate vector lines directly on a screen using a light pen. *Sketchpad* laid the conceptual basis for Sutherland to publish two landmark papers in the history of interactive three-dimensional computer graphics: *The Ultimate Display* (1965) and *A Head-mounted Three Dimensional Display* (1968). The earlier paper is less a technical description of a computer graphics process and more a manifesto. In it Sutherland discusses the possibility of building an artificial room within a computer. Such a system he mused, would not merely be a visualisation, but a complete visual and tactile simulation powerful enough to "control the existence of matter"; he writes:

> A chair displayed in such a room would be good enough to sit in. Handcuffs in such a room would be confining, and a bullet displayed in such a room would be fatal. With appropriate programming such a display could literally be the wonderland in which Alice walked. (Sutherland 1965, p.508)

While an ambitious, if somewhat bleak vision, Sutherland had by the end of the decade, taken practical steps toward its realisation by publishing a follow-up paper *A Head-mounted Three Dimensional Display* (1968). The perspective generating algorithm developed by Coons and Roberts, had allowed for the generation of three dimensional scenes in a manner akin to that defined by Alberti, i.e. representing a scene corresponding to the direction and sight of a single fixed viewpoint/camera. In this second paper Sutherland proposes the construction of a display device that would endow the fixed viewpoint/camera with mobility whilst immersing it within the image space of the representation:

> The fundamental idea behind the three-dimensional display is to present the user with a perspective image which changes as he moves. The retinal image of the real objects which we see is, after all, two-dimensional. Thus if we can place suitable two dimensional images on the observer's retinas, we can create the illusion that he is seeing a three-dimensional object...The image presented by the three-dimensional display must change in exactly the way that the image of the real object would change for similar motions of the user's head. (Sutherland quoted in Mitchell 1994, p.79)

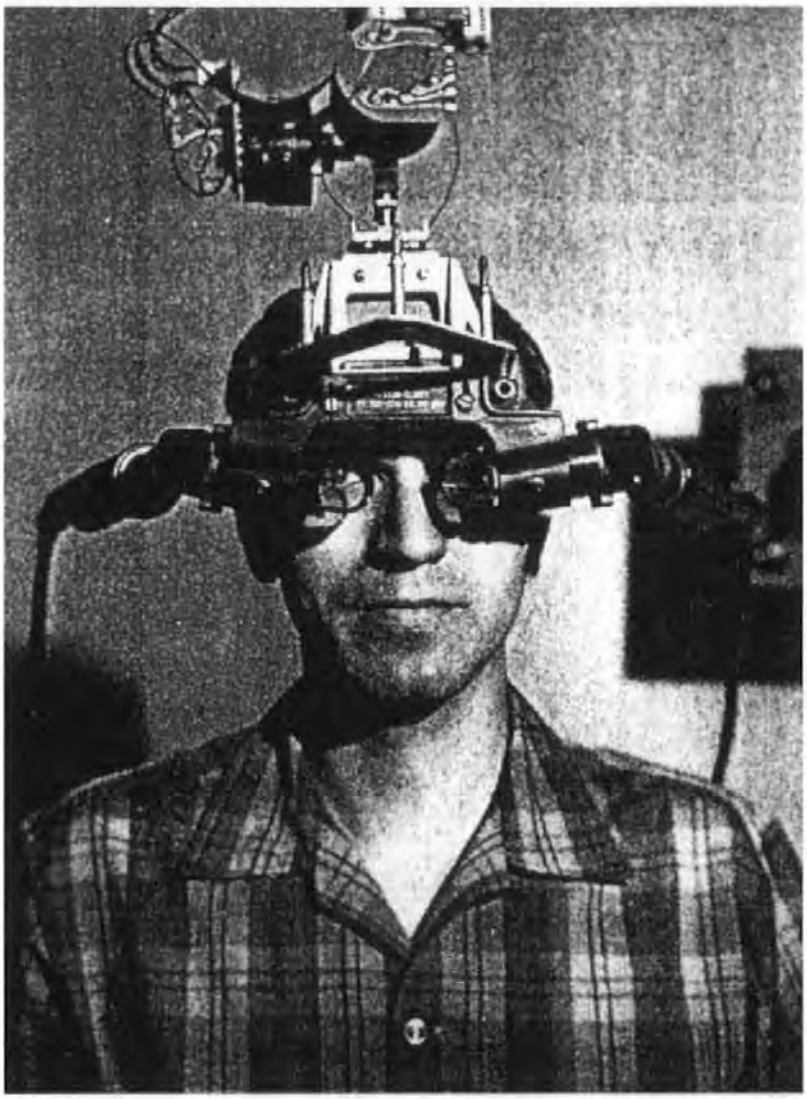

Figure 1: Ivan Sutherland's 1969 Head Mounted Display

By 1969 Sutherland had implemented a working if precarious head-mounted display at the University of Utah, nicknamed "The Sword of Damocles" (Rheingold 1994, p.104). The device was strapped to the user's head and consisted of two tiny cathode ray tube displays mounted on an apparatus that hung suspended from the ceiling (figure 1). Using mechanical sensing devices, the apparatus was able to import the location and direction of the viewers gaze, and update the images displayed on the monitors to provide a corresponding view of the computer generated environment. Sutherland's head mounted display established a paradigmatic set of characteristics associated with all subsequent research into interactive three-dimensional virtual environments,

namely that the virtual image space of the representation be responsive to human agency, and that the human user's viewpoint be immersed within that representation.

2.2.3 Expanded art practice

> The immersive and interactive quality of virtual reality removes the traditional chasm between art and art object, pointing the way to a new kind of awareness as the viewer becomes a participant 'inside' the art. (Teixeira 1994, p.11)

While the first virtual environment artworks were not to be produced until the late 1980s, characteristics pertaining to the medium — the interactive/participatory role of the user, the integration of media and a spatial locus for user activity (literal or metaphoric immersion in the artwork) place the medium within an ongoing tradition of experimental art activity. Beginning with Dadaist and Futurist theatre, Brecht, Moholy-Nagy, and Duchamp's numerous investigations into perception and audience participation: Goodman (1987), Popper (1993) and Schwarz (1997) formulate a genealogy for interactive and immersive media, that finds its genesis in the classical avant-garde's propensity to integrate or force a reaction from its audience. Cornwell (1992), Dinkla (1996) and Huhtamo (1999) extend and update this history to include the later post-object and participatory art movements of the 1950s, 1960s and 1970s. The decade prior to Sutherland's technical breakthroughs had seen increasing collaboration between artists and other practitioners. Notable of these were the experiments with chance structures, live performance and dance produced by Cage, Rauschenberg and Cunningham at the Black Mountain College. Their work and a constellation of other movements/tendencies: Fluxus, Happennings, New Dance and The Situationists amongst others, were connected by a desire to redefine notions of audience involvement, examine new spaces for the production and experience of art (often by conflating the two processes), and challenge the authoritarian role of the artist (Sayre 1992). In parallel with these developments, a number of artists had begun to directly explore the connection between art and technology. In 1969, Kluver and Rauschenberg formed, *The Experiments in Art and Technology* program (EAT) designed to instigate and

facilitate collaboration between artists and engineers (Kluver 1995). A similar initative, the *Art and Technology Program* (A & T), had been running since 1966, organised by curator Maurice Tuchman at the Los Angeles County Museum of Art (Tuchman 1971). Schwarz, draws a plausible line between the development of later virtual reality artworks and these investigations but also includes expanded cinematic and architectural practice, citing the self-configuring and mobile cities of British architects Archigram; the inflatable, portable structures of the Hans Rucker Co. and the intermedia cinematic experiments described by Gene Youngblood (1970) amongst others. The multimedia architectures developed at this time argues Schwarz, directly share a number of maxims with the later medium. These include: a propensity to formulate ephemeral and configurable structures; the abolition of the border between different art forms; the active role of an audience in an open field of possibilities, and an interest in processes rather than finished objects/environments (Schwarz 1997). However while such models of cross-disciplinary practice may be considered as precursors for engaging with the new medium, few of the collaborations attempted at this time, or in the EAT and A&T programs employed the computer to any great extent.

2.2.4 Cybernetic Art

In 1966, Roy Ascott, published his manifesto *Behaviourist Art and the Cybernetic Vision* (1966). In it he proposed that interactive computer based systems were the most suitable platform for examining concerns already current in avant-garde art practice, i.e. the scrutiny and questioning of the relationships, processes and feedback loops, between audience, environment and artwork. For Ascott the computer was more than a tool it was a creative partner. Through its potential to act as a thought amplifier, it could integrate both artist and audience alike as elements in an open ended system or network, the result of which would not be a finished art object but an ongoing participatory process. Anticipating the Internet by a number of decades, Ascott also proposed that telematic networks might support communication between artists and other practitioners, by providing a participatory locus through which ideas might be shared, works collaboratively produced, and cross disciplinary links established and sustained.

Dinkla (1996) reminds us that a number of artists had already been exploring the aesthetic possibilities offered by cybernetics, including Nicolas Schöffer who had been making cybernetic sculptures from 1954 onward. In 1956 in collaboration with Tinguely he produced plans for a cybernetic city, and in following years produced a series of *CYSP* sculptures (cybernetic-spatiodynamic) — reactive assemblages, displaying anthropomorphic behavioural traits. One of Schöffer's *CYSP* sculptures was exhibited at the *Institute of Contemporary Arts* (ICA) in 1968 as part of *Cybernetic Serendipity*. The exhibition curated by Jaisa Reichardt (1968), focusing on the relationship between computers and creativity, featured a number of other cybernetic sculptures, including Pask's *The Colloquy of Mobiles*, and also some of the first primitive 3D computer graphics courtesy of the Boeing corporation (figure 2). While the ICA exhibition mainly focused on the eclectic materiality of computer hardware, Jack Burnham took a different approach in curating *Software, Information Technology: Its New Meaning for Art.* The exhibition held at Jewish Museum in New York in 1970, sought to establish thematic connections between the dematerialised programs of computer software and the transitory and fleeting nature of conceptual art. For Burnham — who had designed the architectural layout of the exhibition to mirror Duchamp's *Large Glass,* computer software provided a metaphor to scrutinise the relationship between conceptual or expanded art practice, and more traditional forms of making which focused on the self sufficiency of the art object. Burnham conceived of computer software as analogous to the conceptual status of the artwork as idea. In this respect conceptual, performance and other avant-garde practice was formulated as being predominantly concerned with "software" aspects of production, over and above practice, which focused on the production of self contained art objects such as painting (hardware).

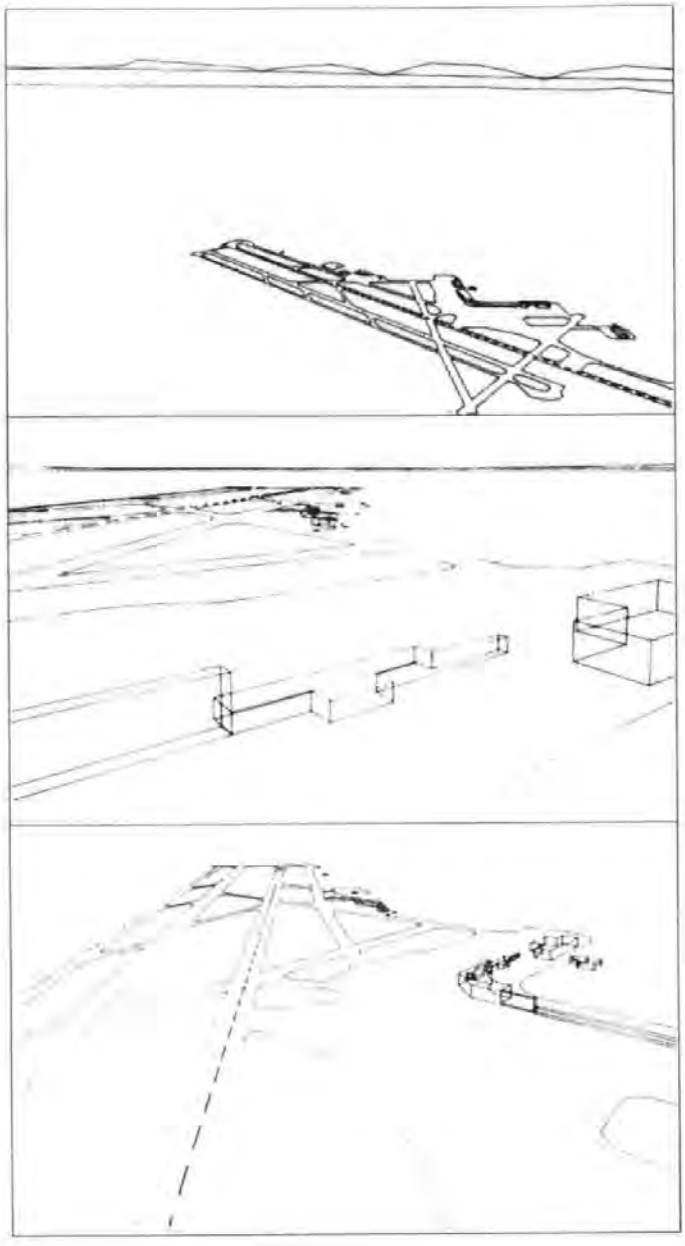

Figure 2 : Images from the Boeing animation shown at *Cybernetic Serendipity* 1968.

For Burnham, a convergence between the increasing conceptualisation of art practice, structuralist art theory, and emerging information systems, heralded a situation whereby artworks would become increasingly interactive. The purpose of the exhibition was to provide a public testing ground for a situation in which two-way communication between computer mediated artwork and audience would become the norm (Shanken 1998). Despite this it was not until the 1980s, with the

arrival of the videodisk, and the ready availability of the personal computer that it became feasible for artists such as Jeffrey Shaw, Lynn Hershman, and Ken Feingold amongst others, to experiment with the types of computer supported interactive structures envisaged by Burnham in 1970.

In the 1970s the use of the computer in fine art practice became marginalized, as video became the medium of choice for artists wishing to experiment with electronic media (Huffman 1996). The reasons for this are many, Cornwell (1992) points out that the complexity of production, limited access to funds, and the primitive nature and unreliability of computers effectively stymied further large scale experimentation. Shanken commenting on Burnham's *Software* notes:

> In many respects *Software* was a disaster. The DEC PDP-8 Time Share Computer that controlled many of the works did not function for the first month of the exhibition due to problems with, ironically enough, the software. The gerbils in SEEK attacked each other, a film was destroyed by its editors, and several aspects of the exhibition — including the catalog — were censored by the Board of Trustees of the museum.
> (Shanken 1998, p.7)

Throughout the 1970s practitioners from other disciplines (notably Myron Krueger, and Michael Naimark), were responsible for much of the creative exploration of computer media. Naimark, working at MIT, collaborated with Scott Fisher in the development of several, computer driven responsive environments including the famous *Aspen Moviemap* considered the first significant "proof of concept" for simulated computer supported environments (Brand 1987). Fisher had been involved with further developments of Sutherland's HMDs, and had been financially supported by a US government bodies associated with the US military: the *Advanced Research Projects Agency (*ARPA), and the *Defence Advanced Research Projects Agency* (DARPA*)* (Hershman 1996).

Krueger has remarked upon the influence that cross-disciplinary art practitioners have exerted on the development of the medium in his book *Artificial Reality* (1991). He reminds us that supported by a grant from the National Endowment for the Arts, artists Dan Sandin and Richard Sayre built the first Data Glove

in 1977, fully three years before Tom Zimmerman constructed the prototype, which was eventually to be presented by NASA to the general public in 1985. Krueger working independently and without military funding, is a pivotal figure in the development of creative usage of virtual environment media. Initially practising as a scientist at the University of Wisconsin, he had been influenced by Sutherland's early research into HMDs but soon reacted against what he was later to contemptuously describe as "goggles and gloves" technology:

> There is no denying that stereoscopic three-dimensional displays that put you in a graphic world offer incredible promise for creating compelling experiences. In the past, however people have shown a resistance to using stereo glasses. Three-dimensional television has been possible for decade, but there has been no great desire to commercialise it. If people have been unwilling to wear lightweight glasses for entertainment, it seems likely that a technology that asks people in everyday situations to don goggles, gloves and wired suits to do their jobs will meet resistance. (Krueger 1992, p.75)

Influenced by the aesthetics of John Cage and Alan Kaprow, Krueger developed a series of interactive art installations entitled *Videoplace* in which the computer responded to the gestures of the audience by interpreting, and anticipating their actions. The significance of the *Videoplace* installations was that user interaction with the environment was enabled free from encumbering devices, such as HMDs and Data Gloves (DG). Using an elaborate system of sensing floors, graphic tables, and video cameras audience members could touch each other's video-generated silhouettes, and manipulate an assortment of animated organisms, imbued with the presence of artificial life. While not strictly falling within the definition of a virtual environment (most of Krueger's works employ flat graphics rather than simulated three-dimensional graphics); his contribution to an extended series of possibilities in regard, installation, display and interaction within computer supported virtual space, offered an alternative to what had been up to that point a debate dominated by the ubiquitous technologies of HMDs, i.e. in a move that Burnham the curator of *Software* would have appreciated, Krueger shifted the focus of attention from the particulars of hardware, toward software, by concentrating his attentions on the conceptual structures that support user interaction with the artwork.

Schwarz (1997) notes that Krueger's development describes a parallel history for the medium. By offering an alternative to the work done for military research, he did much to legitimatise the technology within the visual arts field, and opened up a creative area that many artists may have found ethically problematic due to its foundations in the cold war research labs. The extant body of virtual environment artworks provides some evidence for this view. With the exception of some high profile projects, the majority of artists employing the medium, have followed Krueger's example and avoided the use of such paraphernalia as the HMD, preferring to devise separate strategies for displaying and engaging the user within virtual space.

2.2.5 Ethical practice

With the deployment of telepresence systems in the Gulf war in particular highlighting the fact that military research largely accounts for the development of virtual environment technologies (Ronell 1996), much debate surrounding creative usage of the medium is concerned with the ethical issues raised in its deployment.

Beardon (1992) comments that that while the technology may be subject to the same principles that govern other media, extra responsibility rests with artists when confronted with technologies that appear to offer an extension of reality. Similarly Gigliotti (1995) recommends that artists design environments that encourage the participants to take responsibility for their actions by building interactive contexts for user activity that make the consequences of their actions transparent stressing that the environment "should push back. The cause of that pushing back should be the actual, physical reality of which virtual reality is a part" (p.293-294). Specifically Morse (1996) suggests that the role of art to give shape to possibilities and questions forced by the medium, not raised by its employment in instrumental practice (i.e. military and commercial usage). This often easier said than done, as production possibilities for larger or more complex projects are often reliant on the infrastructure that supports such practice.

> Artists' interests are complicated by the fact that they remain largely reliant on corporations and institutions for access to the technology. Their motives in it may be poles

> apart from those of corporations yet, in order to get access, they have to offer the corporation something in return. (Moser 1996, p.23)

The complex ethical manoeuvres that artists may have to indulge in, in order to gain access to the technology is demonstrated by the development of the *Aspen Moviemap*. The *Moviemap* widely acknowledged as one of the first virtual environments was built in the late 1980s at MIT's Architecture Machine Group. It was funded by the US military, who in the wake of the Israeli commando raid on Entebbe airport had been keen to develop simulation technologies that would enable them to plan and practice similar "commando style" raids (Brand 1987).

The work consisted of a set of videodisks containing photographs of the street layout of Aspen, Colorado. The images had been recorded using four cameras, mounted on a truck. Each camera pointed in a different direction, taking photographs every three metres. The resulting image database was projected onto a screen and was able to be traversed by a user, who could turn right or left down particular streets or enter specific buildings. Each photograph was attached to other relevant images and an algorithmic process that displayed the resultant image formations at up to thirty frames per second assured that navigation through the environment appeared seamless, giving the impression to the user of navigation through a three-dimensional scene. The *Moviemap*, while financed through military budgets, was also the product of cross-disciplinary research. Michael Naimark, a media artist, who was later to participate in the Banff Centre for the Arts research program in *Arts and Virtual Environments* (Moser and Mcleod 1996), had worked with Fisher on the *Moviemap* and was later to develop its techniques in a series of interactive photographically based virtual environments, (*Golden Gate Moviemap* 1987, *Karlsruhe Moviemap* 1991, and *See Banff!* 1993-94, amongst others), a technique he has dubbed "Realspace Imaging" (Naimark 1996). Naimark has recently embarked on a series of projects collectively described as *Be Now Here* for the UNESCO World Heritage Endangered Cities project. Among nearly five hundred World Heritage Sites, UNESCO have listed eighteen as in danger, from military action, natural disaster or other potentially destructive activity. Using techniques derived from the original *Aspen Moviemap*, Naimark (1998, 1998) has made photographically based simulations of four of the most threatened: Jerusalem; Dubrovnik; Timbuktu, Mali; and Angkor.

In an ironic reversal of the rationale for the original *Moviemap*, the techniques developed to satisfy military needs for battle simulation are now being used to document and record sites of historic interest threatened by such activity.

2.2.6 The virtual body

> Our body is our interface,
> (Brickemp quoted in
> Pimentel and Teixeira 1992, p.160).

Closely connected to the deliberations regarding ethics is a large debate concerning the status and position of the body in virtual space.

> 'Functionality' is a term used by virtual reality technologists to describe the communication modes that are active in a computer-human interface...Functionalities work in both directions; that is, they both describe the computer's capabilities and also indicate how the user's sensory-motor apparatus is being trained to accommodate the computer's response. Working with a VR simulation, the user learns to move her hand in stylized gestures that the computer can accommodate. In the process changes take place in he neural configuration of the user's brain some of which can be long-lasting. The computer molds the human even as the human builds the computer. (Hayles 1996a, p.275)

Questions arising from the relationship of the body to virtual space have been investigated by Vesna in her recent online artwork *Bodies Incorporated (*1996). The project presents an ironic commentary on the relationship between the corporeal self and its overlapping virtual form as represented by a configurable three-dimensional human model (avatar). The basic premise of the project, is that users become active members of a mock corporate structure. As they acquire shares, they are invited to build a virtual body out of predefined body-parts, textures, and sounds. Once built the user is able to define the sex, and sexuality, of their body and interact to a limited degree with other shareholders, by viewing other bodies in specially defined environments on the Internet. More complex interaction, i.e. the ability to communicate with other users visiting the environments is blocked. Vesna, as "CEO" of the corporation reserves the right

to alter shareholders bodies, define interaction and communication possibilities and even kill off bodies that have been inactive or abandoned by share holders for long periods of time. The uncertainty this generates surrounding ownership of the body poses a number of pertinent questions to the creative practitioner: what ethical responsibilities lie with the artist in designing virtual bodies? Who owns the body, the artist or user? Who gets to decide what visible form the body takes? What sort of attachment do owners exhibit toward their virtual bodies?

Early supporters of the medium promoted its potential for disembodiment (Heim 1993). The technology would free the user from the gravity and the fleshy constraints of the real world by allowing us to leave our physical bodies behind:

> In CYBERSPACE, there is no need to move about in a body like the one you possess in physical reality. You may feel more comfortable, at first, with a body like your 'own' but as you conduct more of you life and affairs in cyberspace your conditioned notion of a unique and immutable body will give way to a far more liberated notion of 'body' as something quite disposable and, generally, limiting.
> (Walsall and Gulichsen quoted in Rheingold 1994, p.191)

Contempt of the body has a long tradition and can be traced back from St Augustine through Descartes (Scarry 1995), reaching its contemporary apogee in the theories of Hans Moravic [1]. "VR" Coyne (1994) suggests, through its disavowal of the corporeal self "is a literal enactment of Cartesian ontology, co-cooning a person as an isolated subject within a field of sensations", the world is laid out for inspection and utilisation "presented to the subject." (Coyne p.68). Descartes fetish for clarity lead him to develop a philosophical and rational model (Cartesian Dualism) in which mind and body are seen as two separate forms. The mind capable of self-subsistence and independent existence is seen as superior to the body. Rational cognition is superior to the senses via its ability to comprehend, understand and quantify the world mathematically. Through its reduction to quantifiable matter "nature" is considered a measurable resource, Heidegger's "standing reserve" waiting to be exploited and manipulated (Dyson 1998).

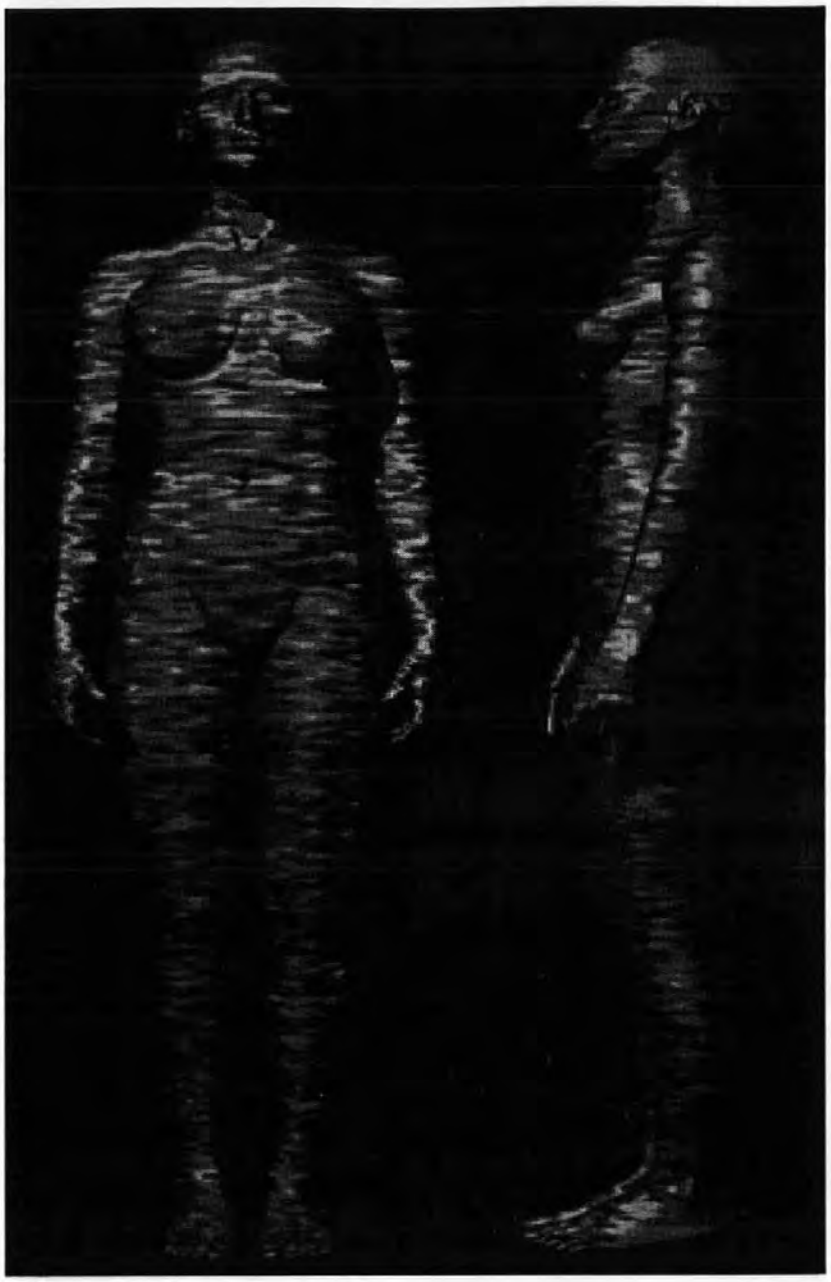

Figure 3: Screen shot of *Bodies Incorporated*

Virtual environments for Pryor and Scott (1993) are "deeply rooted in an historical philosophy that privileges perspective with its implications of detachment objectivity and observation" (p.168). Dualistic theory inscribes the relationship between the viewer and representation with questionable power structures and can be related to other oppositional/ binary forces at work in society male/female, black/white, self/other, gay/straight, (Bailey 1996). An almost a complete male monopoly in the historical development and usage of the technology, has according to Stone (1995, 1996), and Milthorp (1996), reinforced patriarchal power structures to the exclusion of women and others: for Tikka:

> The present state of the virtual reality interface technology undoubtedly serves as an adequate example of the constitution of the Cartesian cognito in the information space...The subject of the VR finds himself enclosed into a dataspace and deprived of a corporeal body. In the VR-space the abstracted vision becomes associated with a gesture. The pointing gesture moves the user forward in the constant state of erection. (Tikka 1994, [Internet])

Both proponents and detractors of the supposed disembodiment that occurs in virtual space, tend to ignore the fact that fanciful descriptions aside, the actual experience of the environment is unhealthily static —experienced sitting in front of a screen rather than immersed within it — "simulator sickness" and repetitive strain injury insistently remind us of our corporeal body.

Hayles questions the value of taking up of positions either in favour or against the technology. As technology is the operative principle regulating our lives, the body, and our perception of the world is mediated by it to the extent that older forms of social and historical analysis are outdistanced. For Hayles virtual environment media precipitate a radical shift in postmodernism — refashioning the body as informational data by implicating it in the environmental feedback loop of a cybernetic environment. In this discourse, the new informational body, is conflated with post-structuralism. Prosthetic technologies, smart drugs, medical implants, and the recent mapping of the human genome have encoded the body as information endowing it with the same liquidity and possibility for recombinantory operation as the postmodern text. The body becomes a permeable surface "adorned with signs and riddled with inscriptions" (Dyson 1998,

p.30,). "*Interpenetrated with informational patterns* [author's italics]" (Hayles 1996b, p.5), the body "exists as part of an integrated information/material circuit that includes human and non-human components bits of information as well as bits of flesh and bone", the virtual body "partakes both of the ephemerality of information and the solidity of physicality" (Hayles 1996b, p.12). This blurring of the boundaries between virtual space and the corporeal body, describes a new set of possibilities that Haraway (1991) has formulated as the "Cyborg". The postmodern body/Cyborg is neither disembodied, nor completely immersed in virtual space, but exists as a human-machine assemblage, a resource for exploring the boundaries between the machine and human, self and other, body and mind, world and representation. By "refusing an anti-science metaphysics, a demonology of technology", we take a "responsible attitude for the social relations of science and technology" (Haraway p.181), in which, the key question becomes not that of the "whys and wherefores" of bodily transcendence, but of the kinds of Cyborg that are possible, and the establishment of responsible practice in the construction of interfaces that allow them.

2.2.7 Public perception, hyperbole and myth

In the late 1980s, NASA released a number of demo videos outlining possible uses and developments of the technology. Images — more often than not featuring HMDs rather than environments became widespread as the medium was catapulted into public consciousness through intensive press coverage. Around this time William Gibson was establishing the "cyberpunk" genre of science fiction. In *Neuromancer* (1984), *Count Zero* (1986), and *Mona Lisa Overdrive* (1989), his descriptions of a technologically mediated synthetic experience in the form of "cyberspace" are bleak and ironic, the technology required to enter it addictive:

> He settled the black terry sweatband across his forehead, careful not to disturb the flat Sendai dermatrodes. He stared at the desk on his lap, not really seeing it...He Closed his eyes. Round the ridged face of the power stud. And in the bloodlit dark behind his eyes, silver, phospherenes boiling in from the edge of space, hypnagogoic images, jerking past like film compiled from random frames. Symbols, figures, faces, a blurred fragmented mandala of visual information. Please, he prayed, *now* — A gray disk, the color of Chiba sky. *Now* — Disk beginning to rotate, faster, becoming a sphere of paler grey. Expanding — And Flowed, flowered for him, fluid neon oragami trick, the unfolding of his distanceless home, his country, transparent 3D chessboard extending to infinity. (Gibson 1995, p.68.)

While only bearing a coincidental relationship to the emerging technology, Gibson's novels established the tropes that were, in public consciousness at least, going to be applied to the nascent medium. As his fetishistic descriptions of the technology ("jacking-in", "nodes". "decks", and "ice" the stuff or data of cyberspace), began to overlap with images of headsets and data gloves, a public perception of the medium was building that bore little resemblance to the rather prosaic and limited potential of the technology as it stood. NASA itself contributed to the general euphoria by releasing exaggerated publicity photographs of ecstatic /terrified people using NASA headsets and data gloves (figure 4), and extended commentaries discussing the various merits of "teledildonics" (virtual sex) became widespread (Rheingold 1994).

Figure 4:
NASA publicity
Photograph.

Despite the fact that research into the technology was largely funded by the military it had developed into an icon of early nineties alternative culture. During the 1990 Siggraph panel convened to discuss virtual reality, counter culture leader Timothy Leary declared the emergence of the medium as a new stage in human evolution (Woolley 1992): Ito and Fisher comment:

> The newly coined term 'virtual reality' (VR) was emerging as a highly visible pop cultural phenomena, partially centered around the psychedelic countercultures of the San Franciso Bay Area. With the publication of the new magazine, *Mondo 2000,* 1990 saw the emergence of a clearly identifiable pop cyberpunk subculture, a unique conglomerate of high-tech utopianism, anarchist philosophy, hippie 'high times,' and techno-culture. (Ito and Fisher 1997, p.301)

A slew of Hollywood films and TV shows reinforced the cyberspace/cyberpunk narrative that had attached to the medium; (*Lawnmower Man* 1992, *Wild Palms* 1993, *Johnny Mnemonic*

1995, and *Disclosure* 1995), all of which shared a visual focus on data gloves, body suits and headsets and a "Gibsonian" plot set in a dystopian near future where cyberspace is a addictive, criminal activity commonplace, technological brain washing a distinct possibility, and a barely legal frontier counterculture abounds.

The contemporary art world itself was not immune to the inflated commentaries surrounding the medium. As Ars Electronica rather strangely announced "the future goes to virtual reality" (Laurel 1993, p.194) at the launch of their annual electronic arts exhibition in 1990, the now defunct UK art magazine *Artscribe* (1991) reserved its glossy front cover for a photograph of a data gloved hand giving a V-sign (figure 5). Writing in *Flash Art* Brian D'Amato's portentous article *The Last Medium: The Virtues of Virtual Reality* captures some of a prevailing spirit. Rather than focus on the practicalities of the present, i.e. the pragmatics of access to technology, funding and exhibition possibilities, overviews of work etc. he situates the medium in a "near future" in which technologically supported transcendental experience is commonplace:

> VR is the most exciting area in the developing synergy of science and humanism and its importance can hardly be overstated as a way out of art's current dead end... Living in cyberspace palaces (infinitely cheaper to build than the real thing) they will create vast works of art in unheard of modes. Artists will produce living, functional mythologies...Users will leave the limits of the fragile, mortal body to exist in realms of pure thought eventually, perhaps, downloading their consciousness onto microchip storage and, as their bodies die, achieving near immortality in the software universe...VR may be the way out of the artistic doldrums that have engulfed us: It's happening! Now! We cannot ignore it. Artists must take the lead. We can create the universe we want and we must create the universe we deserve. (D'Amato 1992, p.97-98)

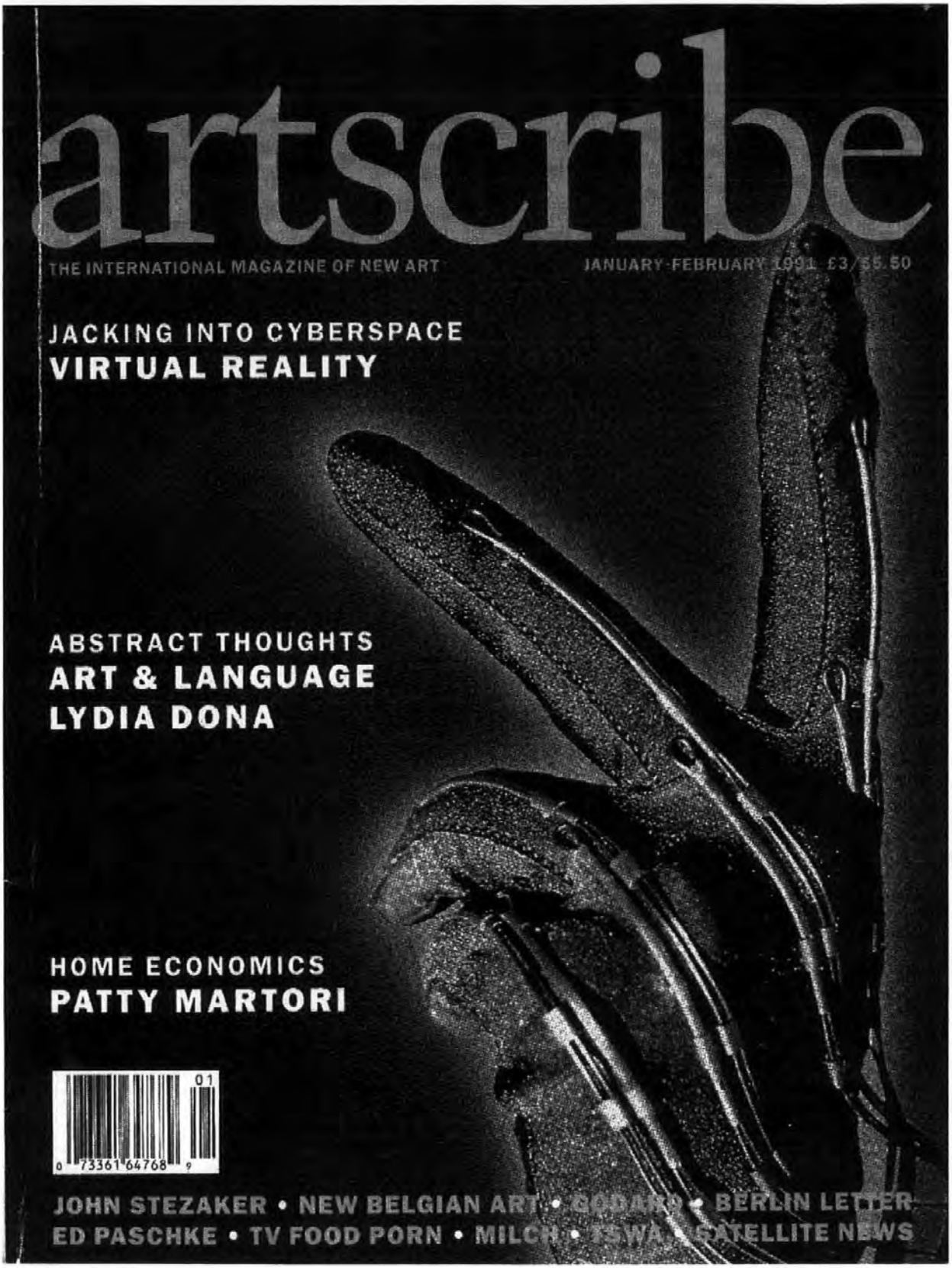

Figure 5: Data glove, magazine cover, *Artscribe* 1991.

Dealing with this level of breathless expectation placed a heavy burden on a medium that had barely crawled out of the rather closeted environs of research labs. As the solid but quite modest capabilities of the technology became apparent, a public primed to expect high-resolution photographically realistic virtual realities began to lose interest and an inevitable backlash began to build. As public confidence in the technology dipped in early 1990s a period of self-doubt set in amongst the active research community. In her influential book *Computers as Theatre* (1993) Laurel charts the damage to the nascent medium's credibility that occurred in the media rush to embrace it:

> The VR meme started to flame out...many of us involved began scrambling to change our shingles from virtual reality to something roughly synonymous but less tainted-telepresence, augmented reality, immersion technology. Anything to get some distance from the all too vivid spectacle of the hype-fuelled VR road-and media -show. (Laurel 1993, p.200)

2.2.8 The 1990s

While for many the medium's initial promise had fallen somewhat short of expectations, supported by the emergence of a number of publicly funded media centres, the early to mid 1990s saw the first sustained use of the technology by practising artists. Newly founded media academies: ZKM in Karlsrhure, ICC in Tokyo, and the Ars Electronica centre in Linz, offered production facilities, technical support and the possibility for public exposure of work. A flurry of initiatives surfaced at this time. In 1993 *Virtual Reality: An Emerging Medium,* opened at the SOHO Guggenheim Museum, one of the first exhibitions to investigate the creative possibilities offered by the medium. The show sponsored by Intel featured work by Jenny Holzer including a meditation on the Bosnian war *World II* made in collaboration with Jeff Donovan. In 1992, the Banff Centre for the Arts invited a group of artists and theoreticians, including Laurel and Strickland, Hoberman, Naimark, and Dove to participate in a two-year research program entitled *Art and Virtual Environments*. Theoretical essays arising

from the project were subsequently published in book form (Moser and MacLeod 1996). The book *Immersed in Technology* while disappointingly light on the detail and specifics of production of artworks made during the project, did much to raise the profile and level of debate surrounding the medium.

Much of the more sustained activity at this time occurred in Europe, particularly under the auspices of Jeffrey Shaw, at ZKM in Karlsrhue (Pijnappel 1994, Duguet, Klotz and Weibel 1997). Following Shaw's premier of *The Legible City* at the Bonnefanten Museum, Maastricht in 1988, large scale installation work by Hedegus —*Handsight* (1991), *The Televirtual Fruit Machine (1993)*; Waliczky — *The Forest* (1993), and Sommerer and Mignonneau— *Interactive Plant Growing* (1992), *Avolve* (1994), amongst others, were introduced at a number of exhibitions and festivals (*Prix Ars Electronica, The Dutch Electronic Arts Festival*, and *Multimediale, ISEA*).

The majority of projects produced during this period, particularly in Europe, favoured the approach instigated a decade earlier by Myron Krueger, i.e. the production of installation work, employing projection techniques for display purposes, and specially developed interfaces. Concerned with an exploration of the relations of real and virtual space and the juxtapositions and interfaces between the two — we might characterise such works as being aesthetic commentaries on Sutherland's military invention of the HMD of 1968 and the utopian conceptions of fully immersive technologies prevalent in the 1980s. A number of works by Shaw, including *The Virtual Museum* (1991), *EVE (*1993-95), and *The Golden Calf* (1995), exemplify this approach, with *EVE* being a paradigmatic example. A research project initiated at ZKM, *EVE* consists of an inflated PVC dome (nine metres high, twelve metres wide) with a silver faced interior surface for video projection. Inside the dome, the spatial position of a video projected image is interactively linked to the viewer's point of view by means of tracking device worn on their head. This controls the movement of two video projectors mounted on top of an industrial robot arm which is positioned in the centre of the dome. The projectors generate a stereo pair of images, which is seen as a three dimensional image by an audience wearing polarizing spectacles. The movement of this image around the inside of the dome constitutes a dynamic picture window evoking a panoramic virtual image space. The apparatus functions as a theatre/viewing environment, in which both a user and audience may collectively experience navigation of a virtual environment, whilst

simultaneously being literally immersed in the installation space of *EVE* (Duguet 1997). Shaw comments that the purpose of the piece was to provide a viable alternative to the experience of virtual space to that provided by Head Mounted Display technologies, which he considers are limited in their intrinsically exclusive operation:

> The disadvantage of the Head Mounted Display is that it is completely private, completely enclosed, and doesn't offer itself to a broad public. I felt that for an artist it would be important to somehow explore the possibility of this viewing strategy and at the same time be able to communicate the work of art to a large group of people. (Shaw quoted in Pijnappel 1994, p.79)

Hoberman (1996) expresses a similar motivation in relation to his project *Bar Code Hotel*, produced at the Banff Centre for the Arts in 1994.

> Most of the virtual reality that I have seen requires an endless wait on an interminable line, only to briefly enter a rudimentary world in which one is a solitary inhabitant with nothing to do...I had something else in mind, at once more social, more casual, and more disruptive...Because I wanted to create a social, multiparticipant installation, I decided to forego the immersive first-person point of view found in most virtual reality. (Hoberman 1996, p.288-289)

In the project, bar codes and cheap stereographic glasses are used as a caricature of more complex and expensive equipment. The bar codes act as an interface through which multiple users are able to interact with, control, and respond to an environment populated with a number of quixotic entities. Both *Bar Code Hotel* and *EVE* confront users with an interpenetration of real and virtual space, thus avoiding an isolation of the audience from the outside world and admitting the possibility for extra social and participatory interaction to occur between audience members.

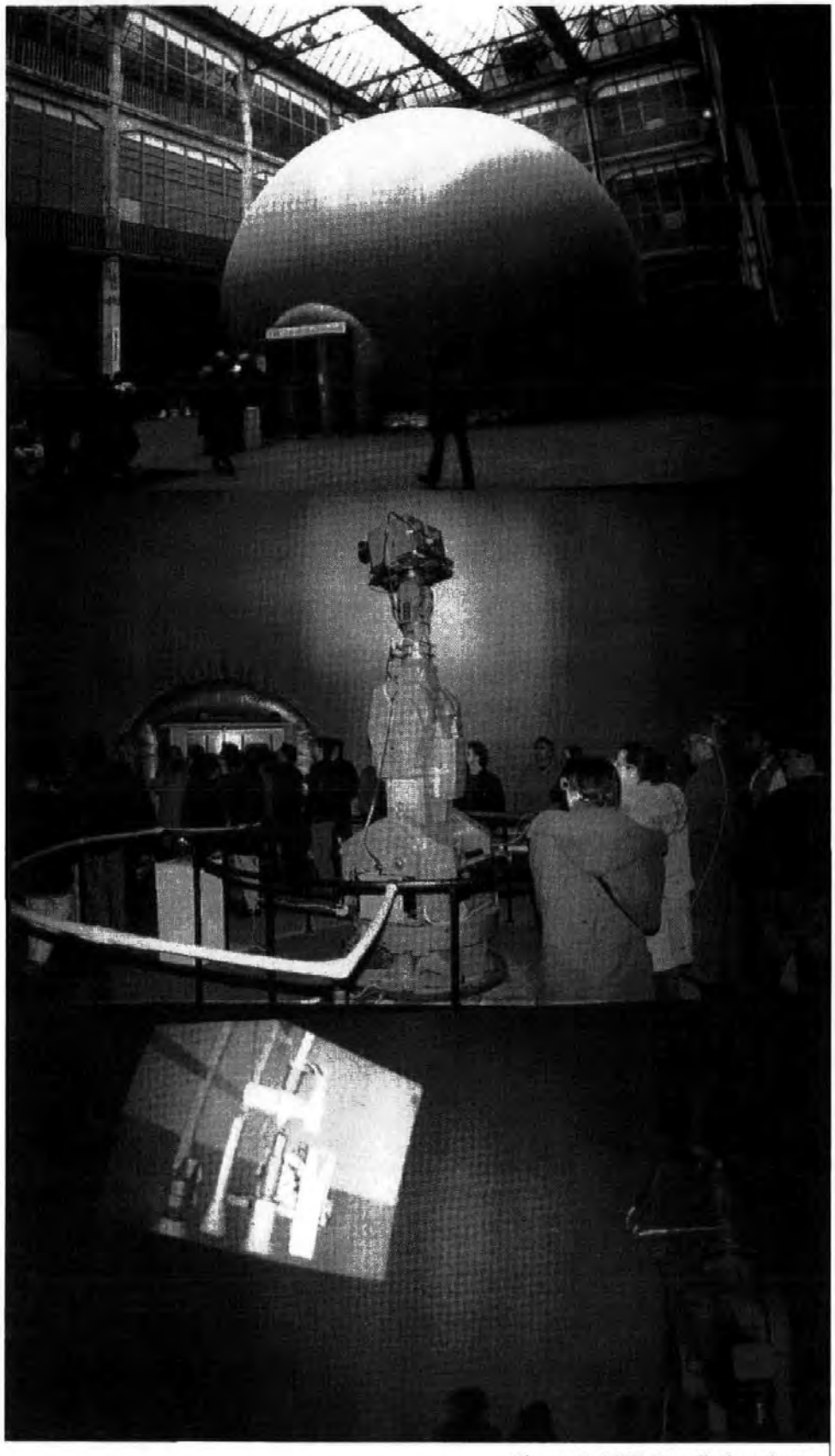

Figure 6: *EVE* Installation shots.

While a small body of interesting work was produced during this period, extended production costs, and the formidable technical difficulties encountered, meant that continued widespread production was not sustainable. In relation to the Banff project MacLeod comments:

> While there are tried and true procedures for production in theatre and film, no such algorithm exists for the creation of a virtual environment...Many of these works will never be shown again. Some are simply too complex to remount. In other cases, the team of artists and programmers that produced the piece has dispersed, taking with them detailed knowledge of the assembly and installation of a particular work...many of these approaches will be ignored, abandoned, or forgotten. (MacLeod 1996, p.12-13)

Cadwallader (1996), questions the value of such practice, and wonders what effect a broader practitioner base might have in exploring and extending the creative boundaries of the medium:

> For practitioners ambitious to use advanced technologies, the frustrations of limited exhibition platforms within the art-gallery circuit can be seemingly compounded by funding opportunities which privilege large-scale commissions...How would that practice look if artists had access to on-going resources in order to develop a studio based practice in order to pursue their own obsessions and so create meanings through smaller scale experimentations and forms rather than respond to and take on the single statement of a large-scale public commission? (Cadwallader 1996, p.31-32)

2.2.9 The present, networked virtual environments

Blase (1997) remarks that 1995 may be considered the high watermark of this form of larger scale publicly funded installation. Budgetary cuts in the mid 1990s, forced media centres such as ZKM, and Banff (which had to close its *Art and Virtual Environments project*), to reassess their commitment to

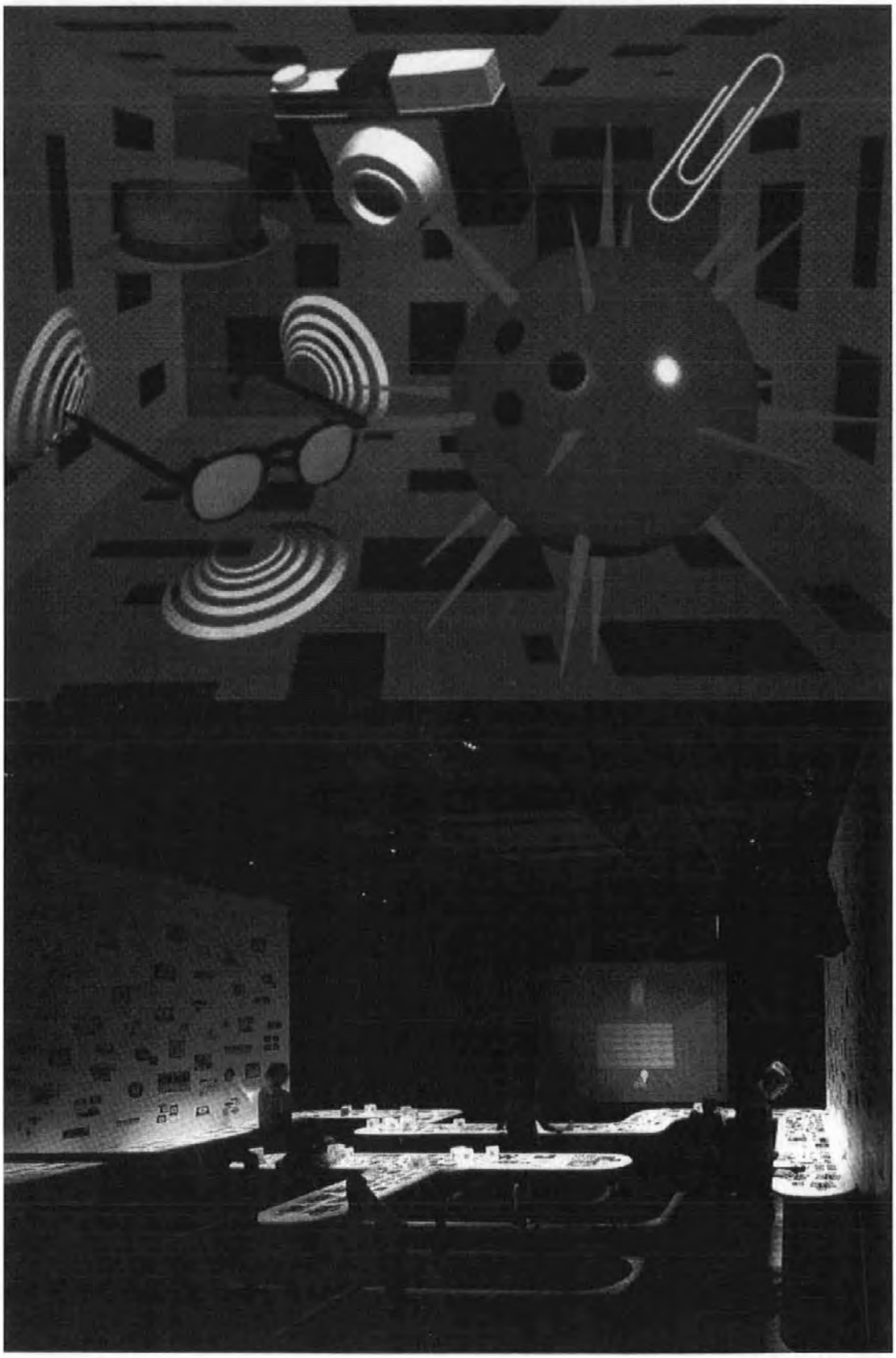

Figure 7: *Bar Code Hotel* installation and environment shots.

the type of longer term research projects that had flourished in the earlier part of the decade (Naimark 1997). While projects of this type continue to be made, their numbers are limited, and many artists have sought alternative forms of support, e.g. software company *Softimage's* sponsorship of Char Davies, and venture capitalist's *Interval Research* support of Michael Naimark, Perry Hoberman and Brenda Laurel.

Another key indicator of this sea change, was the increasing importance of the Internet. The possibilities proposed, both in terms of the staging and production of portable art projects, forced a refocusing in the media art community away from expensive site specific installations in favour of the generally cheaper networked, globally accessible alternatives. Commensurate with this move in 1994 Pesce presented a paper *The First International Conference on the World Wide Web*, detailing work on *Labyrinth*, a prototype three-dimensional interface to the World Wide Web which formed the basis for a freely distributeable modelling platform: *Virtual Reality Mark-up Language* (VRML). For Pesce the two-dimensional text based form of the World Wide Web while useful was ultimately limited. He surmised that to fully make use of the networked communication possibilities of the Internet, information should be visualised much the way we perceive it in the real world, i.e. visually, in three dimensions:

> Human beings navigate in three dimensions; we are born to it, and, except in the case of severe organic damage, have a comprehensive ability to spatio-locate and spatio-organize. It seems reasonable to propose that WWW should be extended, bringing its conceptual model from two dimensions, out, at a right angle, into three...it is necessary to create a unified conceptualization of space spanning the entire Internet, a spatial equivalent of WWW [World Wide Web]. (Kennard, Parisi and Pesce 1994, [Internet])

Up until the latter part of the 1990s artists wishing to experiment with the medium, were reliant on invitations and funding from the new media centres that had opened in the earlier part of the decade. The emergence of VRML promised a language specification for spatial description that was freely accessible, and which did not incur significant production costs in terms of

computer hardware. Potentially it allowed artists to develop smaller scale studio based work of the type proposed by Cadwallader, and provided them with a globally accessible and independent exhibition platform through the Internet.

As is the case with other aspects of the medium, VRML has to this point failed to completely live up to its billing. While relatively speaking it has significantly broadened the base of producers, and a focus and support structure for artists experimenting with VRML has been provided by festivals such as *VRML-Art 2000,* and the now defunct *Networked Virtual Reality Resource Centres for Art and Design* project; when seen in the context of other media, the increase in practitioner numbers is small, and work produced to date had been variable in quality. In their report on the use of VRML in UK art and design education, Beardon, Birtles, and Beach *et al* (2000), highlight a number of reasons why this may be the case. They found that in general terms, the level of awareness or knowledge of the medium was low. Added to this there was no strong tradition of 3D computing in art and design, let alone of the interactive variety and there was very few examples of colleges with access to specialised computer equipment such as HMDs. Technical issues specific to VRML also proved to be a stumbling block: the technology is not simple to use, a low quality of graphical output and incompatibility problems across different computer platforms have inhibited its uptake, among all but the most enthusiastic practitioners. The authors also suggest that using the Internet as a means of publishing 3D environments did not in itself suggest interesting possibilities, but that the possibility of communicating with other users through environments did. A number of these mult-participant virtual environments such as *Alpha Worlds* (figure 12) exist. Virtual environments in the form of text based chat rooms, and MUDs (multi-user domains) and MOOs (multi-user domains object orientated) have existed on the Internet for almost twenty years (Stone 1995, Turkle 1996). These environment accessed via text based interfaces allow users geographically dispersed to meet, interact and participate in imaginary texturally described environments. Typically users may also manipulate the environment (e.g. by building rooms), and will assume a range of different identities, sex, age, species etc. As in the earlier textural form, users of three dimensional environments may choose a range of different identifies, taking the form of "avatars" — three dimensional representations that the user, either in first or third person mode may guide through the environment. Visitors to *Alpha Worlds,* may also construct simple

structures on virtual plots of land, thereby extending the range of participatory activity beyond that of "online chat". While to date, online "virtual art galleries"; "shopping malls", "universities" and fantasy environments modelled on well known television shows predominate, the emergence of multi-participant environments in particular suggest a number of fruitful arenas for creative practice, e.g. performance activity, participatory art situations, and avatar design and specification.

2.2.10 Summary

In terms of sustained art production the medium is little over a decade old, but may be seen to exist in an ongoing tradition of participatory and interactive art practice. This can be identified not only in terms of a shared concern with, the use of new materials, integration of media types, spectator involvement in the development and completion of the work of art, and an interdisciplinary approach to practice, but also in relation to the inhibiting role that the cost and complexity of production has had on the wider uptake of the medium, and its severance from mainstream fine art practice. A discourse of sorts concerning issues of access, interests and ideology has emerged over recent years, but the fragmentary context it describes offers little in terms of describing good practice for a medium which in itself is in continual development.

Although medium is young, it has been possible to identify two broad strands of art practice: an older form that we might characterise as "site specific virtual environments" — such as Krueger's early experiments with responsive environments, and the later globally distributed and accessed Internet sited works. At some point in the future it is possible to envisage a conflation of these two forms. Many possibilities exist for bringing distributed, globally networked environments into local "site specific" installation space. In the mean time — and until access to equipment and technical support becomes more widespread —it is not unreasonable to suggest that much ongoing creative practice will be focused on the possibilities for access and distribution offered by online environments. In the wider sense, the connectivity and communicational potential of the Internet as an entity or phenomena in itself, and questions concerning how human presence and communication is mediated online beyond

the examples multi-user environments that currently predominate, offer many as yet unexplored avenues for creative practitioners.

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[1] Moravic, argues that the age of the human, is coming to an end to be replaced by silicon based life forms. In the future the corporeal body will become superfluous to the support of human consciousness and will be gradually supplanted: "A biological brain built to operate a human lifetime is unlikely to function effectively forever. Why not use advanced neurological electronics like that which link it with the external world to replace the grey matter as it begins to fail? Bit by bit our failing brain may be replaced by superior electronic equivalents ...our thoughts and awareness continue. Our mind will have been transplanted from our original biological brain into artificial hardware" (See: Moravic H. 1998. "The Senses Have No Future", The Virtual Dimension, Beckmann J. (ed.), New York: Princeton Architectural Press.

Chapter 3: What is a virtual environment artwork?

3.1.1 Introduction

The term virtual environment enjoys widespread usage and is used to connote a broad range of environmental conditions: computer interfaces, the Internet, theme parks, shopping precincts, airports etc. Its ubiquity as a cultural signifier necessitates an examination of some key terms and concepts, in order to define the area of study that the project is engaging with.

3.1.2 Some definitions

"Virtual" might according to a common definition mean "in effect but not in essence" denoting a device, service or object that is perceived to be, something that in actuality it is not, philosopher Pierre Lévy writes:

> The word 'virtual' is derived from the Medieval Latin *virtualis*, itself derived from *virtus*, meaning strength or power. In scholastic philosophy the virtual is that which has potential rather than actual existence. The virtual tends toward actualization, without undergoing any form of effective or formal concretization.
> (Lévy 1998, p.23)

A mundane example might be the virtual memory used by computers to extend the capability of computer hardware. Memory in a computer exists in two forms, fast random access memory (RAM) directly accessed by the computers processor, and storage or slow memory, (the computers hard disk) which is where data not needed immediately for the computers moment to moment operation is kept. Virtual memory uses spare "slow" memory as additional virtual "fast" memory thereby, increasing both the speed and capacity of the computer to carry out

operations. Similarly a virtual environment has an appreciable dimensionality not a factual one. While in essence the environment exists as lines of computer code, as a simulated image space displayed on a computer output device, we treat it "as if" it were an analogue of real space, in order to engage, operate and be immersed "within" its boundaries. Heim (1993) characterises a virtual environment as a scene that resembles "physical reality", a responsive environment, or an "experience with which a participant can interact by using computer-controlled input-output devices" (p.160). Benedikt similarly focuses on hardware, the medium being "computer-sustained, computer-accessed, and computer-generated, multidimensional, artificial 'virtual' reality'" (Benedikt 1994, p.122). Bertol highlights the active role of the user in "three dimensional worlds" that can be "accessed, inhabited, walked through", and which are generated in real-time by user activity:

> The participant in a VR environment is perceiver and creator at the same time, in a world where the object of perception is created by actions...The user is surrounded by a three dimensional environment. The computer-generated world is visualized from its inside as well as its outside. (Bertol 1997, p.67)

Likewise for Teixeira, virtual environments are "a multi-sensory medium that can encompass all styles of art simultaneously" (Teixeira 1994, p.9). By transforming users from passive "vicarious voyeurs" into "co-creators" (p.9) — agents of change involved/immersed/engaged in a process of creative actualisation; the emergence of the medium precipitates a fundamental and empowering shift in manner that the audience is able to address and influence the formations of the artwork.

Whether the user is truly involved in a creative or "world building" process is a mute point as the environment that the user addresses generally exists *a priori* of usage. Questions of audience empowerment are discussed in more detail in chapter 7.

3.1.3 The relationship of the medium to other computer based interactive art

Insofar as identified characteristics posit the interaction of the audience with(in) a computer supported system, and the integration of diverse media types (multimedia); art practice using the medium is generally seen to be a specific subset of what is variously described as "new media art" (Schwarz 1997), "interactive computer based visual art" (Graham 1997), or "participatory computer based art" (Bell 1991). The term "interactive art" covers a range of heterogeneous media types, CD-ROM based works, installations, networked art projects etc. each displaying distinctive modalities and nuances of audience participation and interaction. While virtual environment artworks may be differentiated in that they confront the user with a spatialised synthetic environment — and as such literally propose different spaces in terms of audience perception and interaction, as an historical fact the production and distribution possibilities of virtual environment artworks are embedded within the extended world of interactive/new media art, and as such issues pertaining to this area also inform the study.

3.1.4 The area of study

For the purposes of this study the term "virtual environment" means a computer generated and supported representation of space, consisting of three dimensional computer graphics and other media (sound, video, etc.). The user's interaction with the environment may be supported by a variety of input/output devices: Head Mounted Displays (HMD), Data Gloves (DG), mouse, keyboard and computer monitor combinations etc.

As is consistent with current academic habit, the term "virtual environment" is preferred to other phraseology considered synonymous with the medium, e.g. "virtual reality", "VR" "cyberspace", "virtual worlds" and "synthetic environments". When such terms are used in the text (e.g. in quotations from other writers), they are considered as interchangeable. The medium is often associated with the hardware of "goggles and gloves". However this study is less concerned with particular technologies, than in examining how pertinent elements of the medium are organised in the construction of artworks, and how these spatio-interactive compositions affect the experience and

perceptions of the user. A definition of "artwork" is beyond the scope of the project. Within the context of the study it refers to both the products arising from creative practice, i.e. objects (whether virtual or physical), and the works of other artists. The area of study is the exploration through creative practice of interactive, computer based 3D virtual environment media, and is summarised by the diagram in figure 8.

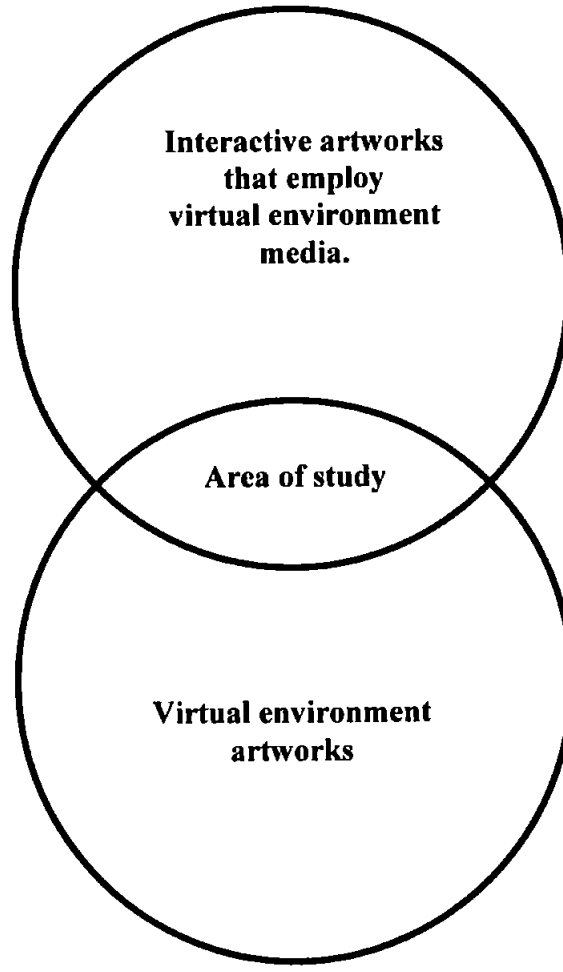


Figure 8: The area of study

Chapter 4: Immersion in virtual environments, some definitions and discussion

4.1.1 Introduction

Despite its familiarity in terms of day to day activity, and its iconic centrality as one of the defining characteristics of virtual environment media (Pimentel and Teixeira 1992), little has been attempted to explicate a study of immersion specifically in relation to visual arts practice. This chapter begins by identifying some basic "types" of immersion, detailed definitions are presented as synthesised from art historical, theoretical and scientific viewpoints, and the concept of "presence" is introduced. Following this some discussion is offered that deliberates upon issues raised by its effects, focusing on how theories of immersion sit within the context of contemporary art practice.

> Immersion 1.the act or an instance of immersing; the process of being immersed. 2. baptism by immersing the whole person in water. 3.mental absorption....from Late Latin immersio.(Concise Oxford Dictionary, Ninth Edition p.678).

Defining immersion seems an easy enough task: the Oxford Dictionary variously describes it as an experiential condition suggestive of a complex enveloping or baptismal state, or alternatively a form of "mental absorption" presupposing some form of psychological engagement; we are re "immersed" in our environment, we can become "immersed" in a good book or a film. While few may have had the opportunity to don a Head Mounted Display (HMD) or wear Data Gloves (DG) we are familiar enough with the concept of entering an immersive virtual environment to seemingly warrant no further exposition of its effects.

In terms of artworks this dual characterisation posits two "types" of audience: a physically overwhelmed or seduced viewer, who experiences the work primarily as a body centred or sensory experience (viewpoint internal to the representation), and/or a

Figure 9: *Osmose*

user who is psychologically engaged, involved in a constructive or psychological relation to the representation (viewpoint external). These characterisations may be demonstrated with reference to two artworks. *Osmose* (1994-1995), by Char Davies, is a paradigmatic representative of the former mode. Using the work involves a complete blocking out of the physical world through the use of a wide angle HMD. The project confronts the user with a "metaphorical reconstruction of nature" (Davies 1998 p.146) in the form of a series of watery glades, populated with semi-transparent rocks, tree forms (figure 9), foliage and flecks of moving light — the overall effect of which produces an aesthetic not unlike Monet's *Nympheas* or late Turner. While the obfuscated figure ground relationships of the project have been criticised for being aesthetically conservative [2], its innovative user interface, consisting of a chest-hugging corset and informed by the scuba diver's practice of buoyancy control, enables the

audience to navigate the environment using breathing exercises. to regulate and direct interaction: breathing in enabling vertical navigation, breathing out and leaning forward triggering downward and forward movement respectively. The project's visual and behavioural codes reinforce each other to literally and metaphorically immerse the user in an oceanic vista. The solitary experience this induces (influenced by the artist's own experience of scuba diving), is states Davies, intended to intensify and favour sensory experience over any "desire for active doing" or "controlled, analytic thought" (Davies 1998, p.146-147). According to Davies, this prioritising of sensorial over psychological experience, leads to conditions more often associated with eastern meditation techniques and certain drug induced states, i.e. an unravelling in normative perceptual patterns that inculcates an openness to alternative sensibilities and an increased sense of the "realness" of the interior world/self.

Figure 9: *The legible City.*

Unlike *Osmose*, in Shaw's, *The Legible City* (1988) there is no attempt to block out the physical world. The artist forgoes the use of a HMD in favour of projecting the environment on an environmental scale. In contrast to *Osmose* the project examines

the experience of the urban, by replicating the street layouts of parts of Manhattan, Amsterdam and Karlsruhe. Rather than model the outward appearance of the actual streets, Shaw substitutes the buildings for giant 3D texts: anecdotes that relate historically and geographically to the described cities. A special interface in the form of a bicycle (figure 10) enables the user to interact with the environment by cycling through the texts. The bicycle interface places the user in an exterior relationship to the representation. Rather than be enveloped in a 360° panorama, the user's viewpoint exists externally to it in real space. Complete sensory immersion is blocked through a staging of the interactive experience between real and virtual spaces. Cycling becomes an act of reading, navigation becomes a choice of texts, the city is reconstructed as process, as the user becomes a "raconteur and auto-biographer of the artwork's many possible forms" (Shaw 1992, p.66). In contrast to *Osmose* in which interaction with the environment is subsumed in favour intensifying sensory experience, in *The Legible City,* the user is encouraged to become an active unit in the world building process, bespeaking a different form of immersion, an engagement with the work precipitated through a constructive/creative act on the part of the user.

Diderot reminds us that these forms of immersive experience have a long genealogy. Commenting on the Salon of 1767, he breaks off from his description of the paintings lining the walls to relay what at first reading appears to be an anecdote describing a journey through a mountainous terrain:

> I continue along the bank of the lake formed by the waters of the stream to a point halfway between the two chains; I look about me, I see the wooden bridge at a prodigious height and a great distance. In front of this bridge I see the stream's waters arrested in their course by kinds of natural terraces; I see them fall into as many pools as here are terraces and form a marvellous waterfall; I see them arrive at my feet, spread out, and fill a vast reservoir. A loud noise causes me to look to my left; it's a waterfall emerging from the plants and bushes...I won't tell you how long my enchantment lasted the motionlessness of the people, the solitude of the place, its profound silence suspends time, nothing else exists nothing commensurable...How beautiful is all this, how grand, varied, noble, wise, harmonious.
> (Diderot 1995, p.92-93)

It is only later on in his description that we realise that the promenades are fictional, the scenery through which he guides us are a series of landscape paintings by Vernet which hang on the walls of the salon. In his description the frame of the painting to all intents and purposes disappears; the medium of oil paint and canvas and the immediate surroundings of the gallery are subsumed by the suggestive power of the image, inducing a rapturous state that allows Diderot the "pleasure of forgetting myself". It also describes some of the most common features of immersive experience: e.g. the user/viewer is transported to, or immersed in an environment separate from the one they physically inhabit (surrogate travel), and that the medium induces in the viewer/user the qualitative illusion of "non-mediation".

Lombard and Ditton (1997) include surrogate travel in a three-pronged taxonomy whereby they identify some key "types" of immersive experience: "you are there", "it is here" and "we are together". The distinctions are useful and are reviewed more fully below.

4.1.2 You are "there", immersion as surrogate travel

Immersion as surrogate travel is culturally widespread phenomena (e.g. Microsoft's inducement to buy their software products "where do you want to go today?"). From a historical perspective Huhtamo (1995) identifies its emergence in the 1880s with the rise of an experience industry catering for an increasing public taste for the exotic and a desire for the experience of worlds beyond the everyday. Described as "virtual voyaging" (p.165), such experiences are generally connected to the development of specific technologies (e.g. the invention of stereoscopic photographs, early cinematic experiments, theme parks etc.). He characterises the effects of "virtual voyaging" as a transition "from one realm to another, from the immediate physical reality of tangible objects and direct sensory data to *somewhere else*" (authors italics, Huhtamo p.159). These particular immersive experiences are often described in relation to virtual environment media in terms of "presence", whereby via various technological or psychological prompts the user is led to believe that they are situated in an environment other than the

one they are actually in: Rheingold (1994) has described this as "a form of out-of-the body experience" (p.256); Slater and Usoh (1994) as the participants sense of "being there" (p.131); and similarly Sheridan (1992) describes the phenomena of "telepresence", the feeling that you are there "at the remote site of operation" , or the "sense of being physically present with visual, auditory, or force displays generated by a computer" (p.120). Presence is discussed further in section 4.1.5.

4.1.3 Bringing "there" here

Rather than transporting the user to another place, a sense of immersion may also be engendered by bringing the objects and environments from another place to the user/viewer's own environment, which Lombard and Ditton describe as "it is here". One of its most characteristic effects being a failure of decoding on the part of the viewer that induces a confusion between image and referent, (e.g. the fleeing from the theatre of terrified viewers of the Lumière Brothers films of trains). As the user is psychologically overwhelmed by the suggestive power of the medium, its status as a mediating form of language achieves near transparency; that is, the user's awareness of the medium disappears leading to the perceptual illusion of non-mediation.

Citing the employment of Panoramas as public spectacles in 18th and 19th century Europe, Grau (1997) notes that this technique has been used throughout history as a manipulative tool for political and propaganda purposes, he writes:

> Ritual fusion, subtle escapes from the world, political power of the pictures — a visual history, the symptom of which is totality — VR reveals itself as the technically developed heir to illusionism as it made itself felt in its paradigmatic representative the Panorama. (Grau 1997, [no pagination]).

Similarly, though from a different art historical tradition [3], Nechtvatal (1997) describes the transparency of immersive media as arising out of the tradition of the *Gesamtkunstwerk*, not in the Wagnerian sense of "polymedia fusion" but as adapted from a broader and older concept:

> Total immersion technology cuts the viewpant [author's term] off from the world and plunges him or her into a homogeneous world without external distraction. It is this sense of radical unity and aesthetic transcendence through totality which immersive experience offers, as it provides a complete alternative reality to the viewpant for exploration and contemplation. In this sense of immersive art as striving toward a consummate harmonious whole that the term Gesamtkunstwerk holds relevancy. (Nechvatal 1997, [no pagination])

4.1.4 "We are together", social immersion

The third form of immersion identified by Lombard and Ditton is "we are together", in which one or more audience members are transported to a place where they can share communication. This form of immersion is characterised by the degree to which geographically separate users conversing via telecommunication technologies get the impression of sharing a space during the act of communication.— a common experience as anyone who has used a telephone may verify. By this definition immersion or engagement is induced primarily as a by-product of interaction with other users of the environment, i.e. occurs through social intercourse. Heeter (1992) defines this as "social presence", conversing with "someone or something else that seems to believe that you are there may help convince you that you are there".(p.262). Turkle (1996) describes a similar phenomena arising out of her observations made of users of Internet based MUDs (multi-user domains)[4]. She reports that users "lose themselves in the game space" (p.358), as interaction in the virtual reality of the MUD becomes so engaging that it becomes a significant aspect of the user's lives, attaining near equal status with life lived in the physical world.

Immersion as Stone (1996) has also testified, is engendered in such on-line environments through the ability to interact and communicate with other users, this activity leads to a heightened engagement or sense of "presence" in the mediating environment. Presence is an important concept in regard defining immersion, indeed the two terms are often used interchangeably. Some further definitions and a description of some of the factors that contribute to it are given below.

4.1.5 "Being there", a definition of presence

Within computer science immersion is usually taken to mean a specific instance through which a "feedback loop" between the user and the virtual environment (usually via the use of the HMD) isolates and floods the user's perceptual apparatus sufficiently "to make a person feel transported to another place" (Heim 1998, p.7), although strictly speaking the term "presence" is usually preferred to "immersion". Zeltzer (1992) defines presence as the "sense of being in and of the world" that results from being "immersed in a very high bandwidth stream of sensory input" (p.127), which Heeter (1992) describes as "the sense of inclusion within a virtual world" (p.263) and Lombard and Ditton as "the illusion of nonmediation" (p.10).

4.1.6 Presence and the environment metaphor

According to Slater, Usoh and Steed (1994), a fundamental attribute of presence is that it is body centred, meaning, argues Wickens (1992) that the environment should be experienced from an egocentric or first person point of view. Anders (1998) describes this as "anthropic cyberspace" (p.9) an approach to fostering presence derived from our bodily experience of immersion in the physical world. Ellis (1991) suggests that perceptual prompts that simulate the dimensionality of the physical world are more likely to engender presence as they build on our memory and experience of immersion in the real world. This idea derives from interface design and is based on the notion that the interface should provide familiar and predictable contexts within which to act. This seemingly naturalistic approach to modelling virtual environments has been considered problematic. Nelson (1995) has attacked metaphors for virtual environments derived from the real world as their "slavish adherence to a metaphor prevents the emergence of *things that are genuinely new*" (authors italics p.239). According to Nelson, it is the creation of "virtualities" that may have never existed in the real world, that are more likely to engage the user than simulations of pre-existing environments. Hullfish (1996) also argues that approaches to modelling virtual environments based on the physical world are problematic as they assume that

all humans perceive representations of space in the same way, he writes:

> Although the technology and the physical signals it generates are necessary for recreating reality, is the realism sought actually achieved? How does the person actually experience the interface created with this technology? Since experience is not isomorphic with reality, these signals could have been interpreted a number of ways. The only way to determine if the goal of realism achieved is to acknowledge and consider the human factor. (Hullfish 1996, p.3)

The subjectivity of human perception has long been acknowledged, Naimark (1995, p.455) relates an anecdote concerning Picasso and a member of the public who approaches him one day on the street. After listening to the man criticise his paintings for distorting reality, Picasso seemingly changes the subject by asking the man whether he has a girlfriend. Replying that he did, the man produces a small photograph of her from his wallet. "She's beautiful" Picasso replied, "but she's so tiny". Forms of representation such as the Western convention of pictorial depth are like languages that have to be learnt in order to be "read" correctly. Whether the process of reading an image is conscious or not, at some point it is learnt, the process of perception and comprehension involves the brain, it is a mental as well as physiological experience (Monaco 1981).

4.1.7 Presence and sensory substitution

It is generally proposed that the larger the number of human senses involved the greater the likelihood that presence/immersion will occur. The potential for presence is thus equated with the number of input/output channels available and the fidelity or richness of sensory experience offered. Vividness and size of display may also be significant producers of the sense of presence as anyone or has sat in the front row of a cinema will testify.

Sheridan (1992) states that presence is determined by "extent of sensory information" or the amount or degrees of sensory immersion provided by input/output equipment (p.122). In this

instance the user is perceived as being a receiver of information, i.e. is subject to it through sensory substitution. The effectiveness of the message/information is reliant on number and breadth of input channels allied with verisimilitude or clarity of informational environment. For presence to occur the status of the virtual environment must not be obvious or obtrusive, "it should not draw attention to itself or remind the media user that she/he is having a mediated experience" (Lombard and Ditton 1997, p.11), any "noise" within the representation that reminds the user that the experience is synthetic is considered a negative artefact that disrupts the potential for immersion.

4.1.8 Emergent presence

Taking a more expanded view of the process Slater, Usoh, and Steed (1994) state that "presence may be considered an emergent property of a VE [virtual environment]" (p.131), as any sense of immersion while arising out of interaction with the formal characteristics of a medium, effectively lies with the viewer/user (and is thus a subjective property of the user). This is an important point, immersion requires an empathic response. For it to occur user's must be prepared to employ Coleridge's famous "willing suspension of disbelief" to "make believe" that what they are interacting with is something other than what they know it to be, i.e. a codified mediated representation.

In the wider sense meant by Slater, Usoh, and Steed presence is not necessarily reliant on technology. They differentiate between "immersive virtual environments" (IVEs) that employ sophisticated input/output devices and non-immersive virtual environments, with the sensory immersion that occurs in IVEs being but one element in an combinatory matrix that may help engender the subjective feeling of presence. Ryan (1994) points out that as "in real life... the greater our freedom to act, the deeper our bond to the environment" (p.14) arguing that a major or primary cause of presence is the ability to interact with, or directly manipulate the environment.

In a similar vein Sheridan (1992) suggests that presence may be promoted through the potential to interact with or change the environment, and is significantly influenced by well designed environmental variables, e.g. sound and the visual/aesthetic components of the world.

This holistic approach to presence is further elaborated upon by Brenda Laurel (1993). In *Computers as Theatre* she advances the hypothesis that the six qualitative structural elements of drama (action, character, thought language, melody and spectacle) may successfully inform the design of interactive contexts in virtual environment media, as both theatre and interaction design share a fundamental goal of formulating representational, experiential contexts for human activity. She stresses that, sensitivity to "the whole action" (p.50) is a necessary prerequisite for successful engagement to occur in any human computer interaction. As in drama the ultimate aim is to present a fusion or "organic whole" (p.49) a continuous representation or performance that unfolds toward a pleasurable conclusion or catharsis. While she notes that the ability of the user to act independently may be problematic in terms of respecting the kinds of closure operative in traditional classical drama, it is less the structure of dramatic performance that she promotes, but rather its example as a medium able to promote presence through psychological engagement of both its audience and actors. As such virtual environments should provide "emotional textures"(p.209), carefully crafted temporal, sensory and perceptual patterns, embedded within representational arenas shaped to encourage exploratory and creative user action:

> Given a multisensory environment that is good enough, people engage in projective construction that is wildly elaborate and creative. And this turns the problem on its head; rather than figuring out how to provide structure...the problem becomes one of creating an environment that evokes robust projective construction. (Laurel 1993, p.209)

4.2 Immersion and media transparency

The condition of immersion has been described as the "illusion of nonmediation" (Lombard and Ditton 1997). To successfully achieve this state, the user must be insulated from the work's status as a representation. Held and Durlach (1992) argue that a virtual environment should be free from "artifactual stimuli that

signal the existence of the display" (p.110) and Lombard and Ditton that "it should not draw attention to itself and remind the media user that she/he is having a mediated experience" (p.20): that is, a total subordination of the representations status as a media generated image is a prerequisite for immersion to successfully occur.

Insofar as this presupposes a transparency of technology and medium, some commentators have described immersion in virtual space as being a purely intuitive form of communication free of any mediating or abstract symbolic language. As Jaron Lanier (1996) puts it virtual environment media are "like language but better...postsymbolic communication" (p.49), a direct form of expression that Pimentel and Texeira (1992) similarly suggest "doesn't require you to convert your ideas into abstract symbols with restrictive semantic and syntactic rules" (p.17). The virtue of media transparency is an old idea as advanced though the mimesis in classical painting and literature. Bryson (1983) reminds us that the goal of mimesis in art lay in its ability to approximate as closely as possible "nature". The efforts of artists were directed toward a technical elimination of that which impedes "accuracy of registration". Art advanced through overcoming the technical deficiencies of previous generations of artists: "Appollodorus appears: Zeuxis outstrips him. Cimabue appears: Giotto surpasses him" (p.3). The culminating point of this continuous cycle of technical advances being the appearance of the perfect reproduction of reality the "Essential Copy" , a state of naturalness or perfection that measures its effect on the beholder[5].

Ryan (1994) has noted that the proposed quality of such forms of total immersion are akin to what Swedenborg, (a philosopher who lived between 1688 - 1772) described as the "language of the angels" (p.4) such technologies promise a kind of freedom from language, an escape from post-modern self consciousness (the dominance and construction of the world by/as sign systems). The cost of this however is a kind of "semiotic blindness", a bereavement of the user's critical faculties, she comments:

> Freedom from signs cannot be achieved through their disappearance but only through the awareness of their omnipresence...Signs must be made visible for their role in the construction of reality to be recognized.
> (Ryan 1994, p.8)

Bolter (1991) argues that immersion represents a reactionary trend in popular culture, by which the critical or reflective faculties of the viewer are smothered in a subjection to the engulfing authority of the simulation:

> The problem is that virtual reality, at least as it is now envisioned, is a medium of precepts rather than signs...What is not appropriate is the absence of semiosis...Viewers are encouraged to lose themselves (and therefore their critical judgement) in the simulation. (Bolter 1991, p.230-231)

4.2.1 Immersion deferred

This raises some interesting issues. If much contemporary art (as seen through post-modern/post structuralist theory) seeks to play with the opacity of representational signs (i.e. to look at them, not through them); how does the effect of media transparency proposed by immersion sit within contemporary art practice?

Firstly we must doubt that any media artefact might exert such "somatic" power as to completely block out the user/audiences deep rooted (common) sense or consciousness that what they are perceiving is a representation. Some of the wider assertions as to the effectiveness of the technology must be put into context here, claims to transparency of medium as anyone who has ever worn an HMD will testify are greatly exaggerated — the image quality is poor and out of focus, and the display uncomfortable to wear.

Manovich (1999)[6] has cogently pointed out that digital images, whilst striving for transparency continuously betray their status as media based representations. This is identified as occurring along two axis: the perturbing of the image surface that occurs via interactivity; and the "continuous presence of the communication channel in the message". For example, in the construction of virtual environments a technique called "level of detail" or "distancing" is commonly applied to save on unnecessary computation. The idea being to render the models present in the environment more crudely when the user is moving through the environment, than if the user stops or is close to the object; in which case a more detailed or realistic

version of the object is substituted and extra detail gradually fills in. A virtual world that employs such techniques is possessed of a "fluid ontology that is affected by the actions of the user". As the user interacts with the environment "objects switch back and forth between pale blueprints and fully fleshed out illusions. The immobility of a subject guarantees a complete illusion; the slightest movement destroys it". Thus interaction with a virtual space involves a systematic performance of "auto-deconstruction" a "periodic reappearance of the machinery", the image oscillates between opacity and transparency; a three-dimensional space becomes a surface, a character an icon, "what at one moment was a fictional universe becomes a set of buttons that demand action"; the user is continuously prompted to act, to make choices, click on buttons, navigate spaces, wait for file downloads etc. Engagement with digital media involves a continual switching between an "illusion and its suspense", that is structurally defined arising from the media specific qualities embedded within the computer technology, and the activity of interaction (Manovich 1999).

A point of departure for much of this study's creative practice was led by a desire to highlight the opacity or "constructedness" of the environment. In *Bethlem* rather than employ realistically modelled and textured solid objects, a decision was made to exploit some of the phenomenal attributes of the modelling process by employing visual languages intrinsic to it. The porous net like quality of the wire frame models used in the work deny the potential for transparency by structurally demonstrating to the user that they are modelled representations. Similarly in *Reconnoitre* the user was required to switch back and forth between a flat two-dimensional interface, and a generated navigable three-dimensional environment The processes of interaction (inputting search terms, waiting for returned results etc.) placing the user in a situation whereby he/she rapidly oscillates between a conscious state of choosing, and unselfconscious absorption in the returned search term material; immersion is deferred and then allowed; the user is switched between an "in and out" state similar in manner to Walter Benjamin's description of the effect of film on a movie audience. Film, as he puts it in *Illuminations* (1999); via its "shock effect" alternately places the audience in the "position of the critic" while engulfing them in distracted absorption, "The public is an examiner, but an absent-minded one", reception occurs, but does so "in a state of distraction" (p.233-234).

4.2.2 Summary

For the purposes of this study the concepts of immersion and presence may be considered as interchangeable each describing the "illusion of nonmediation" (Lombard and Ditton 1997), or the subjective impression of "being there" (Slater, Usoh, and Steed 1994). The causes of immersion are complex, but may arise from multilevel relations between different supporting conditions:

- technologically formatted sensory substitution;
- via perceptual prompts that simulate the dimensions and attributes of the physical world;
- engagement through interactivity (physical and psychological); the active role of the audience.
- aesthetic and other media specific attributes of the environment;
- social interaction with either human or other forms of agency.

Sensory substitution may be differentiated from the other routes due to its reliance on technological input/output mechanisms. The other identified non-technological approaches — which we may characterise as "higher level" either originate as intrinsic attributes of an individual work (its content) and/or as specific responses or psychological properties of the user of the work. The following builds on some of the above findings, by deliberating upon the effects of immersion in relation to pragmatic and theoretical issues pertaining to contemporary art practice.

4.3 Discussion and conclusions

Immersion being such a complex and multidimensional condition begs many more questions than can be accommodated within the confines of this particular study. The fact that it may be engendered in a number of different ways and in variable conditions provokes some interesting and complex questions: to what extent is immersion determined by technological devices? Does technologically defined immersion offer anything different or new in terms of the experience of the audience? What function does the work play in inducing immersion, how does the artist work with the viewer (and the viewer with the work)?

The more extreme rhetoric of VR describes immersion as primarily a sensory condition. This technologically deterministic definition positions the user as a receiver of information, i.e. is subject to it via the totalising effect of sensory substitution. The mind submits to a body centred sensory engulfment, "suspending disbelief" that it inhabits a space other than the one it actually does. Davies (1998) considers such experiences superior to the kind of psychological immersion common to us from older media: "By its very nature, immersive virtual space invites full body kinaesthetic exploration, leading to a deeper engagement than that involving just the mind" (p.71). A better description might be "different" rather than "deeper". While opponents of immersion worry about the potentially somatic effects engendered by the lack of psychological distance this implies (Virilio 1998), a more realistic assessment of the technology must account for the fact that (rhetoric concerning bodily immersion aside), the experience is still primarily ocular and generally speaking uncomfortable at that. We must also doubt whether the kinds of immersive experiences described truly do relegate the ability for reflective engagement to the periphery. To accept so would be to accept/revert to a classical aesthetic model that perceives the user as a passive receptor of an artist's message, albeit given extra velocity by the mediating instruments of sensory immersion.

The degree to which immersion is determined by technological devices is a moot point. Theorists such as Eco and Iser (1980) have long argued that artworks are activated via a process of construction on the part of the viewer/reader/user. In *The Open Work*, Eco (1989) defines a particular class of contemporary art as "Works in Movement". Such works function as epistemological metaphors for contemporary existence, while

classical art forms present a unified image or narrative of the world, the "open" or contemporary work, attempts to articulate some of the perceptual and psychological suturing of contemporary experience. They achieve this by combining accepted conventions of language (codes) in novel configurations. The subsequent complex structure offers the potential for the emergence of a multiplicity of meanings that require a creative investment on the part of the audience in the process of decoding or inferring meaning. "Open works" invite an exploratory restructuring on the part of the audience; each work "is its own linguistic basis" (p.220) an experimental language capable of a continuos reordering by the audience and a subsequent ongoing generation of meaning(s).

> This aesthetic machine does not ignore the audience's capacities for response; on the contrary, it brings them into play and turns them into the necessary conditions for its subsistence and success. (Eco p.35, 1989)

This process is engendered by the artist who invites users/readers/viewers to engage with(in) the work by providing empathetic contexts for audience activity. In "open works", the user is integrated as an active unit in its structure. Rather than being subject to the work or artist's message, the user participates to engage within the representation —an interaction that enables or actualises the work as a creative movement. If we are to accept that this dynamic or example may apply as much to virtual environment media as contemporary literature, painting, film etc. — and it is not unreasonable to do so, then an alternative approach to or consideration of immersion emerges. Presence or immersion in such terms occurs not through the mediating effects of particular technologies but as a result of the audience interacting or engaging with the conceptual and aesthetic contexts of the artwork. Some support for this is provided by *Reconnoitre*, the final creative project. While forgoing the use of an HMD, users reported absorbing and intense periods of engagement with the work. In the sense meant by Eco, the project displays many of the attributes of an "open work": it encouraged an exploratory creative approach on the part of its audience; it integrated users as intrinsic elements in its structural manifestation; it was capable of a multiplicity of orderings dependent on different user input and it avoided a classical model of representation by exploring alternative

environmental configurations to those based on fidelity to the physical world. Returning to the questions posed at the beginning, immersive technologies need not be necessarily intrinsic to this process, as they are not media *per se* but rather display devices that allow the work to be experienced in a different format. This is not to down play their significance. Insofar as they uniquely function to block out the physical world they do offer different ways of apprehending a work and as such affect the audience's perception of it in complex ways. Clearly a work such as *Osmose* benefits from such an approach. The technology adds to the work, because the work is, as it were "about immersion" (and also about technology). The visual/behavioural codes prevalent in the work are reinforced and accentuated by it. In the same way that certain films demand the environmental scale of the cinema screen and lose effect through a transfer to video, it would seem that particular forms of work are intrinsically encoded as representations, to be enhanced by such technologies. That being said we should not mistake the technology for the medium. Immersion ultimately depends on the ability of the artist in marshalling the array of techniques, craft skills and visual/behavioural codes available to him/her, and the desire and ability of the user to constructively participate within the representation.

We will end the chapter by briefly focusing on issues, of economics and access to such technologies, and the effect this may have on pragmatics issues concerning creative practice.

Penny (1995) has noted that for specific media technologies to thrive and mature, they have to become integrated and circulated within the wider culture. Without such access the types of shared convention and creative experimentation that has built up around other media (e.g. cinema) are stifled, as the technology fails to play a meaningful part in society at large. It is only by being enmeshed within a culture that the phenomenal or uniquely creative aspects of a particular media technology are able to emerge. Media technologies and any inherent potentials they may posses develop through a process of complicity; between audiences, artists and economic and other social factors. While public awareness of immersive technologies is high, in real terms (i.e. in regard the levels of public access and usage), they are rarely seen beyond the confines of academic or military research institutions. This is reflected in the arts, where projects such as *Osmose* and *Éphémère* (both Davies 1995, 1998) are distinguished by their rarity. The majority of artists prefer to

utilise non-immersive forms of display (wall projection, monitors etc.). The reasons for this are many:[7]

1) Capital and labour intensive — high quality immersive technologies, are prohibitively expensive. The expense of equipment and prohibitive insurance costs, putting their acquirement beyond individual practitioners and all but the best-funded arts institutions. Cheaper options are available but in terms of making and exhibiting work, poor quality of image and input/output resolution mitigates against usefulness.

2) Restricted audience throughput — in exhibition contexts only a limited number of people may experience the work, as generally only one HMD or input device is available at any one time.

3) Health risk — prolonged usage of HMDs has been known to induce nausea and headaches, a condition known as simulator sickness.

While undoubtedly immersive technologies present unique creative possibilities, with limited access, unresolved health issues, and prohibitive production costs likely to continue (in the immediate future at least), the question of whether the more fulsome bodily forms of immersion envisaged by many present a viable option in terms of future widespread arts practice must remain open. Surer routes to immersion/presence/engagement will depend less on particular technologies, and may be fruitfully informed by the other "higher level" forms identified in section 4.11. That is, by including the user as a participant in the "world building" process. Through the imagination, ability and skill of the artist in creating empathetic contexts for user activity, and by providing and utilising communication environments such as the Internet, whose connective architectures are ideally suited for exploring and engendering "social presence".

[2] See Mute's critique of the project, p.13, Issue 3, Autumn 1995.

[3] Aside from virtual environment technologies the concept of plunging the user into a homogenous self-sufficient world may also be found within the "non-places" of contemporary architecture such as shopping precincts, airports and railway stations (see: Augé M. 1995 Non-places: Introduction to an anthropology of supermodernity) ; the "artificial perimeter" of theme parks such as Disney world (see: Baudrillard J. 1994 Simulacra and Simulation); and more obviously in non-interactive immersive spectacles such as modern IMAX cinema (see: Huhtamo E. 1995. "Encapsulated Bodies in Motion", Critical issues in Electronic Media, Penny S. (ed.), New York: Suny Press).

[4] MUDs (Multi User Domains) are text based virtual environments that have existed on the Internet for many years and predate the recent emergence of 3D multi-user virtual spaces. "Players" log onto MUDs using a text based Internet program where they can interact with other users. MUDs provide complete texturally described worlds within which users may interact on a social and environmental level. By typing in simple commands at the command prompt they are able to manipulate the environment by adding rooms or buildings or moving objects around. For a social history of text based virtual environments see: Stone R.A. 1994. "Will the real Body Please Stand Up? Boundary Stories about Visual Cultures" in Cyberspace: First Steps, Benedict M. (ed.), London: MIT Press,

[5] In critiquing the tradition of mimesis in western painting Bryson relays the tale handed down from Pliny of the competition between Parrhasius and Zeuxis. The contemporaries and rivals of Zeuxis were Timanthes, Androcydes, Eupompus, Parrhasius. This last it is recorded, entered into a competition with Zeuxis. Zeuxis produced a picture of grapes so dextrously represented that birds began to fly down to eat from the painted vine, whereupon Parrhasius designed so lifelike a picture of a curtain that Zeuxis, proud of the verdict of the birds, requested that the curtain should now be drawn back and the picture displayed. When he realised his mistake, with a modesty that did him honour, he yielded up the palm, saying that whereas he had managed to deceive only birds, Parrhasius had deceived a artist. (Pliny, Natural History, Book xxxv, pp.64-66, quoted in: Bryson N. 1983. Vision and Painting: The Logic of the Gaze, London: Macmillan).

[6] See: Manovich L. 1999, "Computer Simulation and the History of Illusion", [Internet], <http://jupiter.ucsd.edu/~manovich/>.

[7] For an analysis of the problems of audience artwork relations in gallery exhibition contexts see Grahams B. 1997. "A study of Audience Relationships with Interactive Computer-Based Visual Artworks in Gallery Settings, through Observation, Art Practice, and Curation", unpublished doctoral thesis, The University of Sunderland. For some commentary on the problems associated with HMDs and other complex interface devices see: Krueger M. 1992. "The Emperor's New Reality" Proceedings of the 2nd Annual Conference on Virtual Reality International: Impacts and Applications.

Chapter 5: Interaction and virtual environments

5.1.1 Introduction

Recent years have seen the steady production of number virtual environment artworks (Shaw, Davies, Hedegus etc.); with a commensurate growth in discussion of interactivity in relation to computer-based art in general. However little has been published in a visual arts context that examines interactivity specifically in relation to virtual environment artworks.

The chapter begins by briefly examining some definitions of interaction from computer science and architecture. This cross-disciplinary overview defines some key concepts regarding the nature of interaction in virtual space. In relation to creative practice some key questions present themselves: how can we more specifically define "types" of interaction in relation to a virtual environment artwork? What are the conditions necessary to support interaction? And how might these identified conditions characterise any particular artwork, both in terms of user activity and environmental organisation?

5.1.2 Interaction as input and output

Naimark (1995) describes interactivity in simple causal terms as input and output:

> The term interactivity usually means our effectability: what our effectors affect. Though interactivity always requires information flowing in both directions, it is our input and its effect that distinguishes it from noninteractivity, where the flow is always one-way. (Naimark 1995, p.455)

This input/output dialogue is common to all interactive artworks whether it be the simple move of a mouse that causes a cursor to change position on a screen, or the multiple input/ouput options offered the user wearing an HMD or Data Glove. While this dialectic is not unique to computer based artwork, as an overarching description of interactivity it neatly captures its essence whereby user activity is amplified as a state change in the condition of the work.

5.1.3 Instrumental interaction

Interaction can also be classified in terms of the forms of input and output variables supported by particular technologies. Bertol (1997) explicitly links interaction to forms of input/ouput, by focusing on mechanisms that support the interaction. She differentiates between "low end" devices which use less immediate input/ouput processes such as mice and keyboards, games joysticks, standard computer monitors, and "high end" devices (e.g. HMDs, DGs etc.), which she suggests, are able to produce qualitatively more engaging forms of interaction as they are more closely coupled with the human sensorium.

Herndon, Van Dam and Gleicher (1994) list seven input/output variables that virtual environments must support in order to sustain interaction:

- higher bandwidth input and output
- many degrees of freedom
- real-time response
- continuous response and feedback
- probabilistic input
- multiple simultaneous input and output streams from multiple users

Similarly Steuer (1992) enumerates three variables that must be

present to in order to support interaction, including speed of response, choice of interaction possibility and the provision of predictable and natural contexts within which to stage interaction. (p.86). Heeter (1992) notes, that of all the variables, speed of response is probably the most important: "When forced to choose between responsiveness to motion and resolution of images, developers are choosing responsiveness as the more important factor" (p.263).

5.1.4 Interaction as change of place

Most people's definitions of interaction with a virtual environment would include navigation, the potential to move or explore an environment.

A key concept of virtual environment media, and one which differentiates them from other computer based representations is the role and mediated presence of the user's body. A virtual environment is comprised of a database of three-dimensional geometric models, which define the appearance of the objects to be simulated in the scene. The user's body is also represented as part of that data set as a moving x, y, and z, Cartesian co-ordinate vector within the environment. The vector representation often described as a virtual camera or if visible as a human representation an avatar, functions as a controlling input mechanism — a surrogate presence that allows the user access to the environment. Movement of the virtual camera is tracked by the system, which responds by rendering an appropriate three-dimensional scene (summarised by Vince's diagram in figure 11). The feedback loop between user input and rendered environment ensures the impression of a responsive environment. Navigation is perceived as a fluid continuum that simulates the perceptual experience of presence in, and movement through the world. Slater and Usoh (1994) describe this as "body centred interaction" (p.135), an overarching term that encompasses the potential for the user to navigate and/or manipulate the environment. They identify a number of ways in which interaction may be represented (e.g. by flying, use of vehicles, teleportation etc.) and note the importance of appropriate choice of interactive form for specific tasks. For example, the value of fire fighter's training simulation would be undermined if it were to allow the fire fighter to fly to the top of a burning building as this would clearly not be an option in real

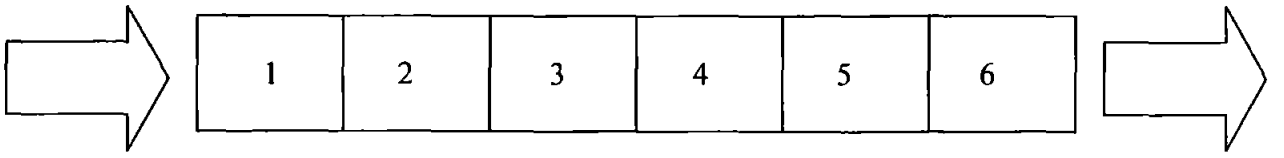
life situation. To this end they propose two further interactive categories "mundane and magical". The choice of terminology referring to the environmental context in which interaction is set, i.e. a simulation of the physical world. The identified forms are shown in diagrammatic form as fitted within an organisational framework that suggests appropriate contexts for usage (table 1). Bertol (1997), describes interactivity in terms of navigation and/or manipulation similarly framing it within "types" of environment that simulate or allude to the physical world:

> Static Worlds...If the virtual environment is limited to the walk-through of a building or an urban space, only static three-dimensional models will be present...When the virtual environment is based only on static objects, the only interaction available is movement of the viewing position.
>
> Dynamic Worlds...start with all the elements inherent to a static world...Individual components of the world can be moved, rotated, scaled, mirrored, and stretched. (Bertol 1997, p.94)

5.1.5 Summary

Factors that support interaction have also been ascertained and a number of different forms have been identified. In broad terms interaction has been characterised as being either a change of place occurring through manipulation of the environment, or via navigation — the movement of a surrogate of the user's body through the environment.

While the classifications are derived from computer science and architecture respectively (and as such should not be criticised for a lack of expanded or artistic/creative approaches to interactivity), what should be noted is that the above definitions present interaction as occurring in relation to a default "world", whose structural and symbolic logic (spatial, visual and behavioural character) is geared to a simulation of the physical world. The next section focuses on this convention for organising virtual environments in more detail, before going on to explore some alternative possibilities.



1	Detect new head position.
2	Convert position to Cartesian coordinates
3	Relay to host VR computer
4	Update renderer with new position
5	Calculate new perspective view.
6	Render new image.

Figure 11: Pipeline of activities between head tracking and display of image, after Vince 1998, p.72.

Interaction	**Examples**	**Manipulation Examples**	**Navigation Examples**
Mundane Reproductions of interactions from the world of everyday reality.	picking something up; walking; driving an automobile.	object selection and placement; transformations, deformations.	walking; driving or flying a vehicle; space walks.
Magical Productions of interactions that are only imaginable in everyday reality.	flying by own violition; tele-portation; psycho-kinesis.	scaling the environment; psycho-kinesis	flying under own violition; teleportation.

Table 1: Classification of interaction as either magical or mundane, after Slater and Usoh, 1994, p.137.

5.1.6 The world as model

Guidelines for human computer interface design (of which virtual environment media are a subset albeit three dimensional rather than two) stress the need to provide interface metaphors that draw upon some familiar aspect of the user's experience, e.g. the desktop graphical user interface common to the majority of personal computers. The premise behind such an approach is that the familiarity of the metaphor provides an emblematic and predictable context within which the user may act, thus enabling a focus on production of work rather concentration on the workings of the computer (Erickson 1995, Walker 1995). From the inception of the medium, beginning with Sutherland's proposals for *A Head-mounted Three Dimensional Display*, organisational schema for virtual environments have prioritised a "default" model that draws upon our perceptual experience of being situated in the world. In the specific instance of devising interactive contexts for virtual environments it is argued that by matching user's expectations of how a particular space may function with their innate experience of presence in the world (sense of scale, distance, movement etc.) a more natural and by extension more immersive engagement with the environment will accrue (Anders 1998). Accordingly the organisational frame of reference for virtual environments has largely borrowed from representational codes [8] able to engineer facsimiles of the world congruent with the way we perceive it, i.e. Euclidean perspectival description as filtered through Cartesian geometry. This general bias is reinforced by the ascendancy of urban or architectural descriptors widely applied to computer-based environments and communication technologies in general ("global village", "information superhighway", "digital city" etc.).

As such, architecture is often proposed as affording the most appropriate methodological model for design of virtual spaces (Mitchell 1995, Bertol 1997, Campbell 1999) as its aesthetic sensitivity to ordering dialectical relationships between solid and void, allow it to fulfil one of the goals of good interface design — the establishment of familiar predictable contexts within which to situate the user.

Architect Peter Anders describes this as "Anthropic Cyberspace" an approach to the formulation of virtual space centred on values of human scale, he comments:

> Of nearly all art forms, architecture comes closest to addressing our purposeful use of space-our bodily understanding of containment, restraint and definition. (Anders 1998, p.107)

Similarly Ragget, one of the early developers of VRML, describes how architectural conceptions of plan, section, elevation and axonometric projection are present in both the methodological level of construction and the experiential level of user interaction:

> The starting point is to specify the outlines of the rooms. Architectures' drawings describe each building as a set of floors, each of which is descried as a set of interconnected rooms. The plan shows the position of windows, doors and staircases. Annotations define whether a door opens inwards or outwards, and whether a staircase goes up or down...Rooms are made up from floors, walls and ceilings. Additional attributes define the appearance. e.g. the color of the walls and ceiling, the kind of plaster coving used to join walls to the ceiling, and the style of windows (Ragget quoted in Bertol 1997, p.89-91)

The fact that such approaches predominate is demonstrated in its most contemporary form by the recent emergence on the Internet of 3D online multi-user environments such as *Alpha Worlds* (figure 12). Characteristically Euclidean, such environments are formatted with horizon lines and architectural structures delineating buildings, roads, pathways, and private/public areas of access. In line with this descriptive model of space which we can characterise as the "world as model", interactive possibilities respect the attempted verisimilitude of the scene by being linked to behavioural models of "action" and "reaction", i.e. the user will bounce off a wall if they collide with it, a plane in a flight simulation game will crash if it runs out of fuel or loses altitude, and navigation simulates the continuous motor sensory schema of movement through the real world.

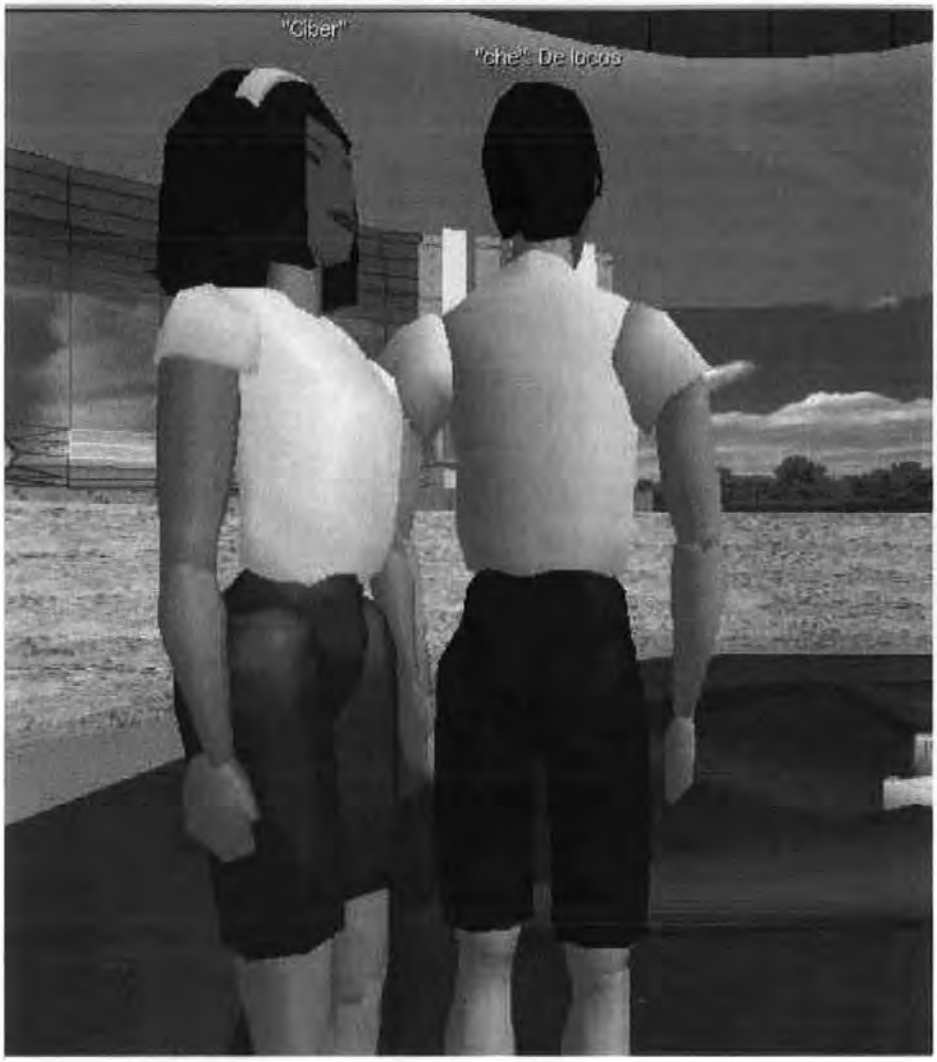


Figure 12:
Avatars in:
Alpha Worlds

5.1.7 Alternatives to the "world as model"

This situation is not without precedent. Monaco, in *How to Read a Film* (1981) describes a similar situation in regard the historical development of cinematic form. From its inception "film and photography were neutral: the media existed before the arts" (p.20). Early filmmakers based their work on codes derived from previously existing media (painting, drama the novel etc.). Gradually it became evident which elements of those arts could be successfully incorporated or transferred to filmic situations and which could not "in short, the art of film developed by a

process of replication" (p.20) before forming a unique voice or language of its own. He also contends out that some codes are unique to, or at least strongly characteristic of specific mediums:

> The genius of an art may be just those codes that don't work well in any other art (Monaco 1981, p.44)

To put it another way, just as the invention of montage made modern film possible by enabling a move away from realism, it is the unique or phenomenal aspects of a particular medium, (those codes arising from its particular technological potentials) that provide the key to a mediums development. In relation to the concerns of this study it is not unreasonable to suggest that any deeper understanding of the medium, may lie in how we define the virtual and how we understand its effects.

Some recent philosophical proposals by Pierre Lévy that focus on the phenomena of the virtual may provide some direction to how this may be achieved and are examined in the following section.

5.1.8 Some further definitions of the virtual

The word virtual is often meant to imply an absence, copy or simulation of the real, (which in turn is defined as signifying truth, authenticity and tangibility). A preponderance of virtual environments follow this established sense of the virtual in that by borrowing spatial and behavioural characteristics from the real world they concern themselves with simulations of it.

The philosopher Pierre Lévy (1997, 1998) proposes a more inclusive sense of the term "virtual" that positions it as a fundamental aspect of human experience. Rather than being a caricature of the real, the virtual operates in tandem with the actual. Both virtual and actual represent processes of becoming, constructive acts that are part of the real. The actual is a resolved movement, e.g. an answer to a question or a particular statement, its dynamic orientates it toward arrival at a particular point. The virtual is described as a matrix of forces or tensions, "act generating structures, lineages of processes, the machinery of becoming" (Lévy 1998, p.174). Fecund rather than manifest, it is

latent implying a future and operates as an outgrowth of "continuous creative resurgence". The virtual "inspires our acts", the actual "describes a history" (Lévy 1998, p.174). By engaging with mechanisms of virtualisation humans are involved in a inherently creative activity.

Lévy's descriptions of the virtual as a "machinery of becoming" resembles Eco's (1989) classification of the "Work in Movement". Akin to the description of the virtual as a fecund mechanism that provokes the discovery of new spaces and modes of being, the "aesthetic machine"(Eco p.35) of the "open work" is not concerned with a denotative simulation of something pre-existing, but in proposing productive structures that integrate the audience as an active and inclusive unit in a generative outgrowth (of forms, meanings). Both the processes of virtualisation and the productive mechanisms described by Eco function as forms of language — experimental communication spaces that provide motors for alternative conceptions (and inceptions) of the world.

5.1.9 Deterritorialization, networked social space

For Lévy language is the virtualisation process par excellence as it abstracts real time, provides mechanisms for an externalisation and sharing of interior states, and enables us to detach ourselves from the present.

One of its most distinctive characteristics is that of deterritorialization. Common definitions of the virtual stress a process of de-materialisation, in the form of a parallel space that simulates the tangible physical environment. In its detachment from the "here and now" virtuality indeed does partake of some of these characteristics, in a very real sense it is often literally "not there" (although its effects are felt in the real through a process of actualisation). However rather than describe this alternate space as a singular uniform (Euclidean/classical) chronology, deterritorialization disengages experience from the "here and now" of lived space by overlaying it with a plurality of times and spaces, whose heterogeneity engenders multiple arenas for communication, and interaction. Lévy illustrates this process by describing the differences that occur between a traditional and virtual company. A conventional organisation situates its employees in a certain building (or set of buildings). Each

employee is assigned a specific space (desk, office etc.), and a particular schedule (e.g. 9 to 5), these conditions may vary somewhat but not a great deal. In contrast a virtual corporation makes extensive use of telecommunication networks and software resources that can co-ordinate and promote collaboration between workers who are physically or geographically separate from each other. The organisational structure of the virtual corporation is no longer defined by a group of buildings, schedules and physical meetings. Its operations are detached from the rigidity of physical/spatial co-ordinates and exists wherever its employees are located, and at whatever times the employees are directed to or choose to work. Physical space is replaced by a process of organisational dynamics; particular working times and places become transitory solutions of a continuos co-ordination process. This productive virtual network continuously reconfigures in order to emphasise processes of communication between its various employees, it has no stable point of reference as it exists wherever they happen to be. As employees are active units that literally contribute to the company's existence an increased creative/participatory onus is extracted/expected from them. Virilio comments that the effects of deterritorialization eliminate the category of space altogether, as every point on Earth is as accessible as any other:

> The new electromagnetic proximity is not so much spatial as temporal. The real time of immediacy (live coverage) dominates the real space of the building, requiring the builder completely to overhaul his working notions and necessitating a perspective in which time, interactivity's duration...prevails over the geometric space of the Quattrocento. (Virilio 1998, p.56-57)

While Virilio is generally pessimistic regarding the processes of deterritorialization, a more generous conception of its effects might stress an increase in spatial forms (rather than a shrinkage) arising out of the greatly increased possibilities for interaction and communication channels that it engenders. This can be seen in its most contemporary form in the example of the Internet. The Internet gives access to a multiplicity of communication and interaction channels, through which presence is amplified/spread. In contrast to the certainties of classical space/time, the Internet is experienced as a bricolage of bizarre space/time configurations. Virtualisation acts as a kind of "clutch mechanism" (Lévy 1998, p.29) that jerks us out of physical or

geographical space/time and introduces us to fractionalized spatio-temporal contexts.

On the Internet as in the example of the virtual corporation described above, traditional concepts of place give way to dynamic processes of re-ordering whereby spatial co-ordinates in the classical sense are supplanted or supplemented by the co-ordinating and communicatory activity of agencies (whether human or software) active throughout the network. Space or environment in this respect is contingent and is constantly re-figured as an outgrowth of interactivity and communication occurring between participants on the network; or as Lévy puts it "the virtual world becomes a vector of collective intelligence and creation" (Lévy 1997, p.7); structure arises, is nourished and linked to, the manifold possibilities for acts of communication. Above all the Internet promotes a ubiquity or richness of social presence: "in cyberspace, every information being on the Net is virtually close to me and actually in my hands... even if it is really (in physical space) on an other continent" (Lévy 1997, p.7).

5.1.10 Summary and discussion

Initial research questions had sought to identify differing modes of interaction and immersion in virtual space, and scrutinise the conditions that broker them. In chapters 4 and 5, we have seen how these conditions are often discussed in terms of particular technologies. Further to this it has been noted that a wide spread consensus exists that promotes the "world as model" as an exemplar for both reinforcing a sense of presence or immersion in virtual space, and for composing models of behavioural possibility or interaction. It is not unreasonable to say that from a visual arts perspective the current paradigm for organising behavioural and spatial possibilities for virtual environments (the "world as model"), may be considered as a conventionalised or even aesthetically conservative form of language open to change, experimental, modification and conceptual enlargement.

At this stage of the research a shift or reformulation of the focus of the study occurred. Its point of departure involved a questioning of the conventional Euclidean forms used to compose virtual environments in favour of exploring some alternative possibilities through creative practice. Lévy has

formulated the virtual as a latent effect that integrates the audience as an active element in the production of space/structure/meanings. Through the deterritorializing effects of telecommunication technologies and the richness of 'social presence/immersion that they support, this condition is accelerated, and expanded. Structures arising from the acts of communication that ensue on telecommunication networks such as the Internet are fluid, linked to, and contingent on, interactions between human and other forms of agency, i.e. new space/structure arises through a process of social morphology.

Rather than conceive of the virtual as a process of simulation, much of my creative work sought to explore some of the phenomenal or intrinsic possibilities offered by the medium and its relationship to the Internet as a social space. In particular the production of the final major project *Reconnoitre*, pointed creative practice toward furnishing contexts for outgrowth and transformation. It signalled a methodological shift away from calculations of built form, or simulations of the physical word, toward the devising of contexts that were contingent on the integration and role of the audience as an active unit or presence in the works manifestation.

Interaction is concerned with time and behaviour. Aside from the descriptions of navigation/manipulation outlined in the opening part of the chapter a number of models of interaction specifically orientated toward computer based artworks have been proposed, identifying a range of interactive types. While not specifically orientated toward virtual environment artworks proper, a chronological review of these identified "types" is offered in chapter seven which are then discussed in relation both to the above findings and other studio based research. The following chapter describes the aspects of the study originating in creative practice, by outlining aspects of methodology, recounting instances of the public exhibition of artworks and describing influences on and details of, the production of projects.

[8] The term "code" derives from semiotics denoting a set of practices or conventions familiar to users/audiences of (in this instance an art medium) that reflects certain shared beliefs and assumptions operative within a particular culture (see: Fiske J. 1990 Introduction to Communication Studies, London: Routledge).

Chapter six: The development of creative practice

6.1.1 Introduction

The central parts of this chapter document the chronological development of three projects and a number of smaller supporting pieces produced between 1996-1999. Sections 6.1.3 to 6.1.25 describe the progress of early work culminating in the development of *Bethlem*; sections 6.2 to 6.2.38 outline the progression of the final main project *Reconnoitre.*

6.1.2 Documentation of artworks in studio and exhibition contexts

Developments in creative practice were documented in a number of ways:

i) A written diary the "log of work" was kept during the production and exhibition of studio based work, detailing technical and theoretical developments, anecdotal information, and reflection on working processes. Edited extracts from the log may be found in the appendix.

ii) Diagrams, photographs and video footage [9] of work recording the evolution of creative practice occurred at regular intervals.

Throughout the course of the study artworks were regularly exhibited in public. This proved intrinsic to the progression of works, as audience response and insight became operative in influencing further developments. Rather than employ a methodological model examining statistical/analytical patterns of artwork usage, it was felt that a format should be employed sensitive to a broad range of responses: intuitive, theoretical and technical. This concern with recording insight and reflection was felt to be more in sympathy with the visual arts bias of the

research and may be considered to be both within the tradition of the exhibition comment book, and the art school "critique", whereby a discursive context is provided within which differing and not necessarily connected issues are raised.

Mechanisms employed to record audience feedback to the work changed through time: conversations with users were noted in the log, email correspondence conducted, and observation of project usage, at different times, all played a part in building up a record of audience response. The approach was anecdotal and informal, fitted to the changing contexts and directions of the work and the variable conditions offered by different exhibition contexts.

Key exhibitions and demonstrations of work from 1996, 1997, 1998, 1999 and 2000 are discussed in sections 6.1.9, 6.1.22, 6.2.16 and 6.2.36. A full list of public exhibitions, and publications/exhibition catalogues associated with creative practice is given in the appendix.

6.1.3 Early work, *Bodies*

6.1.4 Background to the project and influences

Bodies (figures 13-15) was the first project completed. With little in terms of visual arts practice on which to draw, the work was as much concerned with probing the formal possibilities offered by the medium as with construction of an artwork. Conceptually it sought to explore alternatives to what I perceived to be a dominant paradigm for building virtual environments reliant on models based on the physical world: a theme that was to re-emerge in the later main project *Reconnoitre*. While initially dimly conceived, *Bodies* built on an earlier Internet based project finished prior to the commencement of study: *The Infinite Web page* (1996). This was an Internet site where external collaborators could contribute and edit images based on material derived from Internet searches to create an evolving repository of connected visual material. Employing the Internet as both material source and a supportive infrastructure, it was instigated to explore how processes of construction and structure could be conflated, and boundaries between workspace and distribution space blurred.

As in *The infinite Web page,* an important aspect of *Bodies* was that the image space would result from time based process, its spaces evolving in an open ended manner through material derived from Internet based search results. A loose set of rules were devised to underpin the generation of the environment:

- The material found via the Internet searches would be image based.

- It would be generated through the application of certain keywords or search term phrases, (e.g. "body", "laugh" "love").

- Rather than display the found search term material in a series of virtual galleries or rooms, an abstracted or open architecture would be employed.

- The process would occur over 3 months; a constrained life span beyond which material would cease to be included in the space.

The framework delineated a rule base from which structure was to develop. The processes described by the framework may be broken down into distinct activities:

- *Searching*: this occurred using Internet search engines, searches were based on keywords and restricted to specific media types (e.g. JPEG or GIF image types).

- *Sifting and editing:* once images had been sourced and downloaded, an editing process was initiated, its purpose being to clean up images, resize and adjust file formats, and separate image types into their respective subject areas.

- *Environment construction:* the images were texture mapped to 3D cubes and positioned in the environment.

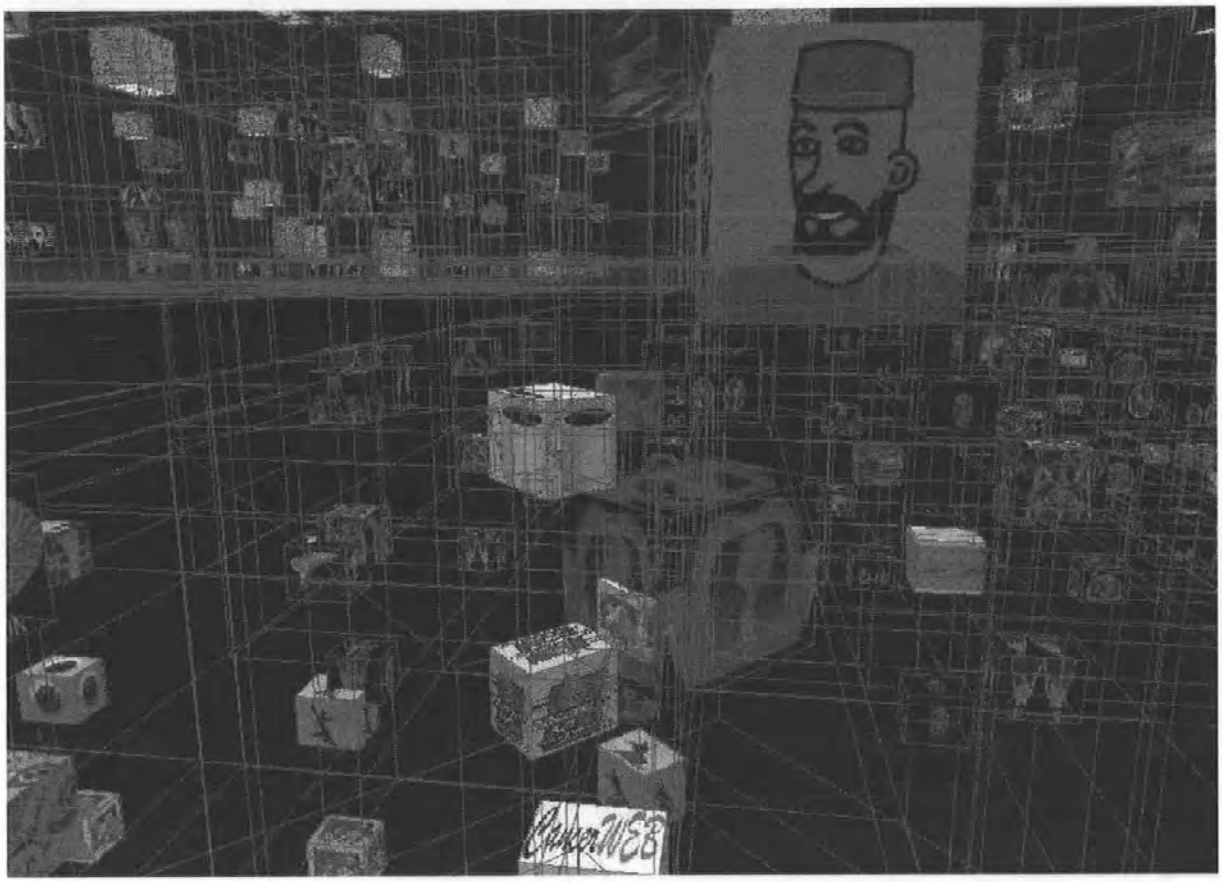


Figure 13: Screen shot of *Bodies* shown at the ICA, 23rd July 1996

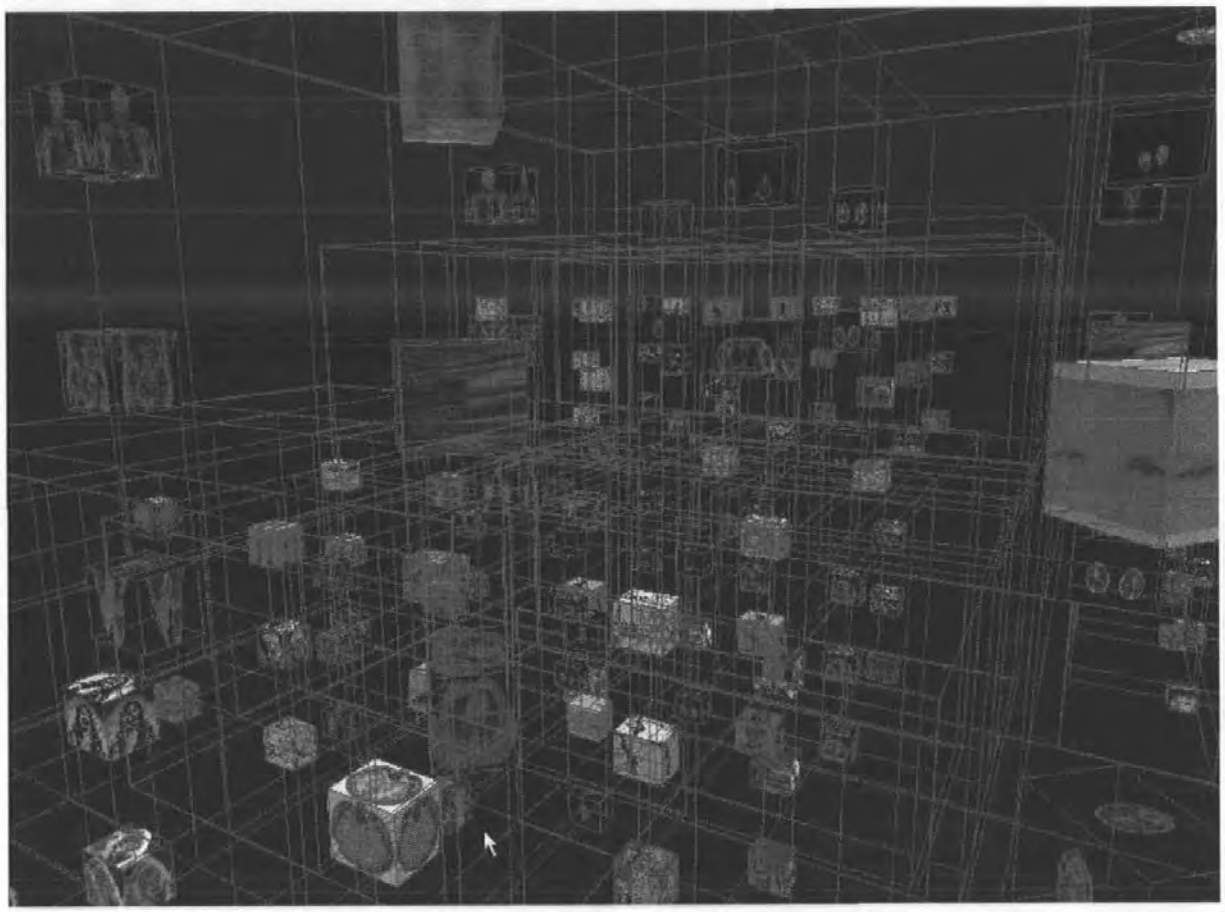


Figure 14: Screen shot of *Bodies*

Figure 15: Screen shot of *Bodies*

It was decided that the formulated work should provide a framework for the inclusion of a range of heterogeneous material; that it should provide a visual, aggregate record of a series of Internet searches, and that its formal manifestation would mirror in some manner the complexity of the Internet as a parallel evolving environment. The choice of search terms drew attention to the fact that the Internet — as well as existing as an agglomerate of communication technologies, evolves as a site for mediated human presence and social activity.

6.1.5 A more detailed description of *Bodies*

6.1.6 The organisation of the environment

As the work was as much concerned with developing technical facility as with constructing an artwork, it was decided to limit formal difficulties by keeping the environment as simple as possible. Its initial configuration consisted of three loosely organised areas of texture mapped blocks, which were added to as and when sufficient new images were downloaded from the Internet. At first a basic wire frame grid was developed as an armature to structure the environment. As each image was found it was texture mapped to a simple cube and added to the space. In time the grid structure was abandoned in favour of a less formal configuration, which it was deemed both more properly mirrored the ad hoc manner in which the visual material was gathered and was suitably descriptive of the multiple time based activities of which the aggregate environment was a product.

6.1.7 User interaction in *Bodies*

Behavioural and interactive possibilities were also simplified in order to limit production time. As the work was not modelled using a real world metaphor, navigation of the environment was not constrained by a gravitational model. Six degrees of movement (i.e. along x, y and z axis) enabled the user to "fly" between and through the texture mapped blocks, which had no physical attributes of their own. Later developments applied behavioural attributes to the blocks, which responded to user proximity with simple rotational movements.

6.1.8 Experiments with head mounted displays

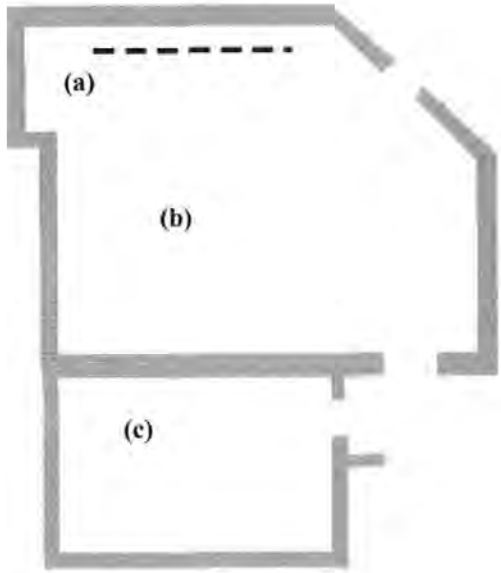
Commensurate with the production of *Bodies*, a number of disappointing trials were conducted with an HMD: a "Virtual IO headset". It was decided that the image quality and resolution of the display was unacceptable. While it is conceded that such trials may hardly be considered scientific, findings do correlate with published criticisms of such technologies (notably Krueger); as such all subsequent studio based work was designed and tested using standard seventeen-inch computer monitors, and work when exhibited or demonstrated in public was displayed using digital projectors.

6.1.9 Demonstration of *Bodies* at the ICA, 23rd July 1996, "Deep Screen Diving-building the Cyber-city"

Within a few months of starting the research, the opportunity arose to show the initial results of creative practice at *The Institute of Contemporary Arts* (ICA). The occasion was a series of talks, lectures and exhibitions of work entiled "Deep Screen Diving". The talk was published as an ICA audio tape *Building the Cyber-city: Deep Screen Diving.*

Bodies was introduced as an example of on-going work in progress and was shown in the ICA's small cinema. The work was preceded by some examples of virtual architecture developed by researchers at The Bartlett School of Architecture (providing a useful counterpoint to the conceptual concerns of *Bodies)* and work produced by researchers into human-computer interfaces from Middlesex University; a broad spread of disciplines reflecting the multi-disciplinary interest in the medium. As the work was shown in a cinema rather than exhibited *per se,* the artist/researcher took on the role of a demonstrator — navigating/performing the work in front of the audience and discussing the motives behind it. The demonstration lasted 20 minutes followed by a brief question and answer session. At the end of the evening, time was set aside for the audience to use the work and ask further questions. The period proved useful as a

way of gauging anecdotal audience response to the work. Comments and feedback were recorded in the artist's log.



(a). Position of the artist in front of cinema projection screen, facing the audience **(b).**

(c). Projection Room

Equipment used
Computer: Gateway P166, standard keyboard,and games joystick for navigation.

Software used: VRT Superscape.

Figure. 16: Plan of small cinema ICA, showing relative position of audience and artist/researcher.

6.1.10 Responses to the work shown at the ICA

Before the work was shown, the artist researcher made a brief note in the log in order to measure what he perceived to be the weaknesses and strengths of the work, against expected feedback from its first public airing.

> While I feel the work is on the right tracks in terms of exploring an alternative spatial experience to that normally offered by the medium; in avoiding the metaphor of the real world, a 'metaphoric safety net' is removed. Issues of spatial and interactive composition become highly problematic as there is a lack of alternative methodological frameworks on which to draw. While the ability to fly through an environment and move through an object can be exciting, the loose aggregate structures don't provide much in the way of navigational information, which can quickly become disorientating. On a visual, aesthetic level the spaces are somewhat crude and interaction a bit limited — when people hear the words 'virtual reality' or 'virtual environment' their expectations go through the roof, I'm concerned that their expectations may be somewhat disappointed. (Artist/researchers log, July 1st 1996)

In general responses to the work, confirmed the artist/researchers initial hunches, i.e. navigational problems were noted and some audience members expressed surprise at the relative simplicity of the graphical displays — clearly anticipating highly sophisticated interactive and immersive systems.

The more positive remarks were directed toward the conception of *Bodies* as an evolved image space: one person drawing analogies between the process based form of its generation and the structure of the Internet as a socially formed evolutionary environment, and another describing the work as being like: "a time lapse photograph of a geological process...rather than a space it's like slabs of frozen time — a recording of an activity".

6.1.11 Conclusions drawn from showing *Bodies* at the ICA

Experience showing *Bodies* at the ICA confirmed the observation that by abandoning the "metaphoric safety net" of the physical world a number of seemingly intractable issues concerning how the user responds to, and interacts with the environment are generated. While the user was aware that they were not interacting with a model that was simulating the world, they still appeared (initially at least) to expect that the space would behave within the predictable metaphoric confines of such an environment. While the conceptual thrust of the project was publicly well received, it was felt that *Bodies* failed to marry the dynamics of navigating and collecting information from the Internet, with some form of plastic equivalence in three dimensional form. That is, in terms of relative roles, while artist engaged in a rich set of time based processes (searching, gathering and manipulating material), the user's experience was of the environment was somewhat passive with interaction limited to navigation.

A way forward was suggested by the earlier project *The Infinite Web page,* in which the user/audience had the ability to directly contribute material to the work. Some consideration was given at this stage to developing an apparatus that would allow a user/collaborator to connect to an environment using an FTP client[10] and directly upload image material to the space. Another idea involved completely removing the artist/researcher from the processes of searching, sifting and organising the environment, by writing a program that would automate the process/rule based framework described in section 6.1.4. Although at this stage of the research it was technically unclear as to how this might be achieved, the positive responses to the work confirmed the that the alternative organisational approach to composing virtual space attempted in the project was worthy of further investigation.

Following the findings arising from *Bodies* software solutions were sought that might be capable of supporting the automation of the original process based framework. As the proposed developments necessitated that the project interface with the Internet, technical requirements demanded that software should support and be able to interact with Internet communication protocols. Many options were investigated including the (as then) recently released VRML. Being specifically designed for the

Internet, VRML appeared to offer a suitable route forward. However beyond the albeit useful ability to access environments over the Internet early experiments proved disappointing, offering little beyond existing software solutions. It was clear that if the project was to advance further technical research was required, and/or advice sought from specialists in the field of network engineering.

6.1.12 Early studio based investigations, discussions and conclusions

Two broad conclusions were drawn from the construction of *Bodies.* Conceptually the project had sought to examine alternatives to the normative approaches used to compose virtual environments based on employment of "real world" metaphors. This was attempted by tying aspects of the environments structural manifestation to an external source (the Internet), and devising a constraining framework as a generative rule base. While somewhat crude, positive feedback from the works public exposure at the ICA confirmed the artists/researchers intuition that a methodological basis for further work had been devised and that it merited further research and development.

Evidence gleaned from the ICA highlighted a number of weaknesses in the project. One of the major tenets of human-computer interface design is that the interface environment (whether 2D or 3D) should present a symbolic environment drawing upon shared cultural convention. In doing so the user is not required to learn a "new language" of interaction as the symbolic context is universally understood and interaction within it is consistent with the metaphor. In *Bodies* the function of the space as a metaphoric context for user activity — and by extension the role and function of the interaction it invited were unclear, leading to the reported problems in user interaction/navigation. One criticism that can be levelled at *Bodies,* was that it was overly concerned with processes at the expense of the wider picture, i.e. if a model based on simulating the physical world is abandoned, some other culturally shared symbolic/metaphoric context needs to take its place. While one of the aims of the project had been to provide some form of spatial equivalent to the formations of the Internet, insufficient time had been focused on examining how this might be articulated.

The second key finding arising from this period of research was that the amount of time and range of skills required to attend to the hybrid character of the medium puts production of anything but the most structurally basic projects beyond the scope of the single practitioner.

In the light of these findings two routes forward were identified:

i) It was decided that a shift in production toward smaller scale projects (initially even at the level of single objects), and away from larger works might prove useful; enabling the artist researcher to explore and generate ideas quickly without becoming embroiled in finalising the complexities of larger works.

ii) Further technical research would be initiated in order to develop the ideas arising from *Bodies,* and a proposal would be formulated in order to obtain the funding or extra technical support required to realise the ideas.

6.1.13 Small scale experiments, the development of the wire frame models

At this stage of research it was decided to offset production difficulties by focusing on a narrow set of issues concerned with modelling objects in space, i.e. focus on the third dimension, rather than the fourth (interactivity/time). One of the more interesting visual phenomena arising from the development of *Bodies* was the wire frame lattice used as an armature for situating the search term material, as described by this contemporaneous quote from the artist's log:

> I've always been struck by how certain media have unique characteristics (the graininess of Super 8 film for example), and how these phenomenal aspects of a medium significantly contribute to its expressive potentials. What is interesting about the wire frame grid is that it barely describes form, it has no surface, colour, lighting or texture, yet 'feels' like the most immersive aspect of the work. (Artist's log, 12th November 1996)

6.1.14 Description of the modelling process

Using this insight as a point of departure, a series of small scale wire frame objects were developed. In order to describe how the wire frame modelling technique differs from normative techniques, it may prove beneficial to give a brief overview of the modelling process.

In empirical terms a virtual object consists of a data set of Cartesian co-ordinate triplets that delineate its form as *x, y, z* points in space. The objects volume is defined by combining this co-ordinate information with a rendered "skin" made up of polygonal facets. A polygon is a flat surface (either a rectangle or triangle) that can be joined to other polygons to describe the boundary of a shape: e.g. a cube may be modelled using six rectangular polygons, one for each of its faces. More elaborate curved shapes can be described using smaller patches — straight lines which can be manipulated to denote more complex organic shapes. Once the polygonal surface of the object is defined modelling approaches favouring a simulative approach will "flesh out" the object by adding 'realistic' colour, lighting and texture attributes.

With the experimental wire frame pieces made at this stage, it was decided to lay to one side the immediate concerns expressed in *Bodies*, and model a series of objects derived from the physical world. The approach taken was to strip down the aspects of the model denoting realism of colour, texture, lighting etc. and focus on the structural aspects of the model as a purely virtual object or "thing" in itself. This was achieved through a process of "reverse engineering", described as a series of steps (figure 17):

i) An object is conventionally modelled in a 3D modelling package.

ii) The object is stripped of its surface material.

iii) Using individual wire frames, co-ordinate points are linked to rebuild the model as a wire frame form.

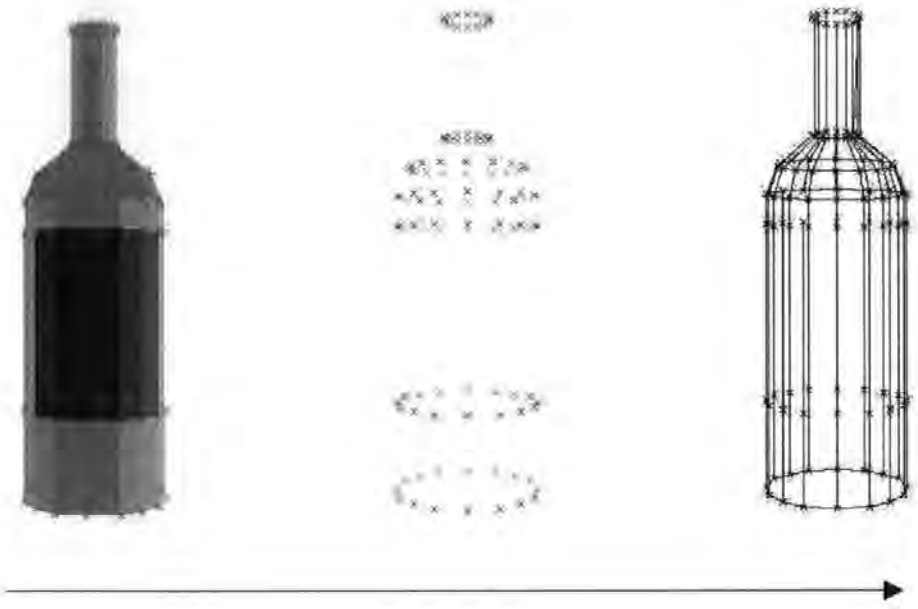


Figure 17: Steps taken in the development of the wire frame forms.

6.1.15 Types of wire frame model, objects and data objects

Many small pieces (figures 18-24), denoting architectural fragments, parts of human torso, and other everyday objects (bottles, chairs etc.) were made using the technique. Occasionally single architectural fragments being worked up into larger navigable environments (figures 20-22). These objects formed the basis for *Bethlem* discussed in more detail in section 6.1.16.

At this time a technique called "extrusion" was often used: a process involving the selection and movement of an objects co-ordinate points to produce an enlargement of its form. During one such process, a miscalculation applied to an architectural element exploded its form outwards (figure 23). Further extrusions of the object increased the strength of the effect; a thicket of abstraction resulting from its continual deformations (figure 24). Visually the dense overlays of form generated by process, were considered metaphorically suggestive of data objects, lattices and networks.

These models were later to prove influential in the further development the *Bodies* project subsequently renamed *Reconnoitre*.

6.1.16 The Development of *Bethlem*

6.1.17 Background to the project

By tying together a range of issues, findings and techniques arising from initial research, *Bethlem* represented a natural staging post or plateau for early studio based investigations. In *Bodies* a lack of a clearly defined metaphor within which to structure visual and behavioural characteristics was considered a factor in the relative weakness of the work. In response, this later project represented a move away from the constraint free navigable environments of the previous project, toward an situation whereby metaphors derived from the physical world be employed as structuring placeholders or metaphoric contexts for user activity. As in previous work, it was decided to avoid any attempt at strict verisimilitude by employing the wire frame modelling technique to define a series of navigable architectural spaces. The architectural elements would not be "fleshed out" texture mapped simulations, but suggestive architectures that would allocate certain navigable possibilities for the user by orientating them toward specific objects in the environment.

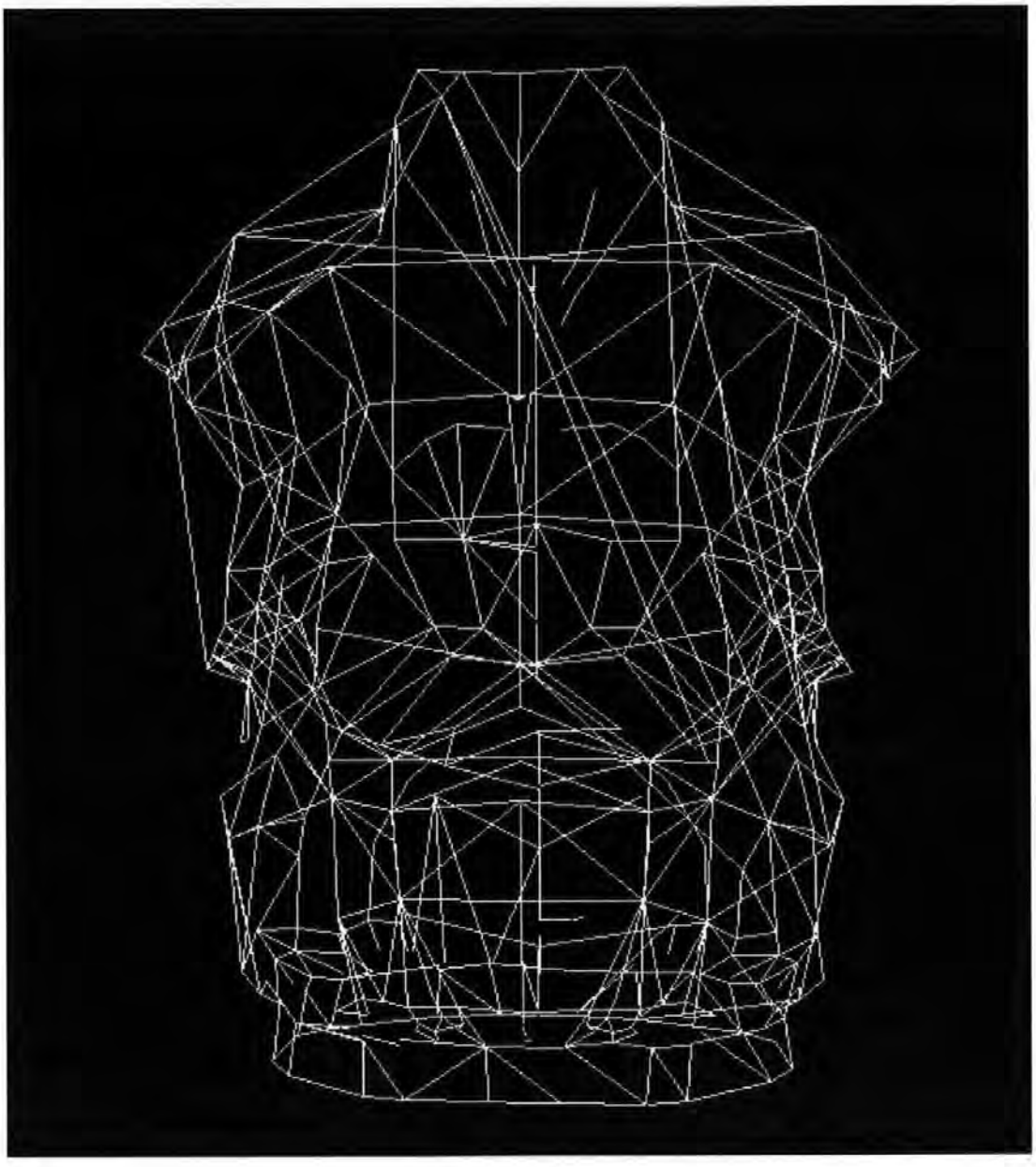


Figure 18: Male torso

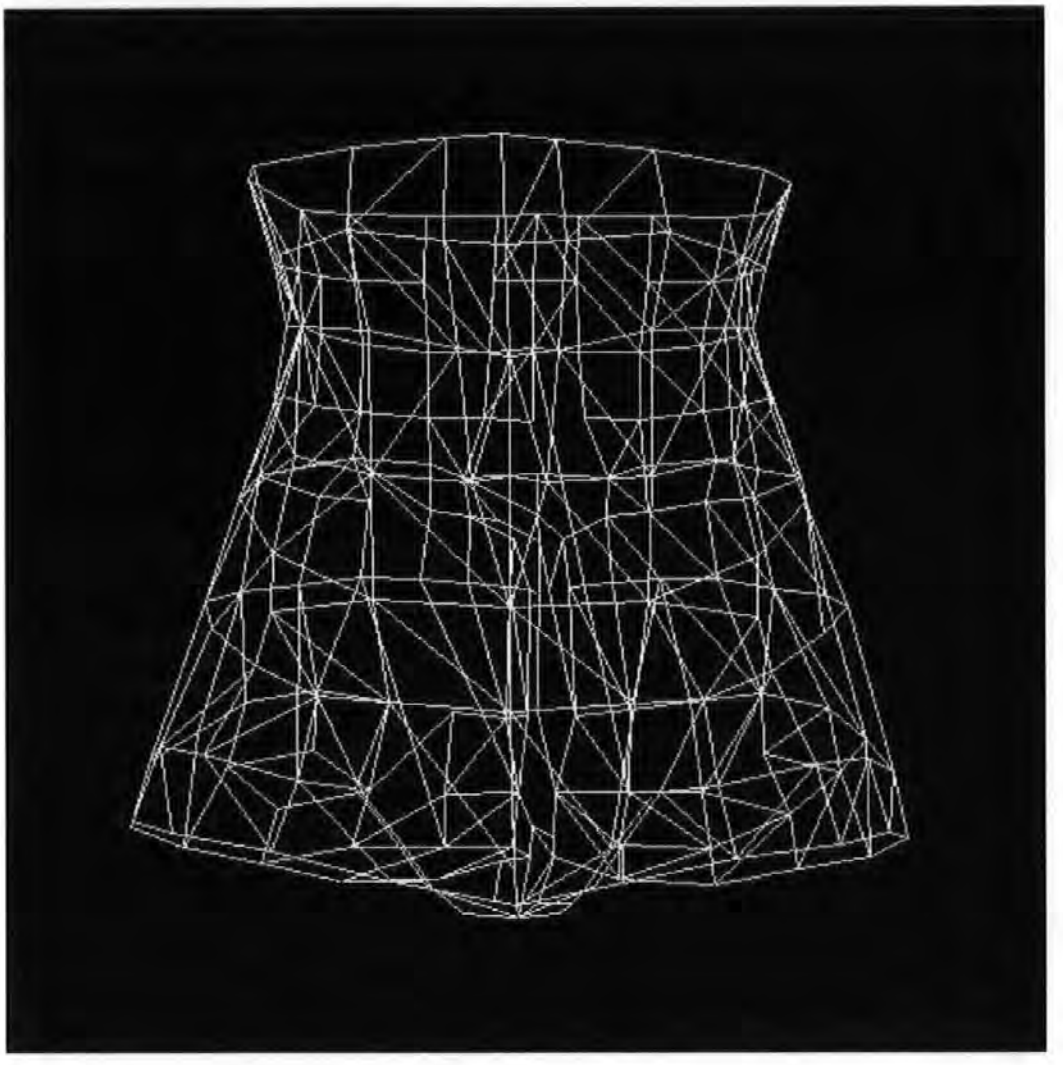


Figure 19: Female torso

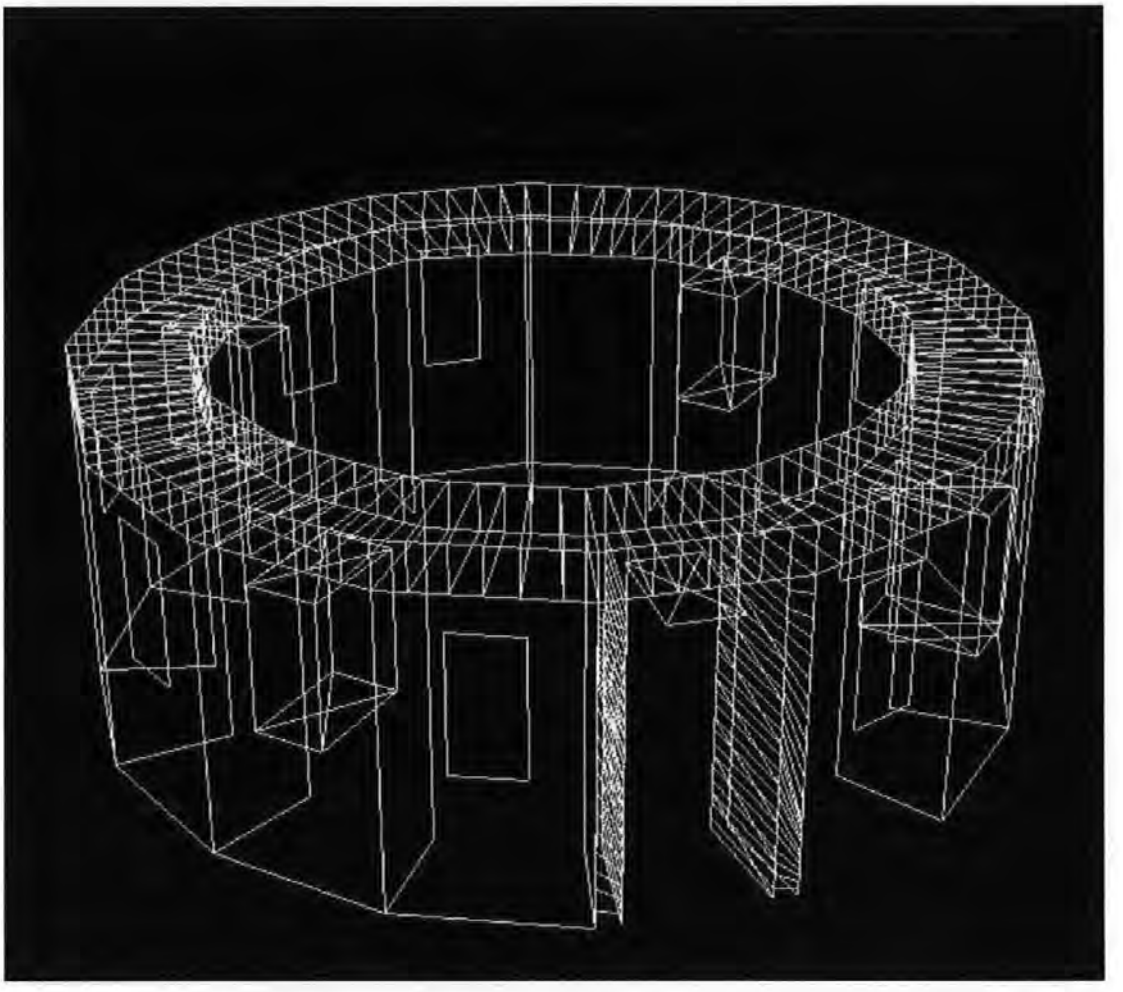


Figure 20: Tower base 1

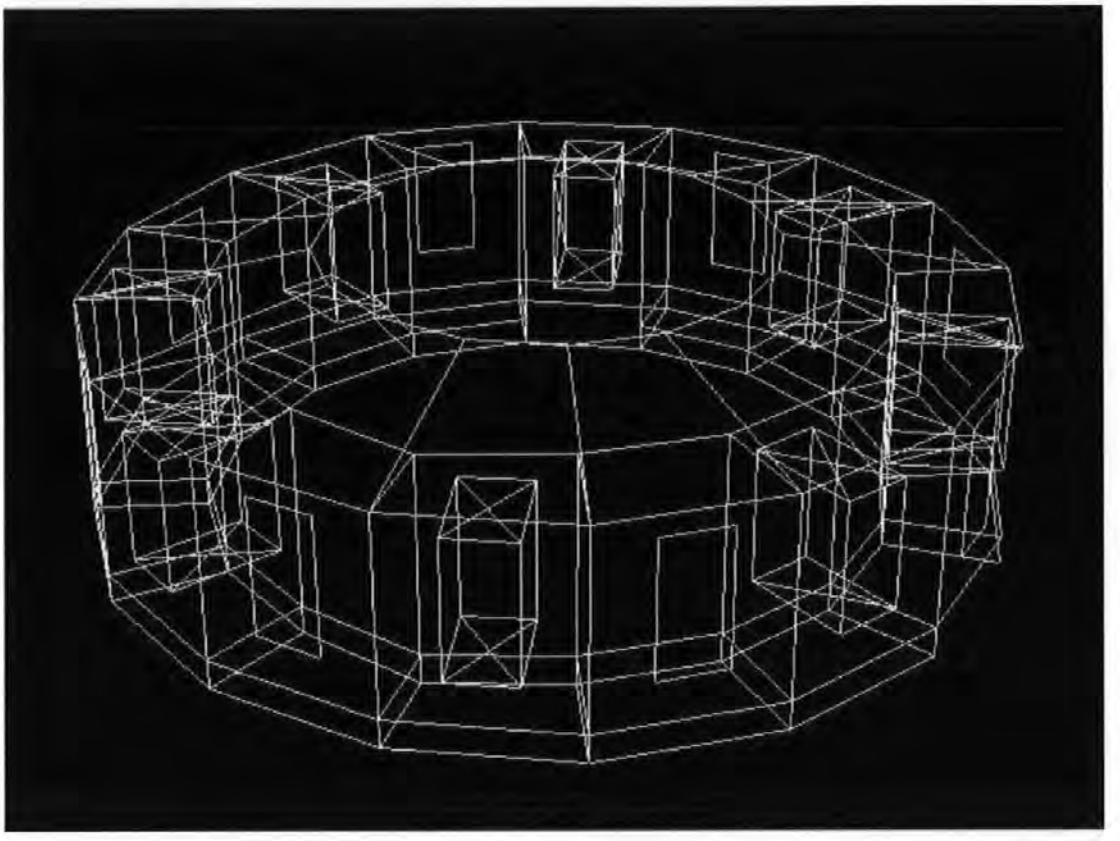


Figure 21: Tower base 2

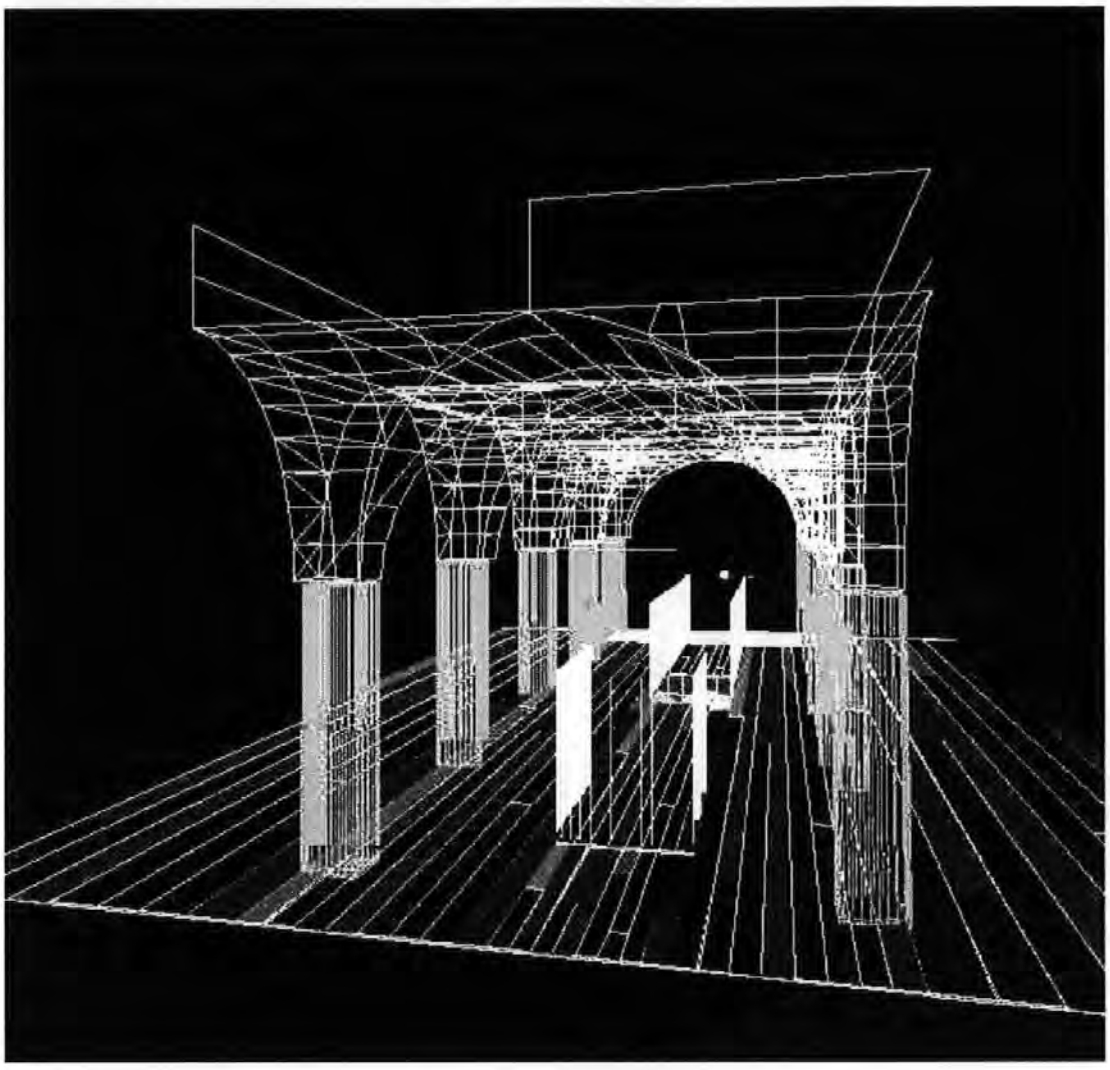


Figure 22: Architectural fragment 1

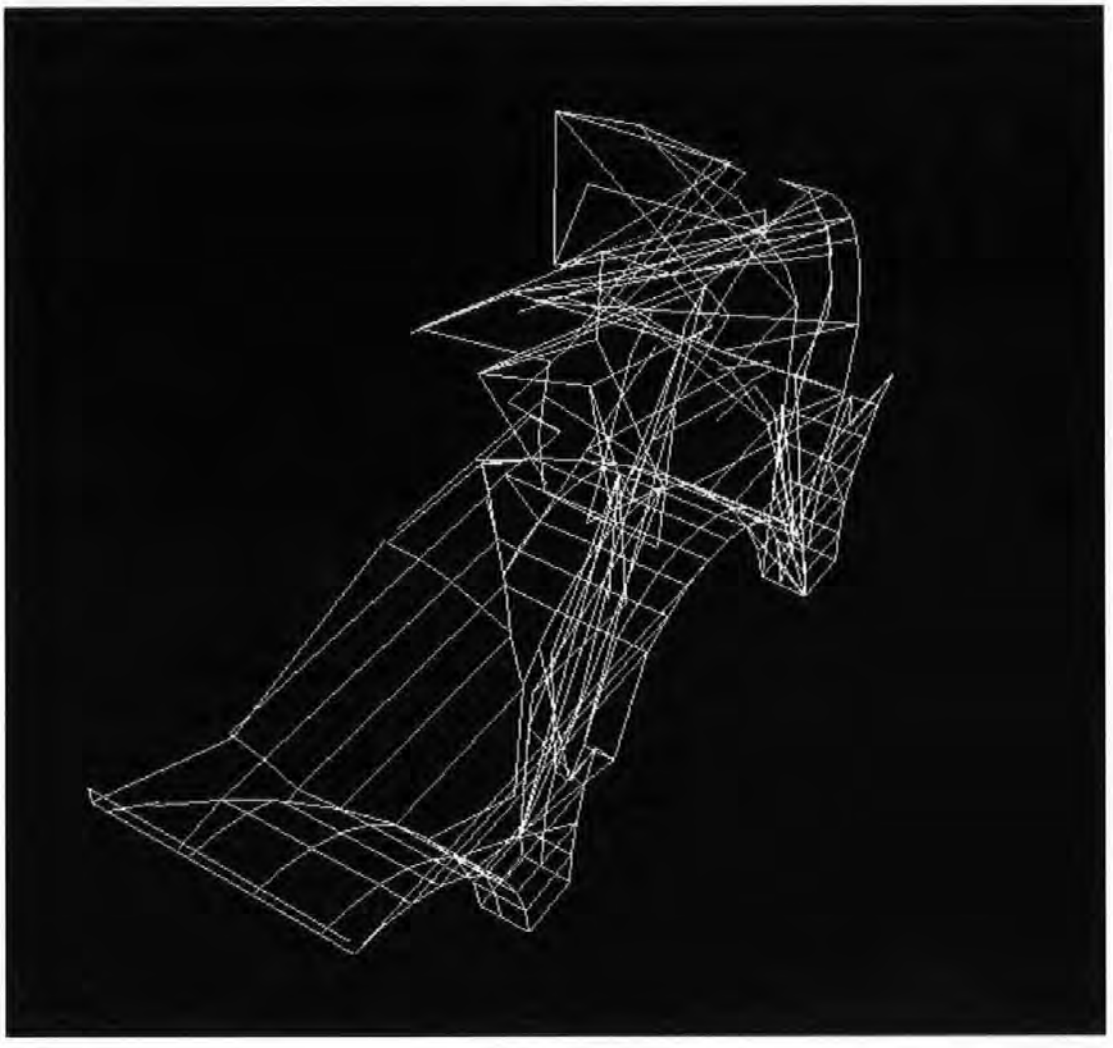


Figure 23: Tangle 1

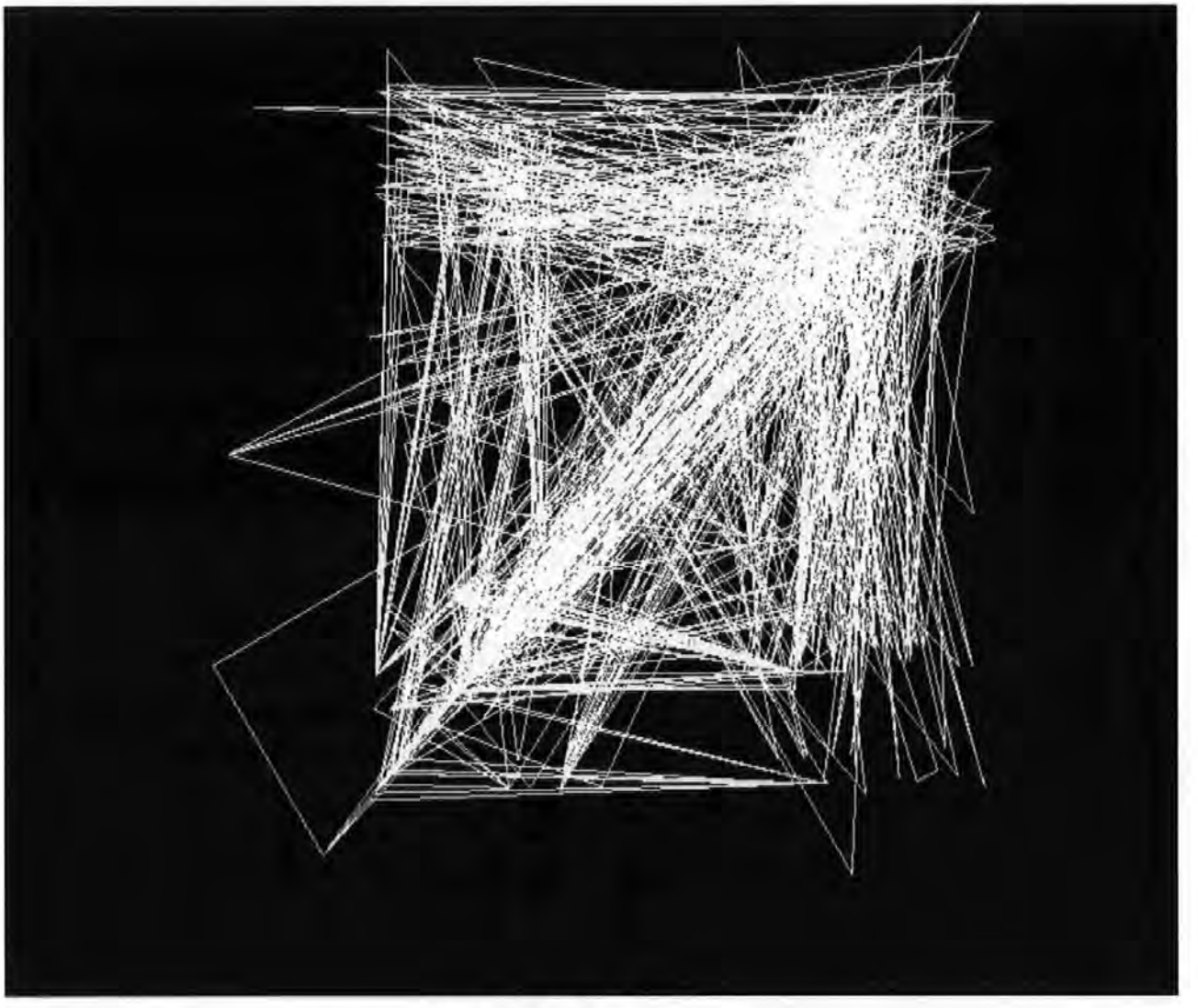


Figure 24: Tangle 2

6.1.18 The choice of *Bethlem* as subject matter

Bethlem (also known as *Bedlam*), is the name given to the oldest hospital for the mentally disordered. It was founded 1247 in Bishopsgate east London, later moving to Moorfields and subsequently occupying the building that is now the Imperial War Museum [11] This Southwark site was close to where I lived and had been the focus of interest for a possible art project for some time. The architecturally defined space was to provide an exploratory locus within which the audience might encounter fragmentary material sourced from the hospital's archive and encourage the audience to construct their own narratives out of their engagement with it.

6.1.19 Visual and textual sources used in *Bethlem*

The visual and textual material used in the project was mainly derived from archival material kept at the Bethlem hospital archive in Hayes, Kent. Visits were made to the archive, in order to gather material and gain consent for limited use within the contexts of the research study. Visual and textual material was supplemented with extracts from an historical study of the work of Dr. Diamond [12], a psychiatrist based at the hospital in the mid 19th century who had devised a technique of photographing patients in order to compare their mental state with their visual appearance; an innovation he described as "The Physiognomy of Insanity". His original photographic case studies are still kept at the archive. The textual references were also interwoven with extracts from Foucault's (1991) chapter on the Panopticon in *Discipline and Punish.* A selection of related textual material is included in the appendix.

6.1.20 Symbolic architecture, the use of the Panopticon

The project also signified an interest in how forms of institutional architecture "form", encapsulate, and house human subjects (inmates, workers, patients etc.), i.e. how architecture operates as both a spatial allotment and psychologically formative apparatus. Initially it was conceived that the environment would recreate one

of the wards from the hospitals original architectural plans, however this was idea quickly abandoned due to the length of time it would have taken to
research and build. Following further research into similar buildings a plan illustration of the Panopticon was discovered.

The Panopticon (figure 25) was designed in 1791 by the philosopher Jeremy Bentham, and functioned as an architectural surveillance apparatus built to house and reform the insane, criminals, orphans and other marginal subjects. While not directly associated with *Bethlem*, Bentham's iconic building fulfilled many of the metaphoric and structural needs of the project, as such it was decided to employ it as the main architectural motif or field of action within which to situate activity. Circular in form the Panopticon contained a series of thick walled, inward pointing cells hermetically sealing and isolating inmates/patients. An observation tower placed centrally within the structure allowed inspectors to continually observe every cell without themselves being seen. Foucault (1991) comments that the Panopticon was the apogee of an enlightenment machine; rather than human subjects to be communicated with, inmates are kept separate, at a distance, subjects of surveillance, study or experimentation. For Bentham, this unverifiable aspect of observation guaranteed the inmates good behaviour and rapt attention in matters of schooling and reforming study, and was the main benefit of the structure [13]. That is, through the possibility of constant surveillance, a prisoner will police his own activity with the knowledge that an inspector may be watching every action regardless of whether anyone is actually observing at any particular moment.

> The Panopticon is a royal menagerie; the animal is replaced by man, individual distribution by specific grouping... It makes it possible to draw up differences: among patients, to observe the symptoms of each individual, without the proximity of beds, the circulation of miasmas, the effects of contagion confusing the clinical tables...among workers, it makes it possible to note the aptitudes of each worker, compare the time he takes to perform a task, and if they are paid by the day to calculate their wages. (Bentham quoted in Foucault 1991, p.203)

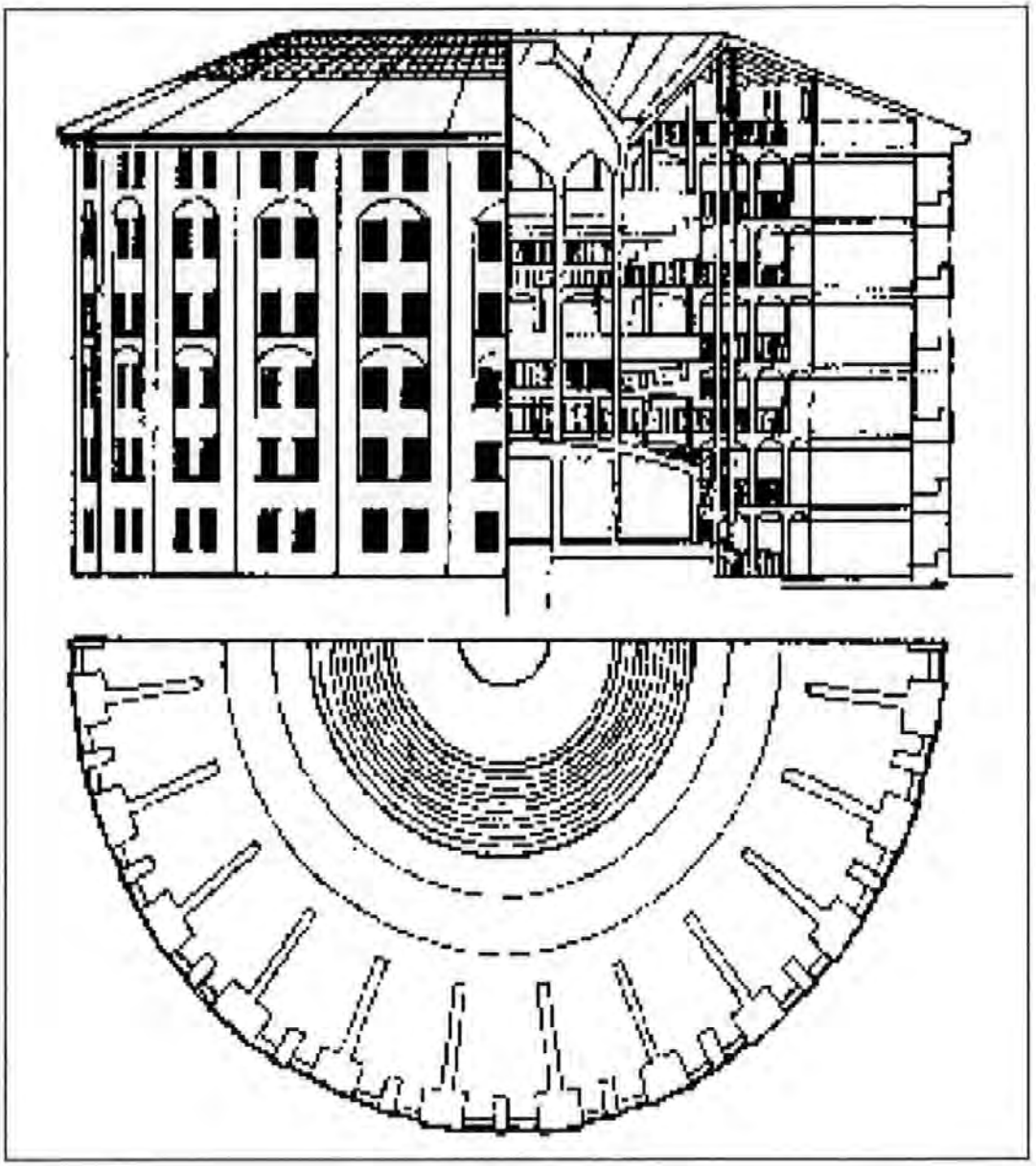


Figure 25: Bentham's Panopticon

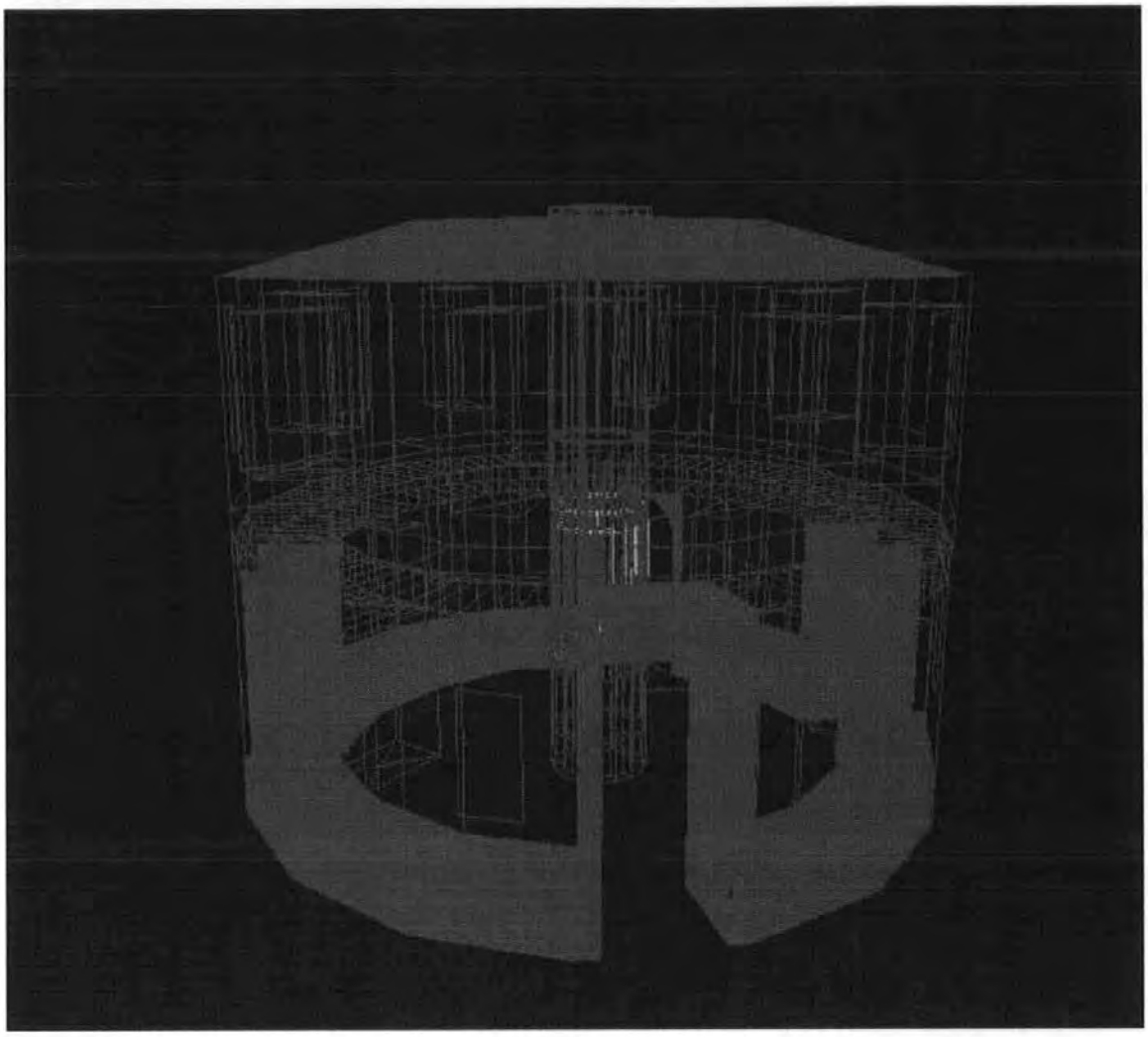


Figure 26: Screen shot of *Bethlem*

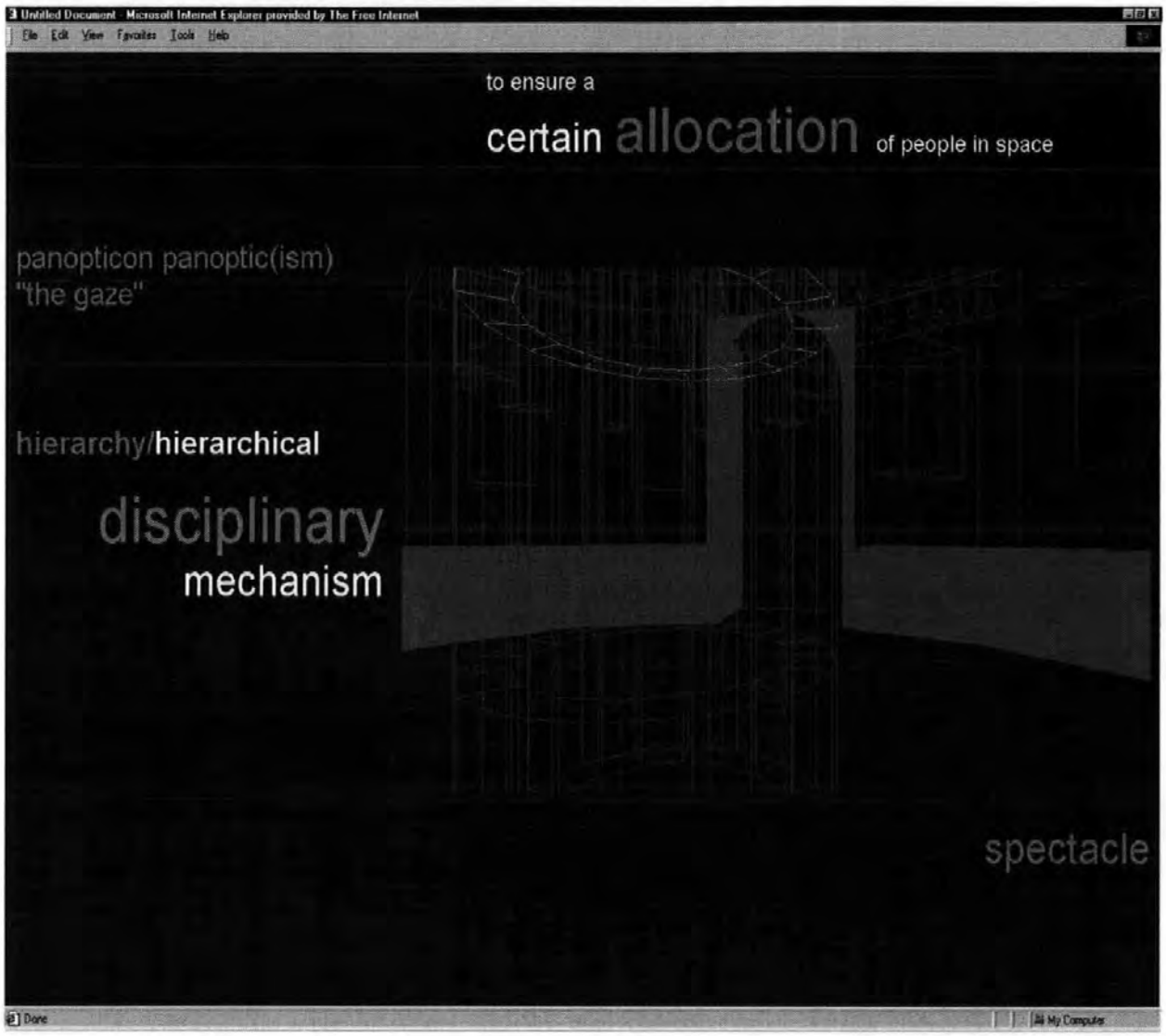


Figure 27: Screen shot of *Bethlem*

Figure 28: Screen shot *Bethlem*

6.1.21 A more detailed description of *Bethlem*

Aside from its resonance as a symbolic or metaphoric entity, the architecture functioned to orientate the user toward specific objects and points of interest. Simplified approximations of the Panopticon derived from a series of earlier models of towers were built using the wire frame technique described in section 6.1.14. Using the plan illustration of the Panopticon as a rough guide, a number of architectural studies were worked, describing the relationship between structures and possible navigational routes (figures 26-28). In Bentham's original plan, a network of structures were to be distributed throughout the country; following this theme it was decided to arrange four linked buildings within a landscape. On entering the work the user was to be guided to a single empty building; three exits would act as routes from this main entry point to the other structures which were to house material alluding to the condition and observation of interned patients. In keeping with the themes of the project (and as a way of simplifying and controlling colour composition), I decided that the models and surrounding landscape would be coloured a neutral grey and some weather effects would also be included to add atmosphere.

6.1.22 *Bethlem* shown at "Parallel space", 5th July 1997, the Institute of Contemporary Arts London

Bethlem was exhibited just once, as part of a one-day conference "Parallel Space" convened to discuss the impact of new technologies on geographic space. As part of the event, gallery space was set aside for the demonstration of artworks, architecture and other research in progress concerned with aspects of virtual space and network technologies.

Being at a formative stage the project was shown as *The Panopticon* a "work in progress". As the archival material had yet to be worked into the project, the exhibited piece consisted of the bare bones of the architecture. The behavioural metaphor employed at this stage was borrowed from the physical world: gravity operated in the environment, navigation mirrored movement in the physical world; objects and architecture displayed physical attributes etc. In order to "flesh out" the space, and provide some visual points of interest, a number of the wire

frame models developed after *Bodies* were used to populate the structures. The project was run on a Gateway Pentium personal computer, and displayed on a standard seventeen-inch colour monitor. Input was provided by a standard keyboard and mouse combination. The artist/researcher was present in the gallery space for three separate periods of approximately an hour each in order to observe usage, and discuss the work with visitors.

Showing projects in an unfinished condition, is a particular hazard when constructing artwork using complex technologies: unstable or unresolved programming, "bug-filled" software and hardware incompatibility, may all conspire to catch out the unsuspecting artist. Insofar as a degree of risk is implicit in this situation production of computer based artworks requires some form of user feedback in order to test the stability and usability of work. While the producer of the work is able to do this him/herself to a certain extent, closeness to the project bought about by involvement in production often blinds the maker to potential deficiencies.

One of the consequences of employing the wire frame structures was a confusion of figure ground relationships. While generally this was seen as positive (rather than flatten the space it gave the environment a greater feeling of depth), it was felt users might find it difficult to judge or position themselves within the space. While in-depth responses to the work were curtailed by the brevity of its public exposure, it was hoped that some useful feedback relating to this issue might emerge, and other unnoticed problems be bought to light.

6.1.23 Responses to the work shown at the ICA

As expected, responses to the project were mixed: the work was unfinished and at that time, its themes underdeveloped. One of the aims of the project had been to employ a model based on the physical world but add a "twist", by using the wire frames to undermine any possible reading of the space as a simulation. While a small number of users thought that the wire frame structures were accidental — the product of some form of rendering problem, they were generally perceived as a positive innovation, an extension of the medium's possibilities. Positive comments were also reserved for the themes of the work, with further references to related material proffered by a number of users. Prior to the exhibition

some concern was expressed regarding the possible disorientating effect of wire frames structures. These fears were largely allayed with user feedback confirming the value of the wire frame structures as both interesting aesthetic propositions and structural navigational guides.

In the earlier project *Bodies,* audience difficulty in navigation of the project was noted. It was suggested that one of the reasons for this was a lack of clarity in the environmental/behavioural metaphors that the work employed. During observation of *Bethlem's* usage it was noted that users were able to navigate the structures with greater ease. This was partly expected, the environment presented to the user was recognisably derivative of the physical world enabling users were able to draw upon their experience of the physical world in order to engage the work. One of the more interesting findings emerging from this stage of research was the extent by which user expectation of how a work functions is framed by the experience of playing computer games. A number of the visitors approached after using the work, reported experience of game playing. Significantly these users also appeared more at ease with the work, drawing upon their prior knowledge of games to intuit an understanding of the navigational structures and interactive possibilities offered by it.

Following feedback from showing the work at the ICA some routes forward were identified.

i) Responses to the wire frame environment were largely positive confirming the merit of the technique. It was decided to continue experimenting with the process and examine how it might be applied to other projects.

ii) Anecdotal evidence had highlighted the degree to which games provide a cultural point of reference for users of virtual environments. Interaction models derived from games provide a language model already familiar to audience members and represent a potential base or set of techniques from which an artist might draw. Following this it was decided to examine how such conventions might be employed to extend the range of interaction in the project.

6.1.24 Forms of interaction in *Bethlem*

Prior to the ICA the behavioural model used to structure user interaction in *Bethlem* employed metaphors derived from the physical world. Following the insights gained from its brief exhibition, it was decided that interaction might be enriched by employing some techniques borrowed from computer games [14].

Two approaches suggested themselves. Initially it was thought that a pseudo game might be developed, employing the archival material and game based strategies to offer an ironic commentary on the form of the game as a cultural artefact. This idea was quickly dropped as it was felt that the sensitive nature of the material militated against such an approach. The second approach, and the one that was taken, was to selectively isolate certain techniques and re-deploy or reassemble them within the context of the project.

A base or default behavioural metaphor based on the physical world had already been defined. Within this overarching context a number of common techniques from games were assembled:

i) Teleporting as its name suggests is employed as an alternative form of navigation. It functions by shifting the current co-ordinate position of the viewer, directly to another point in the environment. This discontinuity of temporal structure or "scenic jump" may be considered similar to certain montage techniques in film (e.g. jump cuts). In Bethlem "teleporting" was used to move the user back and forth between the initial entry building and the three other structures.

ii) Hybrid modalities: in computer games it is common for different environmental modes to coexist in the same information display, e.g. 2D schematic maps overlaying the game's environment, interface option menus, resource displays describing the various supplies available to players etc. In *Bethlem* it was decided to employ this technique to provide another layer of information in the form of hypertext documents. The environment was to be embedded in a web browser, interacting with objects within the environment would launch off-line Web pages displaying textual material associated with the project.

iii) Strategy: computer games often employ "find and reward" strategies (the player having to search for clues, or carry out

specific tasks in order to proceed through the game or enter its next level). In Bethlem a similar technique was employed, with the audience required to explore the environment in order to discover and interact with objects that allowed access to further levels of material in the form of the Web pages.

iv) Symbolic enactment: in games the player is generally given a role to play (space marine, dragon slayer etc.), in *Bethlem*, the user is cast in the ethically suspect position of the all seeing jailer, the "Inspector".

While close to a game in some respects *Bethlem* may be differentiated on a number of levels. Peirce (1997) notes that a game must have a clearly defined goal that is described at its outset, games also directly engage time — the player literally "playing against the clock". This was not the case with *Bethlem,* while it employed certain aleatoric structures it was not a game *per se.* There was no time limit imposed on the user, the singular goal based activity common to games was replaced by a polyvalent open-ended approach. One consequence of employing both textual and three-dimensional material was that it induced a shift in the way that the user both interacted with, and perceived the work; involving the user in a process of oscillation between navigation of an architectural space and reading discovered textual material. In *Bethlem* it was hoped that by encouraging the user to link together the disparate image and textual material a tentative guided narrative would emerge, providing a reflective experience quite alien to that provided by the majority of game playing scenarios.

6.1.25 Lessons learnt from the construction of *Bethlem*

Bethlem provided an exploratory framework within which to explore issues arising from earlier research. By employing a standard behavioural model borrowed from the physical world many of the problems regarding navigation and user interaction identified in *Bodies* were overcome. The viability of wire frame modelling technique was also proven and was generally well received.

In showing the project at the ICA a particular issue regarding the employment of shared cultural conventions arose in the guise of the computer game. In order for a user to connect with a virtual environment its composition must allude to a set of shared conventions or metaphors. Generally speaking this involves the work indexing or alluding to the physical world. At the ICA as well as drawing on their experience of the real world many users reported experience of computer games, i.e. were framing their connection with the work in relation to fictional game spaces.

A number of formal developments arose from highlighting the context of the work in relation to a wider culture of virtual environment technologies (i.e. games). In the project an interplay between textual and spatial information was achieved by presenting the archival material in both Web page and spatial 3D form. This hybrid multi-modal approach offered the user different ways of perceiving and interacting with the subject matter within the same field of action; that is, the user could oscillate between navigation and interaction in virtual space, and a quieter reflective process of reading excavated textual material. This mixing of different modes or languages was a significant development. It described a situation whereby common forms from other areas/disciplines (games, 2D interface designs, hypertext documents etc.) could be borrowed and recombined to generate a hybrid assemblage, that in itself described a new set of possibilities.

In many ways the project remained unfinished, superseded by the development of the *Reconnoitre.* While some useful technical innovations had emerged, it was felt that the sensitive nature of the subject matter deserved more time than could be accommodated within the boundaries of the research project.

Bethlem was not exhibited publicly after the ICA, making any extended discussion of the success or otherwise of the multi-modal or assemblage approach difficult. While possible dangers arising from such a method may involve further confusion for the user, the artist researcher felt that the approach taken had interwoven the different forms to reasonable effect. Indeed many of the developments relating to the assemblage approach were carried forward into the final major project where the opportunity for public exposure was significantly increased. These aspects are discussed in more detail in the following section describing the making of *Reconnoitre.*

6.2 The development of *Reconnoitre*

Reconnoitre the final project was completed between January 1998 and September 1999. The work, which consisted of two versions, was co-authored with Gavin Baily who bought specialist programming support to the project. Beginning with its relationship to the early work *Bodies*, the following sections describe *Reconnoitre's* development from version 1.0 to 2.0, and documents instances of its public exhibition.

6.2.1 *Reconnoitre* and its relationship to *Bodies*

In *Bodies* I had attempted to build a space that diverged from what was perceived to be a dominant paradigm for building virtual environments reliant on architectural metaphors and behavioural models derived from the physical world. This approach ran into a number of difficulties, both in regard the development of an appropriate contextualising metaphor within which to organise user interaction, and the manner in which the project interfaced with the Internet. In *Bodies* material had been manually searched for and organised by the artist. It was decided that any further development should automate this operation and increase the possibilities for interaction by writing a program that would enable the user to define or influence processes which previously had been the exclusive preserve of the artist (i.e. searching for, sifting and organising search term material).

6.2.2 The proposal for the new project

One solution that suggested itself lay in the mechanics and processes of the Internet search itself in the form of the Internet search engine [15]. An Internet search engine is a program that queries a database or index for specific information and then reports back the results in response to a user request submitted via the Internet. Its data base consists of lists of references and Web page addresses (URL's) collated by an Internet search agent (also known as a "bot", "web crawler" or "web spider") that traverses the Internet gathering the material from any Web page it

encounters. Of particular interest was the autonomous and unpredictable nature of the web agent's activity as it navigated the Internet. The Internet evolves in response to a range of unpredictable social and commercial forces. This activity is regulated by a complex array of software protocols and programs of which search agents play a predominate role in processing information and disseminating it to human users. In this sense the Internet may be considered a heterogeneous assemblage/environment within which both human and software agencies collide, form "relationships" and "participate" in an exchange of information. In the light of this technical research a basic framework was devised that would confront the user with, and incorporate aspects of these automated configurations of information flow and complex human/machine interrelationships:

- A "search agent" collects data from Web pages, news groups or Internet relay chat channels. The collected data is downloaded onto the users machine.

- The user is able to define what the agent searches for.

- As the collected data exists as raw "bytes" it can converted or re-presented in any form, i.e. 3D model, sound, text image etc.

- The converted data is re-constituted in virtual space. The virtual space is navigable by the user, and the user may be able to interact with the data to change it in some way.

As well as collecting data from the Internet, it was envisaged that the piece might be extended to include data from other sources: satellite systems, radio and television broadcasts, mobile phones etc. The previous name *Bodies* was abandoned to be replaced by *Reconnoitre,* which it was felt more suitably reflected the processes described by the framework.

6.2.3 Collaboration in *Reconnoitre*

At this time, a number of meetings were arranged with media companies and other IT specialists. By pitching the project as a possible research and development proposal it was hoped that interest would be generated, and the specialist programming support needed to develop the work obtained. After much searching a professional graphics programmer with a background in arts based projects was found. The decision to involve someone else in the production process involved draughting a procedural framework within which production, forms of communication, and meeting frequency could be formalised and agreed. Weekly face to face meetings were supplemented by regular email correspondence and production roles delegated. While inevitably there was a degree of overlap in these roles the programmer Gavin Baily was mainly responsible for the programming of the project. Aside from defining the original concept and carrying out the initial research and development; the artist researcher was responsible for formulating the visual aesthetic of the project, model making and visualisation, and other aspects of production such as interface design and further concept development.

6.2.4 Visual metaphors in *Reconnoitre* and further wire frame developments

During work on the small wire frame models a number of tangled forms had been made (figure 24). Visually it was felt that they were suggestive of networks and/or evolutionary forms forced through complex interactions. In order to explore and extend this metaphoric vocabulary a series of developmental sketches (figure 29) were produced which formed the basis for a further suit of wire frame models. These further wire frame experiments were instigated to explore a number of key issues:

- What visual/spatial form should the returned Internet material take?

- What metaphors might these forms suggest and how might they act as "entry points" for the user in enabling them to intuit the works functionality and subject matter?

• What type of interface might be developed to allow user interaction and access to the material?

Two different construction methods were employed at this time: by "hand" using a software modelling program to shape and edit structures, and a "hands-off" approach using automated algorithmic processes to generate randomised forms. Arising from these processes four "types" of structure were developed:

i) Sculptural hermetic objects (figures 30-31).

ii) Abstracted tangle/net forms where the boundaries between "inside" and "outside" are not so clearly defined (figures 32-33).

iii) Larger grid pieces that contained the sculptural objects within an environmental armature (figures 34-35).

iv) Text pieces, where material downloaded from online Internet dictionaries was combined within wire frame structures (figures. 36-41).

The most successful of these were felt to be the text environments, their fissured arrangements considered metaphorically suggestive of the activity of Internet browsing as a dislocated ambient grazing of information or a drift through an evolving "info-scape". In a broader sense the structures were appeared visually akin to a wide range of phenomena: geological processes; viral or bacterial interaction; biological morphology; flows of energy/traffic operative in urban environments; information overload; outer space; satellite photographs etc.

The metaphor of textual browsing proposed a certain type of functionality — a 3D Internet browser able to take a 2D stream of text and reformat it. The other identified metaphors suggested a function analogous to a visualisation or amplification apparatus: telescopes, microscopes, radar or other mapping technologies. These metaphors were to be influential in the further development of the project and are discussed in the following sections.

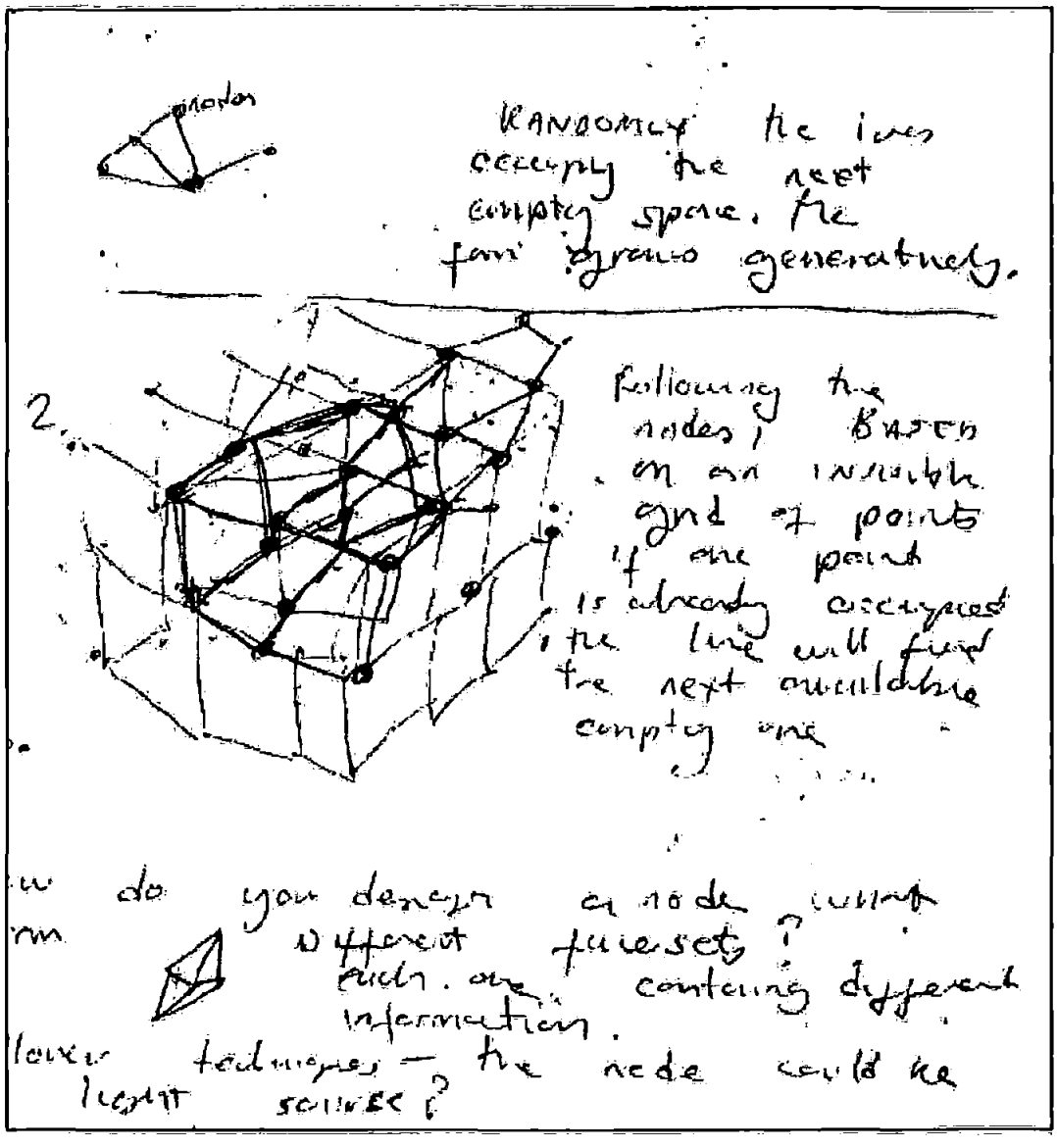


Figure 29: Preparatory sketch for wire frame model.

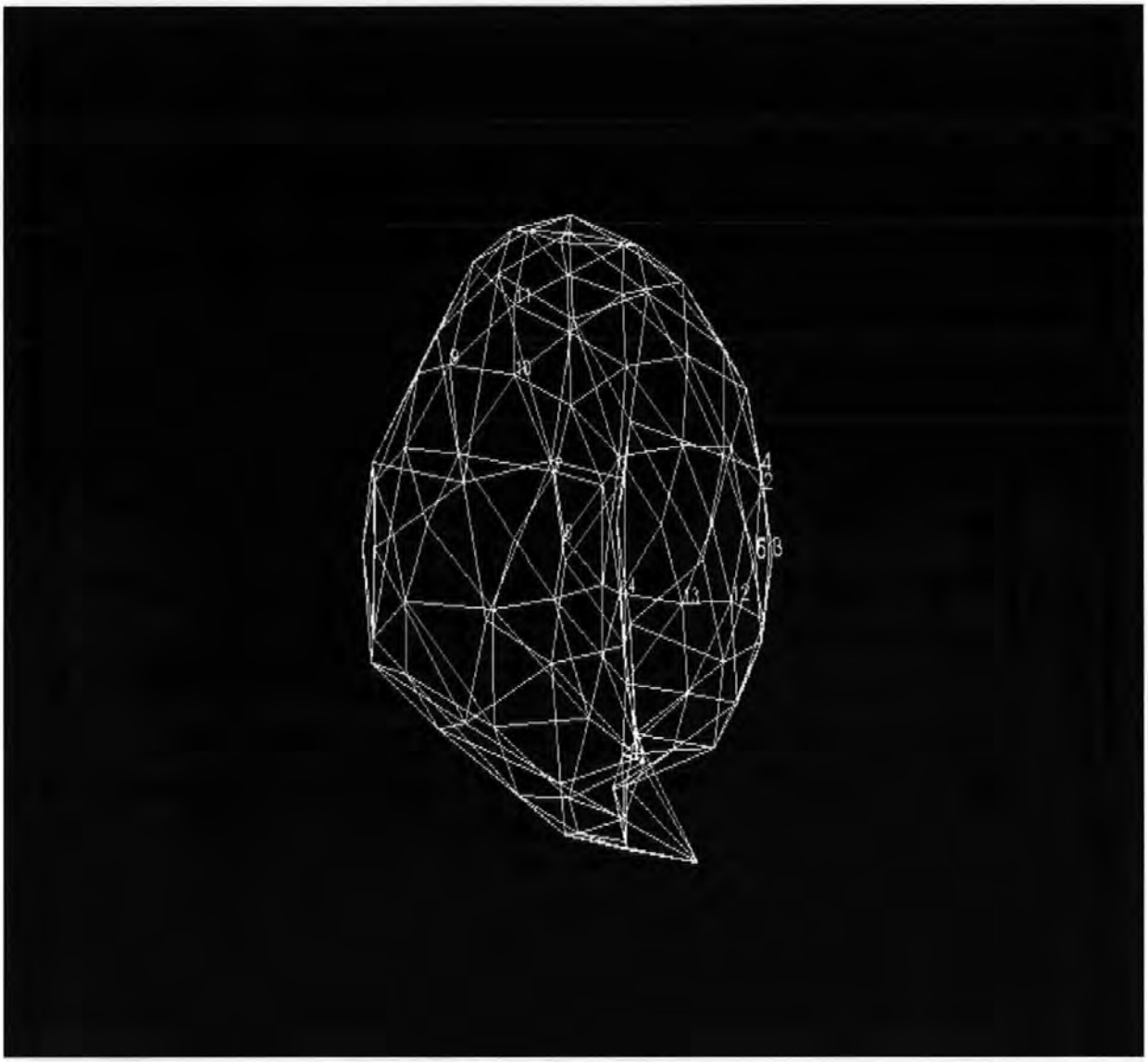


Figure 30: Wire frame maquette.

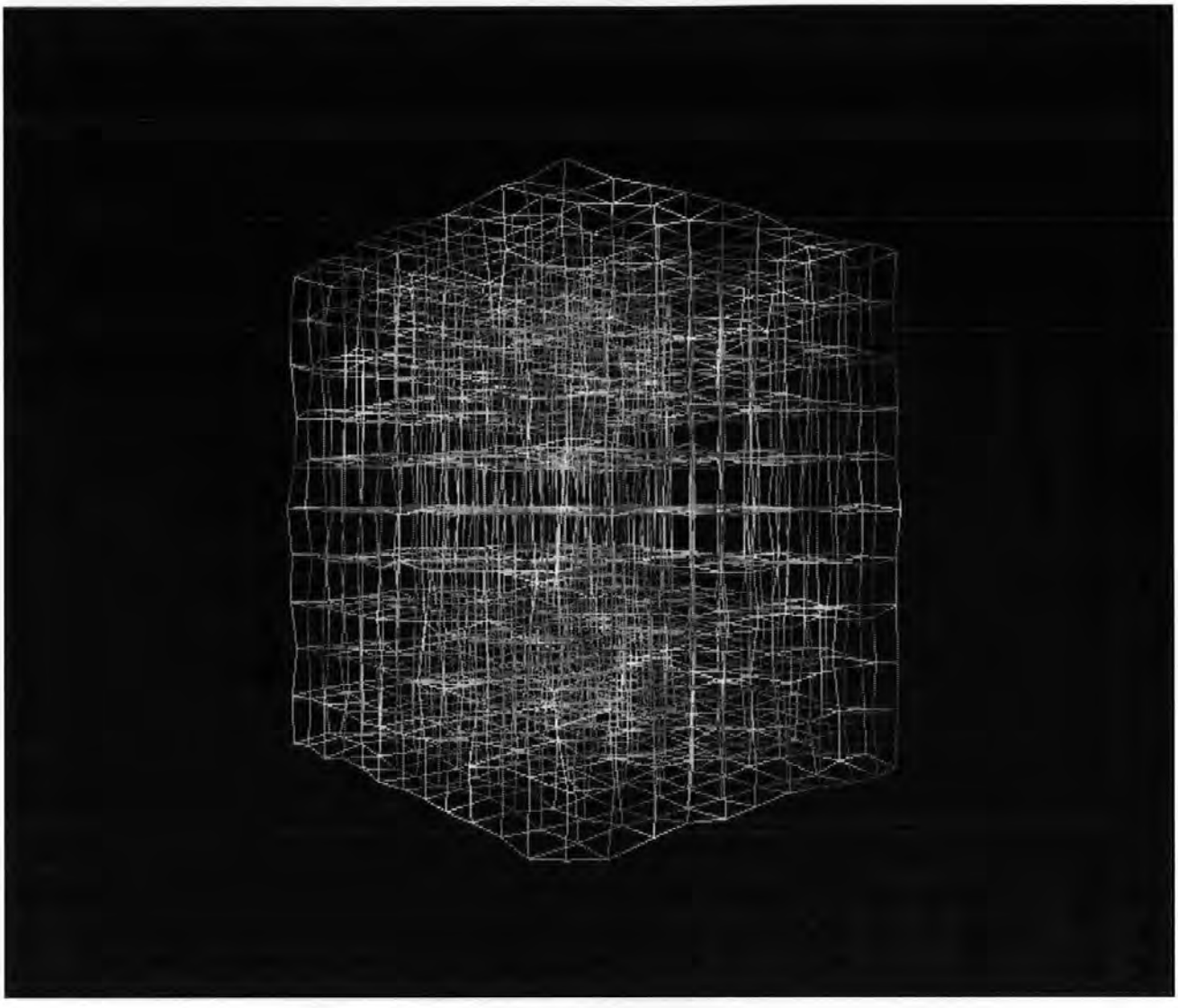


Figure 31: Wire frame maquette.

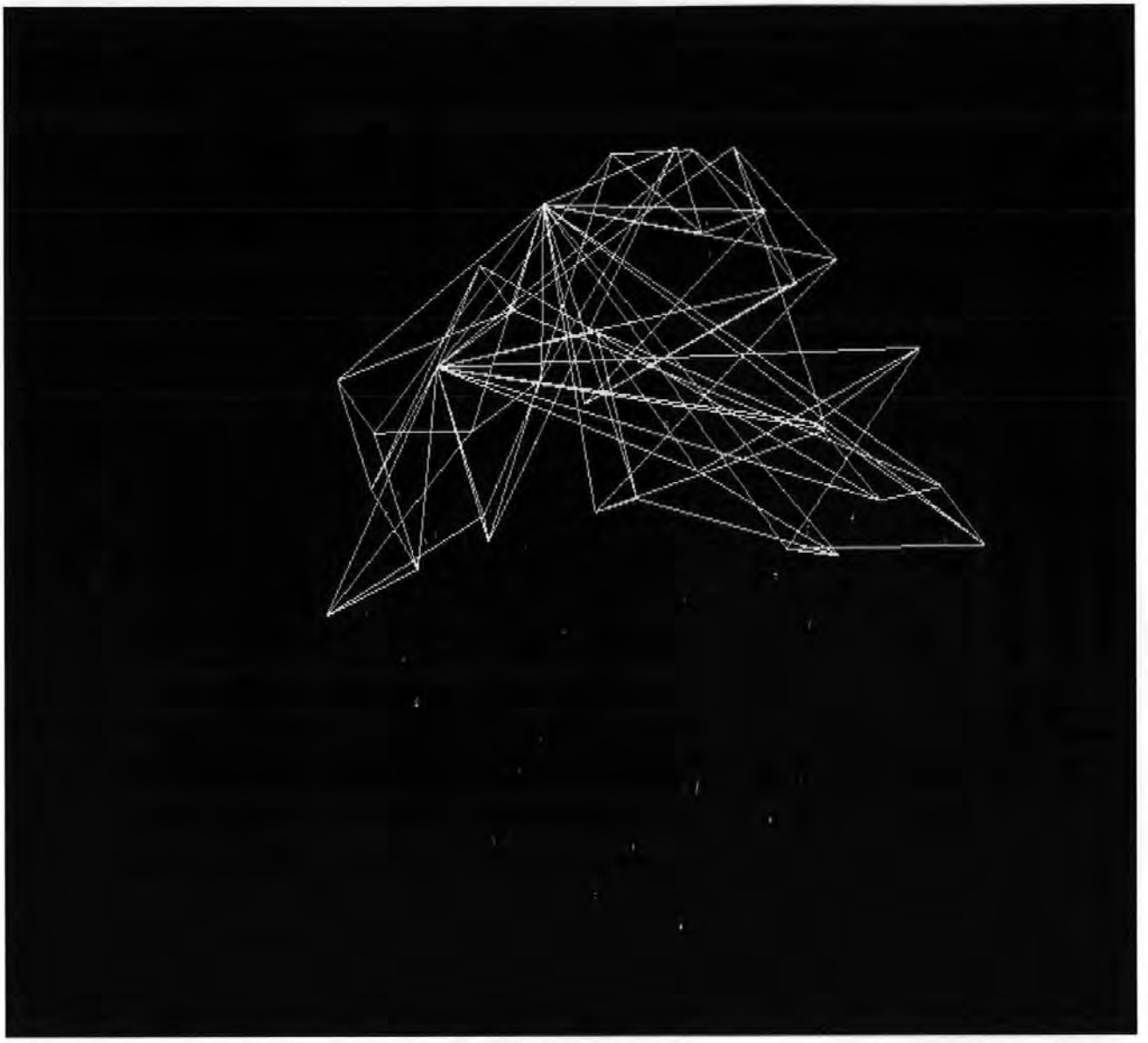


Figure 32: Wire frame maquette.

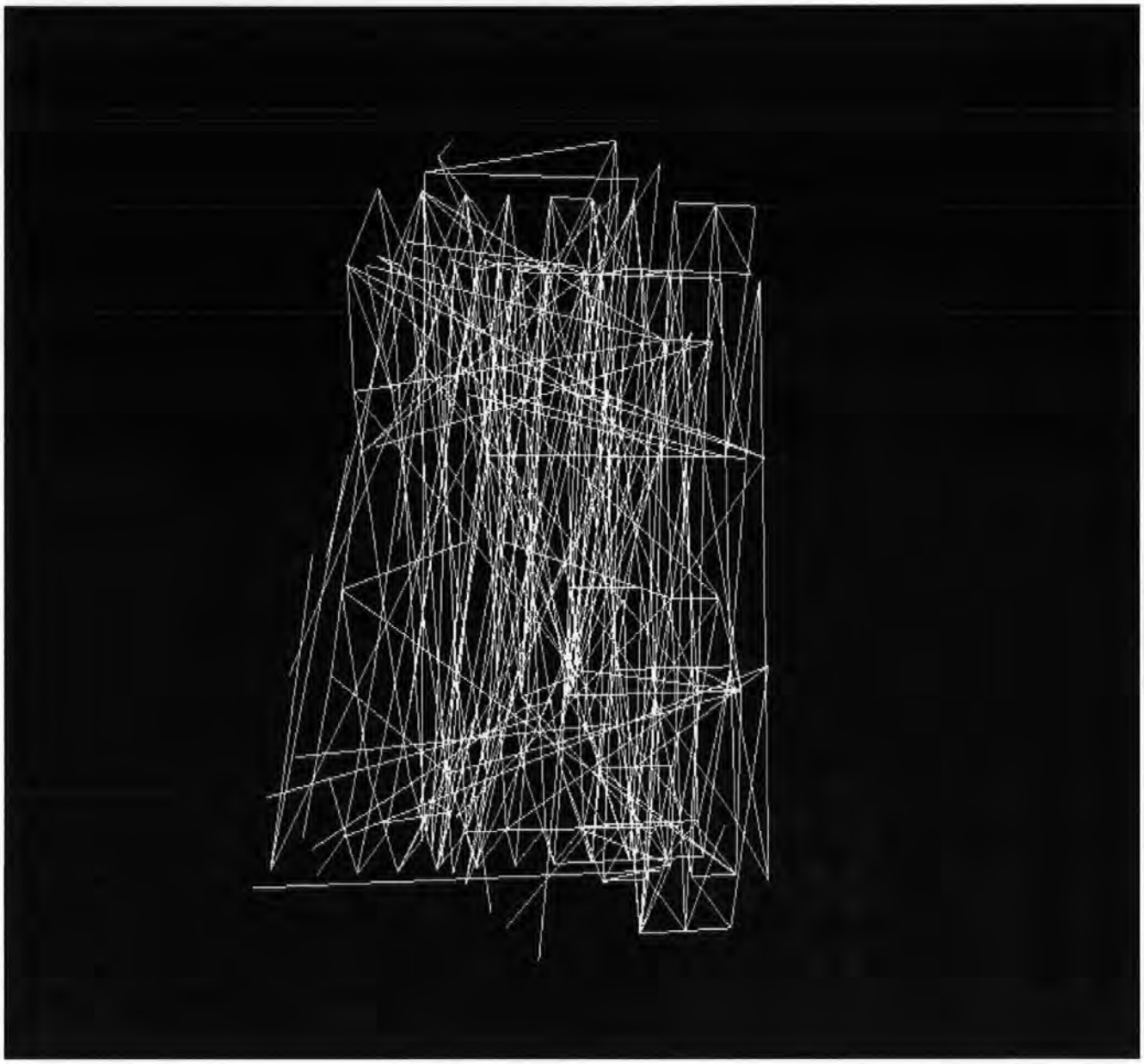


Figure 33: Wire frame tangle.

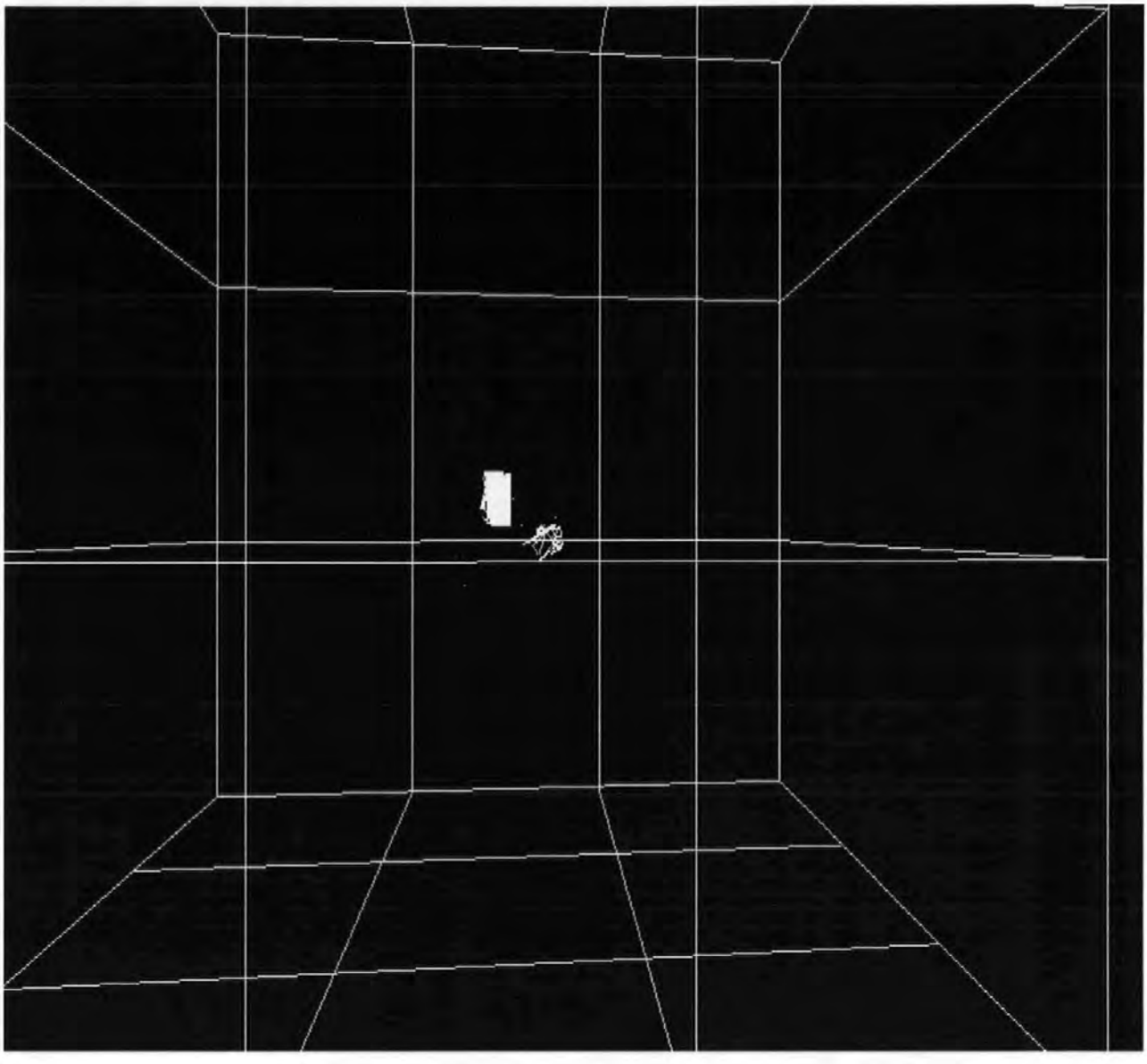


Figure 34: Wire frame maquette

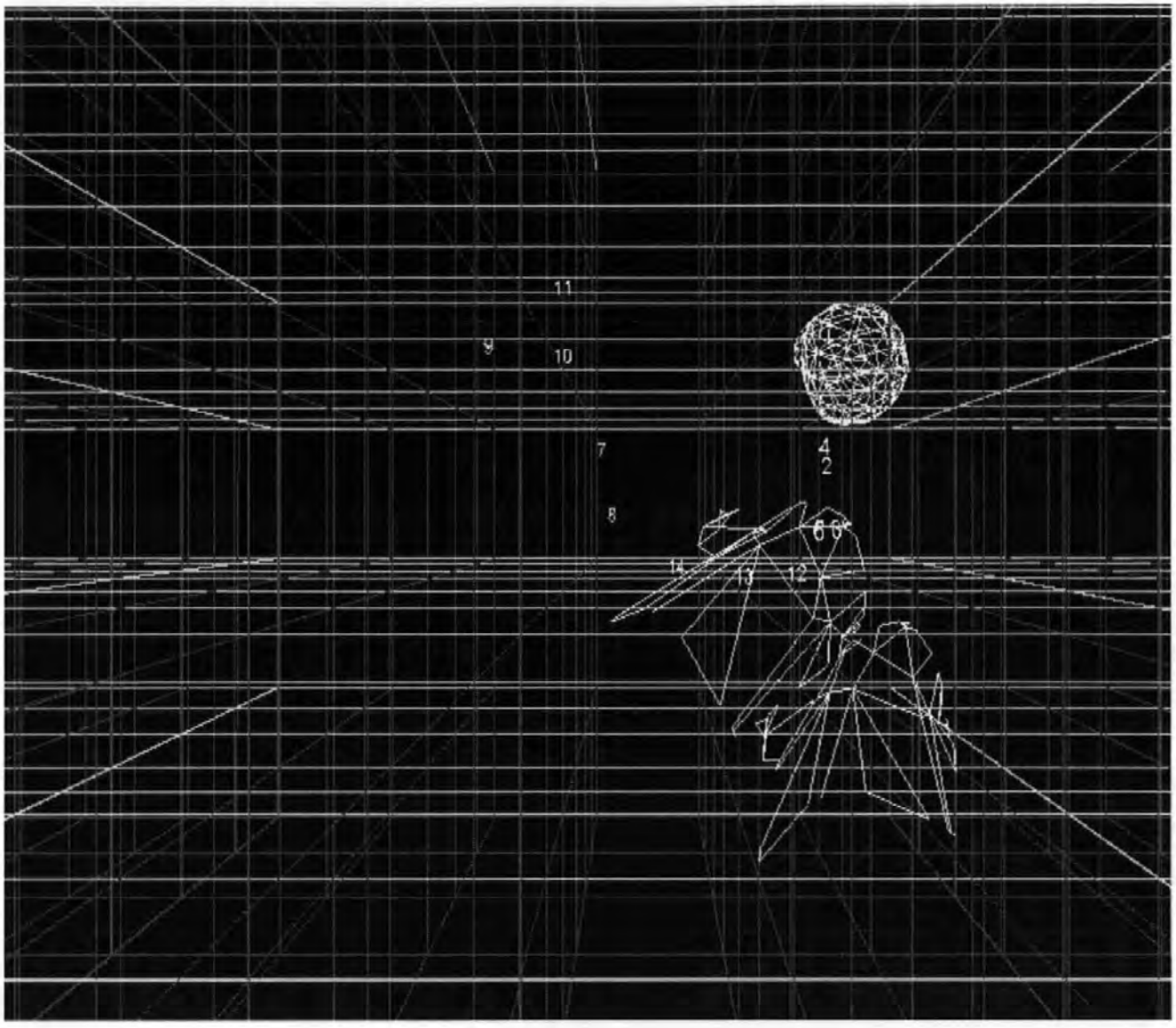


Figure 35: Wire frame maquette

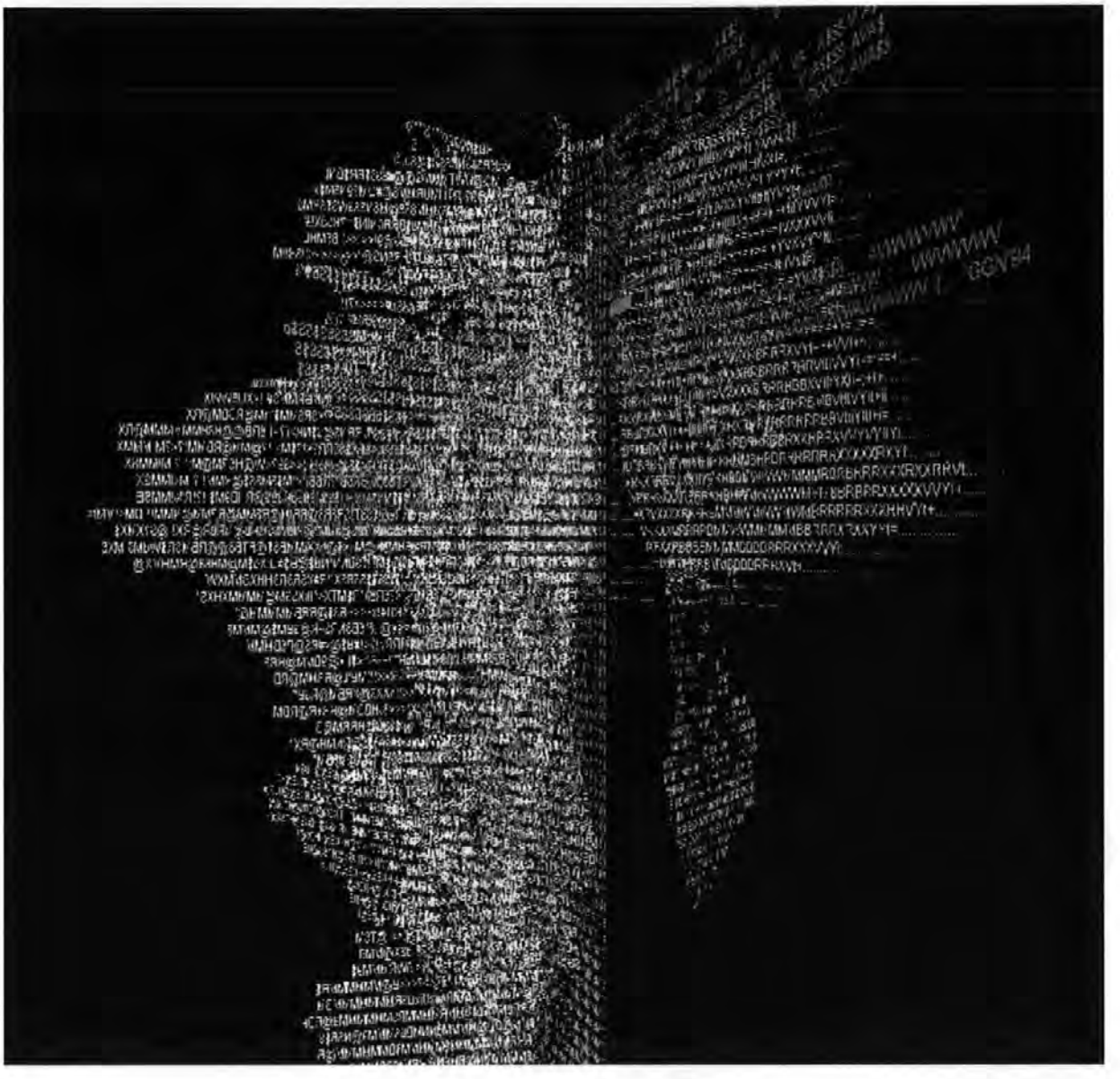


Figure 36: Text environment.

Figure 37: Text environment.

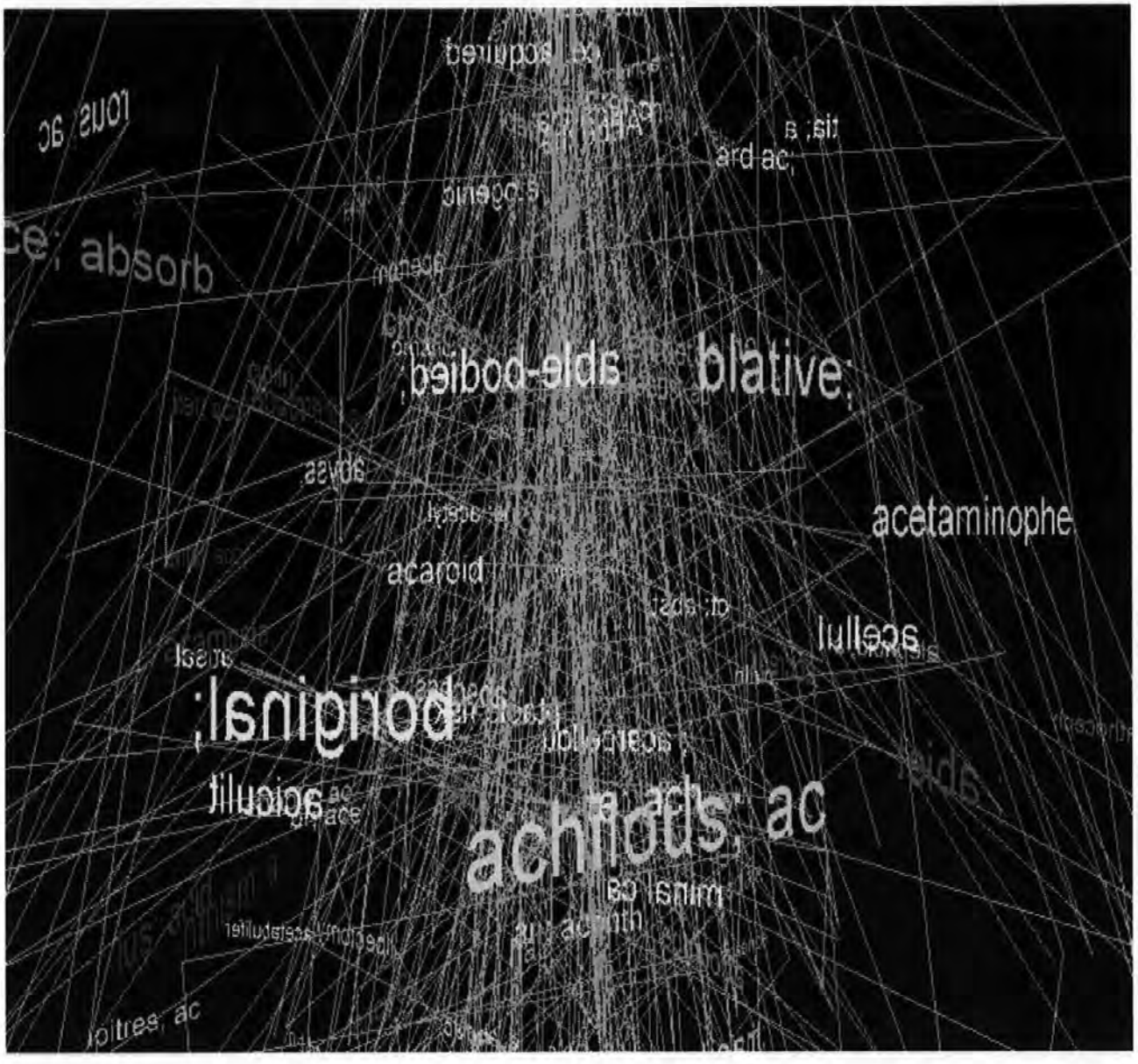


Figure 38: Text environment and wire frame.

Figure 39: Text environment and wire frame.

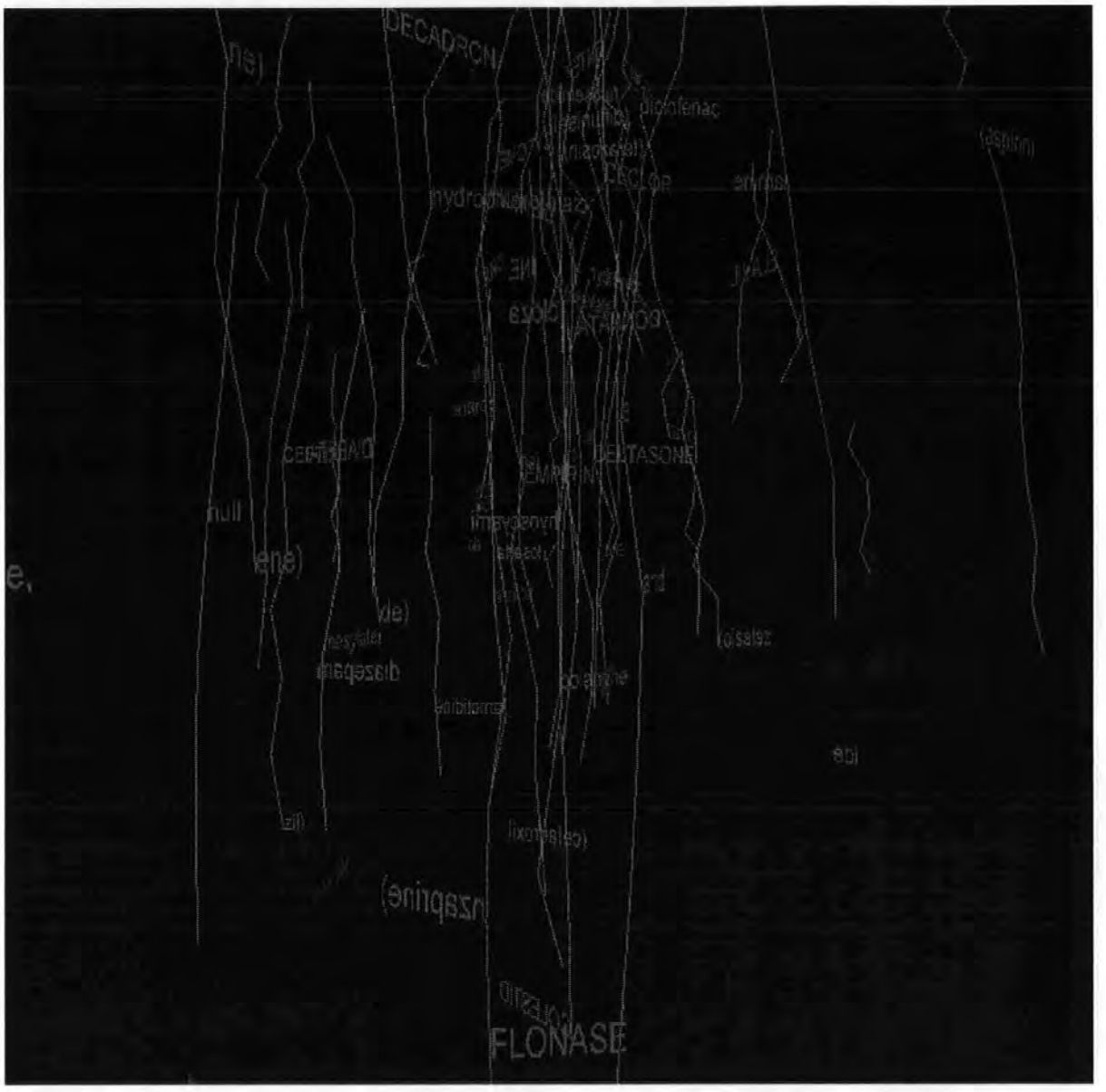


Figure 40: Text environment and wire frame.

Figure 41: Text environment

6.2.5 The development of *Reconnoitre 1.0*

Two broad possibilities for developing the project had been identified, both offering alternative ways of perceiving and interacting with networks. Further key decisions relating to the framework outlined in section 6.2.2 were also made at this time. In order for the user to directly interact with the project a 2D browser interface was developed allowing the specification of search term requests and Web page addresses. By inputting requests the user activated a web spider which depending on the input, gathered and returned material to the environment for display. A more detailed explanation of this process is given further in the chapter. In metaphoric terms the wire frame models had been considered suggestive of generative phenomena and analogies had been made between the structures and a characterisation of the Internet as an environment in a state of constant generative excitation. To reflect this, it was decided that the material organisation of the incoming search term material should model these processes in some manner. Four different versions of the project were developed to explore how this might be achieved, described in greater detail in sections 6.2.9 to 6.2.13.

Research into search engine technologies had unearthed an "open source" [16] web spider search agent written in the Java programming language. In order to incorporate the web spider into the project a switch from VRML to the Java programming language was necessitated [17]. As Java programs can be downloaded from the Internet, it was decided to develop the project as "client" software. A "client" is a small program that exists or may be downloaded onto a user's machine, e.g. a Web browser. This "client" connects with the Internet and allows its user to perform activities on it, e.g. browse or surf Web pages, send email etc. Similarly rather than have *Reconnoitre* exist on a web site, it was decided that it should be a single downloadable application, that users could access and "browse" the Internet through.

6.2.6 A detailed description of *Reconnoitre 1.0*

6.2.7 General description of functions

Reconnoitre 1.0 is a Java 3D program that combines a navigable 3D environment; a 2D interface containing search term and a URL input fields; and a web spider Internet search agent that allows both the project and the user to interface with the Internet. The project has a hybrid function operating both as a "meta" Internet browser and a search term engine.

By typing into the request fields the user is able to define URL (Web page addresses) and search term requests. The requests activate the web spider which (beginning from the URL specified by the user) traverses the Internet attempting to find keyword matches. When found the relevant Web pages are downloaded by the agent and passed to the *Reconnoitre* program where the material is converted (parsed) and output into the 3D environment. The user is able to manipulate and scrutinise the returned results by navigation of the 3D environment.

When released into the environment the material is initially displayed as a cross-hair "result node", depending on the version each node representing either a returned Web page, a search term, or an image. Initially there is no geometry in the environment, its default state being empty, geometry is rendered "on the fly" as and when search term results enter the space. Result nodes enter at a random *x, y, z,* Cartesian co-ordinate in relation to a central nodal point, wire frame linkages are made between nodes allowing the formation of an emergent wire frame form that spins out in real time in response to returned material.

6.2.8 User Interaction in *Reconnoitre 1.0*

There are four levels of user to program interaction in *Reconnoitre 1.0*:

i) Interrogation of the Internet through user input of search requests.

ii) Creation: the user participates in creating the environment by seeding it with search term nodes.

iii) Navigation: movement through the environment is achieved through use of the mouse and a drop down menu. The menu allows three different navigation possibilities: "walk" (forward/backward, and left/right movement), "slide" (vertical movement) and "examine" (turning on the axis of the entire, set of returned results). Holding down the left mouse button and pushing the mouse allows movement dependent on the navigation mode selected.

iv) Scrutiny, the user may examine returned search material by clicking on the returned result nodes, releasing the returned results which hang off the result node. The result node may also be closed to hide the material.

6.2.9 Versions of *Reconnoitre 1.0*

Four versions of the project representing search results in different ways were built. The titles: *WebStruct, ImageQuad, PointCloud* and *SearchFrags* were working titles, reflecting the manner in which they presented search term material. When demonstrated in public the separate projects were presented as a suite of programs collectively entitled *Reconnoitre.*

6.2.10 *WebStruct*

Whereas in other versions of *Reconnoitre 1.0* material results are randomly arranged, *WebStruct* preserves the relational structure between Web pages, and thus may be considered as a form of mapping mechanism. Each result node in the environment contains an entire Web document. All subsequent wire frame links off the result node represent the actual links contained in the original document, i.e. the resulting form is thus both a representation of the traversal of the web spider as it navigates the Internet and the hypertext structure of the specified web site.

Theoretically if left running, this version of the work could generate large spatial maps of relational hypertext links between documents (i.e. a map of a part of the World Wide Web), to prevent hardware overload a "link depth" was set. From the

original document at depth zero, a further depth of seven levels of hypertext links would be followed. All the Web pages from each level would be retrieved and stored as data nodes in the environment. The resultant form (branching out like a tree), is illustrated in figure 42. This form of "depth restraint" was adopted for all following versions of *Reconnoitre 1.0.*

Depth zero is the starting point (URL) of the web spider. The web spider follows the hypertext links in each document, mapping the link relation between each page down to a depth of seven. The text data from each page is retrieved and mapped into the 3D environment as a discrete search result node.

6.2.11 *ImageQuad*

In *ImageQuad* (figure 43) the returned material takes the form of images (either JPEG or GIF file formats) that the web spider comes across during its traversals of the Internet. Aside from providing image based instead of textural results, it differs from other versions of the work in that the user is not requested to supply a search term but rather inputs a single URL address. The web spider takes the designated URL as a starting point for its navigation. Any image that it comes across is collected and returned to the program where it is displayed as and when it is downloaded. As in *WebStruct* once the spider reaches a predetermined navigational limit the amount of information that the web spider returns stops.

6.2.12 *PointCloud*

Pointcloud (figure 44) is based on *ImageQuad* with the difference that as images are downloaded they are "desiccated"; each pixel of the image is converted into a coloured point and moved along the z axis. As a result the image is "spatialised" and re-presented in the environment as a collection of coloured floating points in space, giving the appearance of a "pixellated fog" (figure 45).

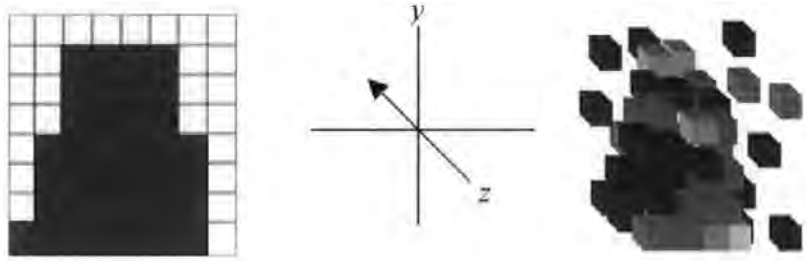


Figure 45 : Conversion of 2D image to 3D points distributed through the z axis.

6. 2.13 *SearchFrags*

SEARCHFRAGS is closest in concept to *Reconnoitre 2.0* the mature final version of the project. Whereas in *WebStruct,* returned textural material is presented as a relational map of the structure of a Web site, in *SearchFrags* the relations between result nodes are random i.e. not relational. In this version more than one search term can be entered during a session. When the user inputs search terms, they are seeded at random *x, y, z,* co-ordinates throughout the space as "search term nodes". As the web spider returns material, it enters the environment at the position of the corresponding search term node. Clicking on the search term node releases the returned material. When the Web page is downloaded *Reconnoitre* parses/processes the page, isolates all the sentences in the document which contain the search term word and discards the rest. Rather than display the entire Web page each search term match is relayed to the environment, where it is displayed as "cut-up" or fragmentary sets of sentences.

The amount of material returned to the environment depends on which choice of word the user inputs into the search field. If an unusual or little used key word is input the amount of returned material is relatively small — the visible returned results being single words or sentences. If a common search term keyword such as "the" or "a" is input the amount of returned material

would be by order of magnitude much greater i.e. whole paragraphs of text. The overall effect of employing this "sifting" technique produces a more varied range of spatial/visual/textural results than in *WebStruct*

6.2.14 Program elements in *Reconnoitre 1.0*

Reconnoitre 1.0 is a Java 3D program made up of a number of different program elements (Java Classes) that interact to search for, sift and represent search term data in response to user request (figure 46).

Main Program (RecApp)
The main program (RecApp) contains the program elements described below.

Organiser (RecDoc)
Contains the canvass, 3D and 2D interface (mouse keyboard events), and organises the other described program elements. When a search term and URL is input into the program the *Organiser* stores them as a list before passing the URL/search term to the web spider. The spider navigates to the URL and starts gathering information.

The web spider
The web spider is a Java program written by Jef Poskanzer. In itself the web spider does not find keyword matches, but starting from the URL defined by the user makes a list of files that branch out from the original URL (a web sub-tree). The list may be constrained or unconstrained. A constrained list as used in *Reconnoitre 1.0* has a depth starting at "0" and ending at a specified point e.g. "7", i.e. it will return the addresses for Web pages followed for a depth of seven hypertext links (figure 42).

Sifting Engine (WebGrep)
The *Sifting Engine* interacts with the web spider. In itself the web spider does not find matches to the key words specified in search term requests, but traverses the Web indiscriminately collecting lists of URL's, which it passes back to the *Sifting Engine*. The *Sifting Engine* then downloads documents specified in the web spider's list of URL's (in much the same way as an Internet browser would) which it then scrutinises for search term matches or images. If found the *Sifting Engine* passes the material to the

Organiser which passes it on to the *Parsing Engine*.

Parsing Engine (SpiderGraph, SpiderNode)
The *Parsing Engine* determines how search term results are to be represented — as text, text blocks, entire Web pages, point clouds or images; how the space is to be generated and where each search term node is to be placed in the environment. At this stage textural material is converted to a bitmap image — white text on a transparent background. This greatly decreases the amount of rendering time required to generate the environment and in terms of processing is more efficient than outputting the text as fully fledged 3D objects. Once parsed the search material is output to the environment, where the user is able to navigate the emerging structure and release returned material from the compacted result nodes.

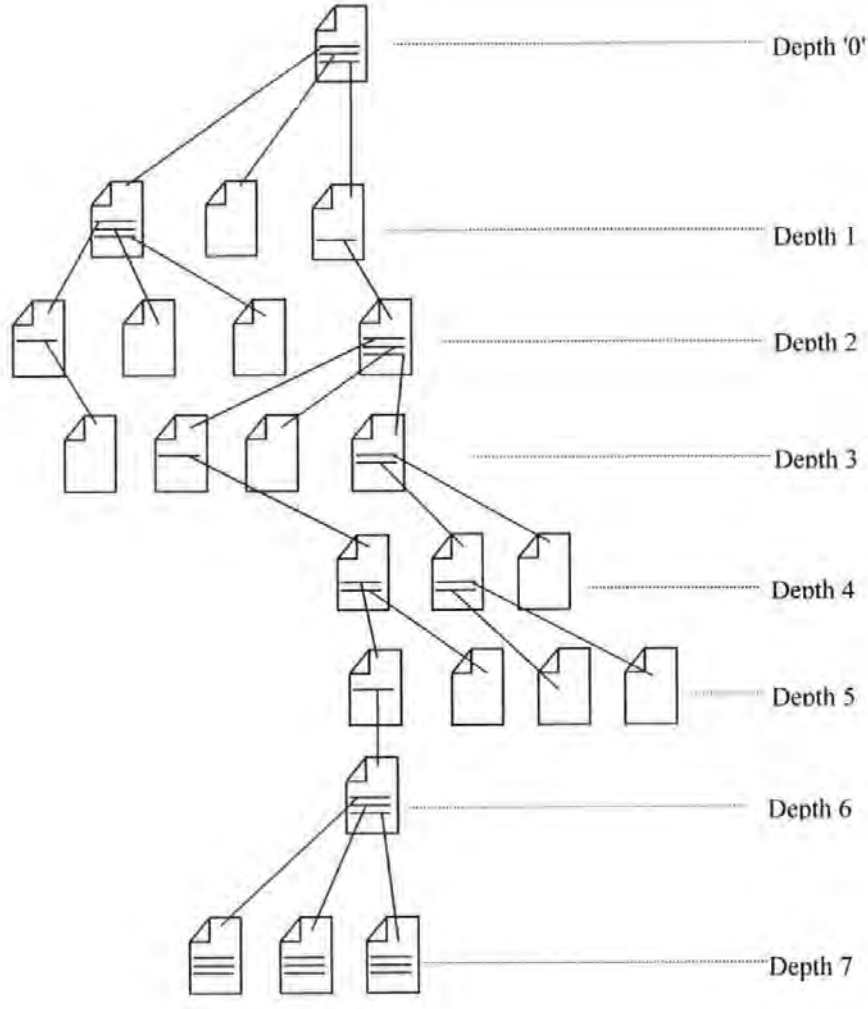


Figure 42: Model of link depth restraint employed in *Reconnoitre 1.0*

Depth zero is the starting point (URL) of the web spider. The web spider follows the hypertext links in each document, mapping the link relation between each page down to a depth of seven. The text data from each page is retrieved and mapped into the 3D environment as a discrete search result node.

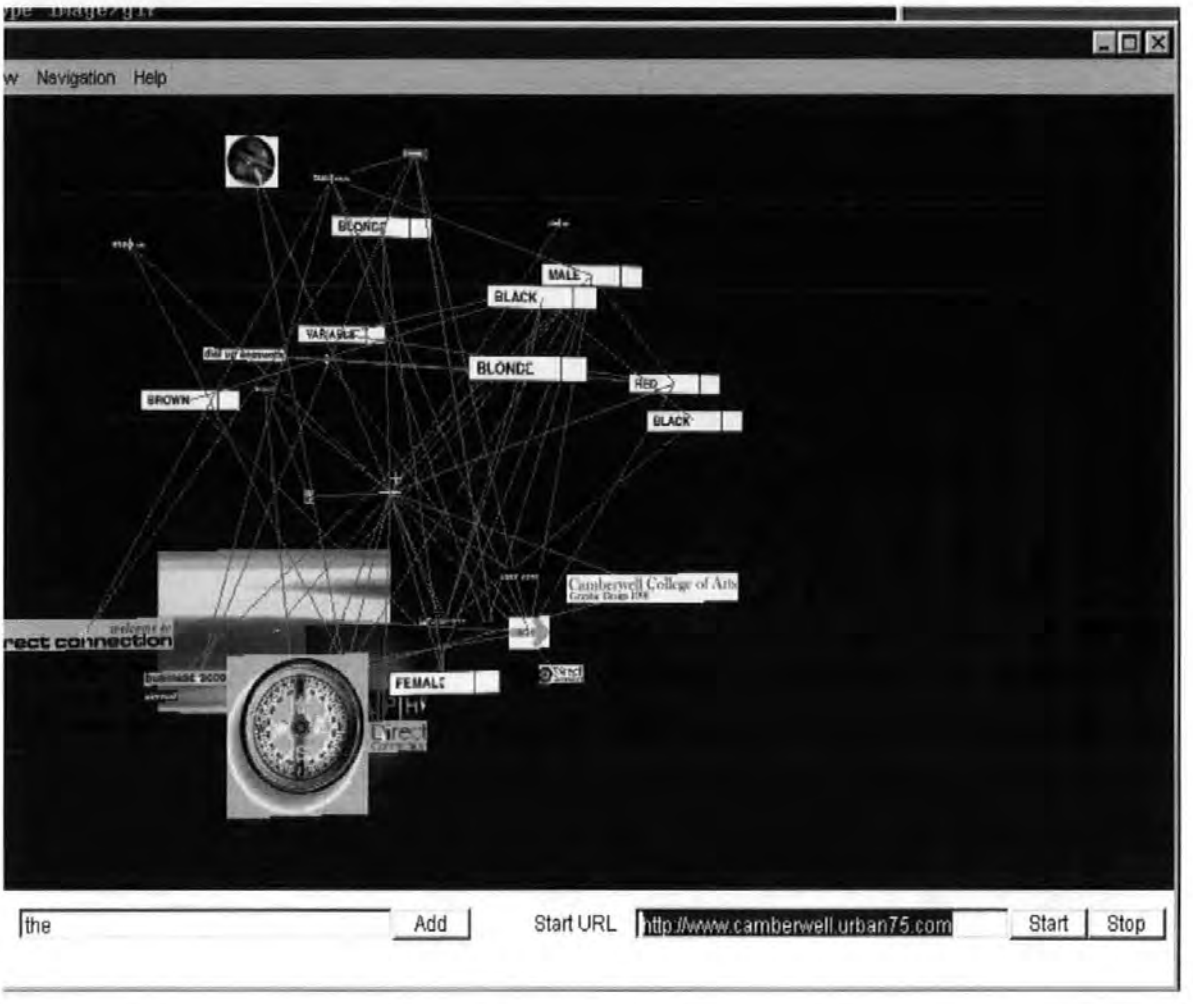


Figure 43: *ImageQuad*

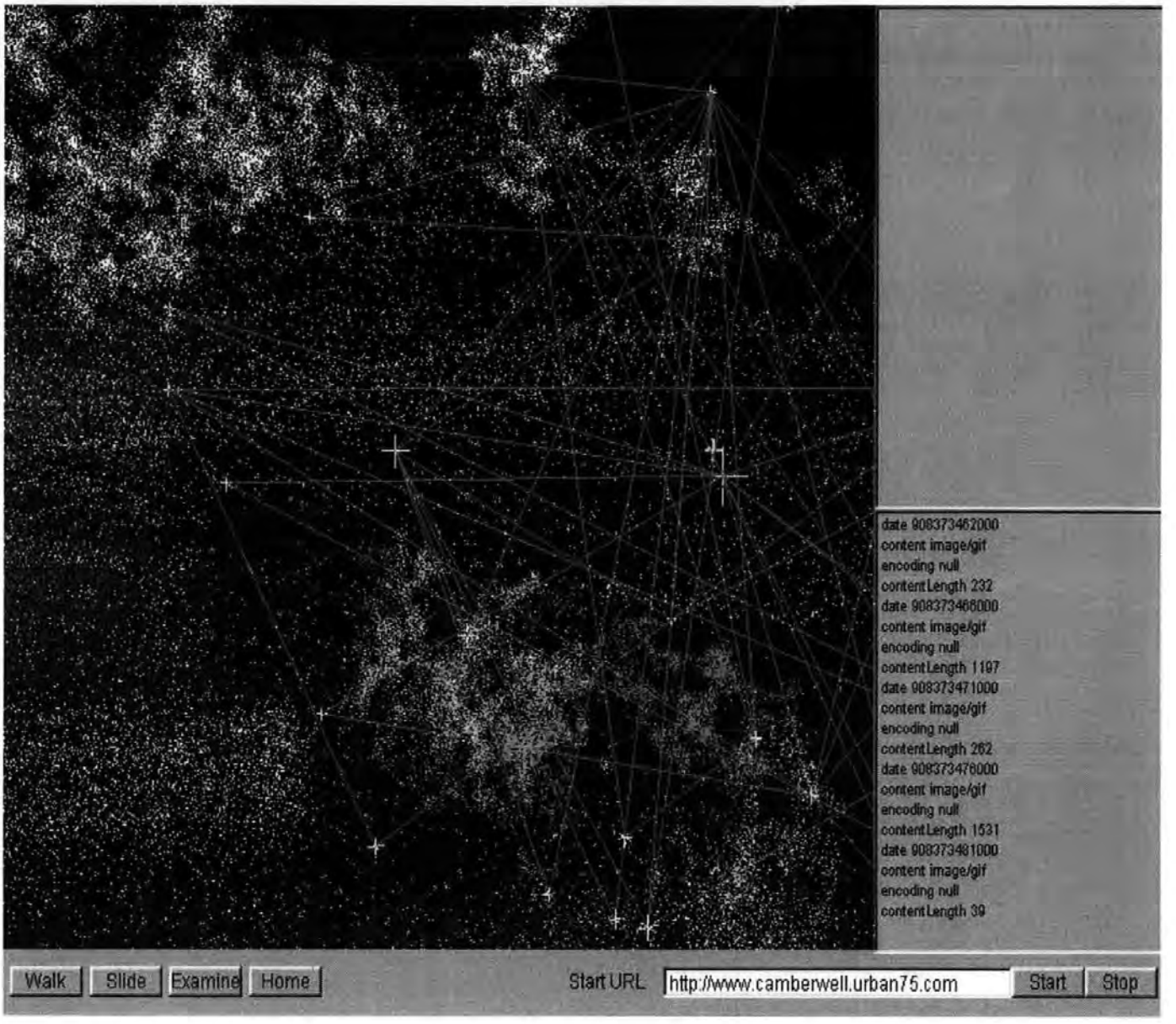


Figure 44: *PointCloud*

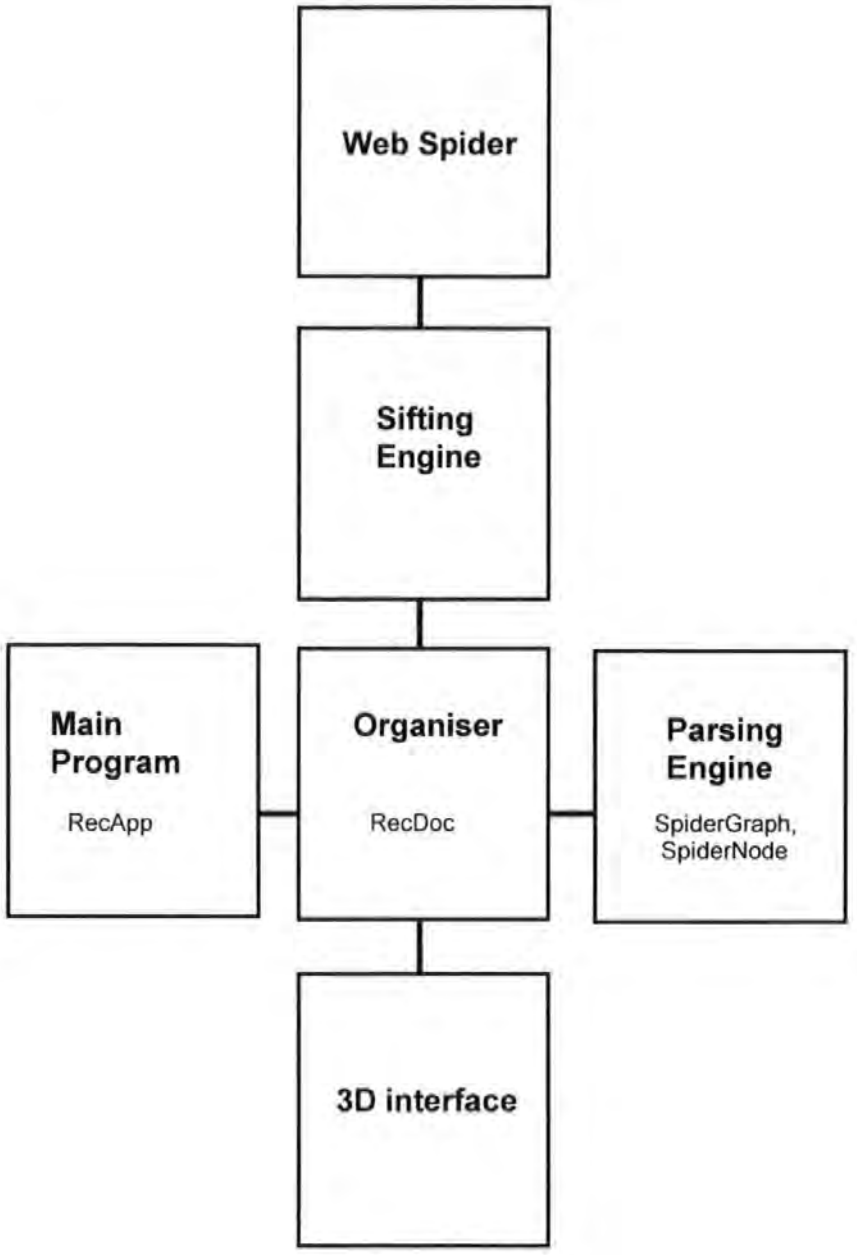


Figure 46: Diagram describing the relationship between the different program elements in *Reconnoitre 1.0.*

6.2.15 Environment generation

As search results are returned to the environment they are placed as result nodes in the environment, a wire frame form is established as links spin out between the different nodes. The form is generated via the application of a random geometry algorithm and is described below (figure 47).

1) The first node is created either in response to the user inputting a search term or URL.

2. A second node is created in response to the web spider finding a search match. The node is placed at a set distance to the first node randomly at an *x, y, z* Cartesian co-ordinate. The first wire frame line links the two nodes.

3. In response to further input from the web spider a third node is created. The node is again placed randomly in relation to the second node. A wire frame line joins the third node to the first to create a triangular form.

4. Nodes continue to be produced in relation to input from the web spider. A fourth node is created. The node is placed at a mid point and at a right angle between either sets of pre-existent node (i.e. between 1 and 2, 2 and 3, 3 and 1 etc.).

5 & 6) Nodes continue to be generated and linked by a wire frame connections The resultant geometric form is randomised and unpredictable.

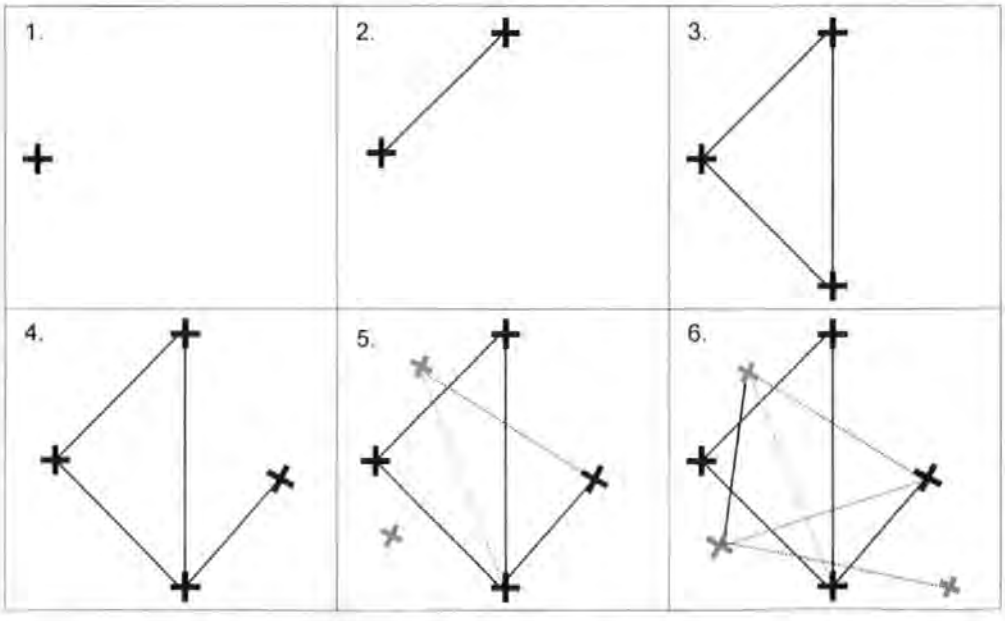


Figure 47: Environment generation

6.2.16 Artist in residency program the ICA, September 1st to November 1st 1998

The versions of *Reconnoitre 1.0* described above were largely developed at the ICA's New Media Centre during a two-month artist in residency program. The residency allowed rapid development of the project providing an opportunity to work on a "day in day out" basis with Gavin Baily. During two open studio sessions attendees were given the opportunity to use the work and presentations outlining its themes and development were delivered. In order to garner and document response, ten visitors were asked whether the would participate in a further discussion of the project via email correspondence. Each corespondent being emailed a set of questions:

1) What aspects of the work did you feel didn't work?

2) How do you think the work could be made more successful? And how do you think it should be developed?

3) What aspect of the work most interested you?

6.2.17 Email responses to work shown during the ICA residency

In total six email replies were received. In answering question 1 "What aspects of the work did you feel didn't work?" a number of replies requested the ability to interact with the data in a more involved manner:

> Maybe I would have liked to have seen the information presented in a more usable way, as well as just going for an aesthetic. I know I'm missing the point though. (Computer science student, Bristol).

> To relate to the text a little bit more, i.e. see more what the pages in question were actually about (this works well in the image one). It seemed too abstract and therefore potentially repetitive. (Media Researcher University of Westminster)

Other quibbles concerned the display quality of the 3D graphics compared to the speed and responsiveness of 3D games. One person suggested getting in touch with the games industry "I imagine they have had the time and money to develop the best VR engines" (recently graduated design student, London).
In answering question two "How do you think the work could be made more successful? How do you think it should be developed?" two main issues emerged. A major gripe was the lack of sound: "the addition of sound would intensify the viewers experience...by feeding the viewer...I can't imagine any computer game without sound" (art student, London). The other recurrent theme being interaction. Concerns over interaction seemed to centre less on the types of interaction with the environment, than on the interface that enabled interaction to occur: "I think you could add more icons to make the work more interactive" (art student, London).

The majority of answers to question 3 were of the "I enjoyed your work very much" and "I found the whole project fascinating" variety, with responses to the broad themes of the project positive:

> A fresh approach to presenting web information is long overdue. I think that *Reconnoitre* might have some interesting implications for developing a more immersive environment for viewing net data. (Computer science student, Bristol)
>
> The idea of the web as a "living space" rather than a flat dead thing. The connections...the ability to explore the Web in a completely different way. (Arts consultant, London)

By querying how more involved modes of interaction might relate to forms of activity on the Internet one reply proved particularly interesting:

> The spider software linked to the 3D rendering engine builds, over time on the basis of a search, a kind of representation of the data space. However this search data must necessarily be represented in an entirely arbitrary form; as it moves across the information from the network fills the navigable space, and while offering viewers the heady illusion of being able to voyage through the ether

> between URL's no other interaction is possible. What I like about *Reconnoitre* is the fact that it is reflexive, and that it struggles with the difficulties of representation, when what is described are interior relations between points on a system of communications. There are, I know additional features that you are still working on, however the most frustrating aspect is that the user is excluded from any interesting interaction. Unfortunately, I'm not sure what kinds of action could plausibly increase involvement, or make the experience more stimulating, but it might involve forcing interaction between different domains, or the modification of behaviours. (Freelance multimedia developer).

It is possible to extrapolate from the answers to questions 1 and 2 a desire to have some form of extended control over what was happening in the environment, other than just being able to navigate its structures and feed search terms or URL's to the web spider. Whilst adding more icons would not necessarily make the work any more interactive, the interface as it stood was somewhat sparse. While it was conceded that some extra forms of functionality might enrich the project it was as yet unclear as to how this might be engineered and what form these extra functions might take.

To this date production had concentrated on interfacing the web spider with the environment. While a working method of streaming the returned search material had been found, and a basic generative schema to organise the incoming data devised, it was felt that further work was required as described by this contemporaneous quote from the log:

> The project works well as an aesthetic phenomena — the unfurling of structure and the positioning of data within virtual space is successful, engaging and at times quite eerie. While this successfully reveals possible relationships between different types of data (or represents the path of the web spider traversing the net), once the information is in the environment it is inert, static. The work requires a shift in emphasis from this static display to something more temporal, rhythmic.
> Communication and information flow on the Internet is dynamic, flowing and unstable, some form of behavioural mechanism needs to be implemented that highlights these aspects. (Artist's log, 5th October 1998)

6.2.18 Directions pursued following the residency scheme

Working at the New Media Centre had proved invaluable, much technical progress had been achieved and insights made into the further development of the project. Broadly speaking *Reconnoitre 1.0* had focused on developing the project's connectivity (user to web spider, web spider to Internet, web spider to environment). This it had achieved, however some concern had been expressed regarding the status of the material after it had entered the environment. Following from this it was decided to develop a second version of the project *Reconnoitre 2.0* which would build on what had been accomplished in the first project but introduce elements of connectivity into the environment itself.

6.2.19 The development of *Reconnoitre 2.0*

Reconnoitre 2.0 was the final creative project. Production commenced in January 1999 and was completed the following September. The project was exhibited on a number of occasions: "Readme.txt - Browsing online art", September 30th 1999 to September 28th 2000, Museo de Monterrey, Monterrey, Mexico; "COMTEC Art 99 3rd International Festival for Computer Aided Art and Interdisciplinary Media Projects", 1st to 28th November 1999, Kunsthaus, Dresden; "Transmediale 2000, International Media Art Festival", February 11th to 20th 2000, Podewil Centre (Figure 48), Berlin; "[d]vision 2000 — Interfaces for Digital Culture", 4th to 6th May 2000, Schikaneder Theatre, Vienna; "Ars Electronica Festival 2000: Next Sex", 2nd to 7th September 2000, Linz, Austria. A more detailed description relating to the exhibition in Dresden is given later in the chapter.

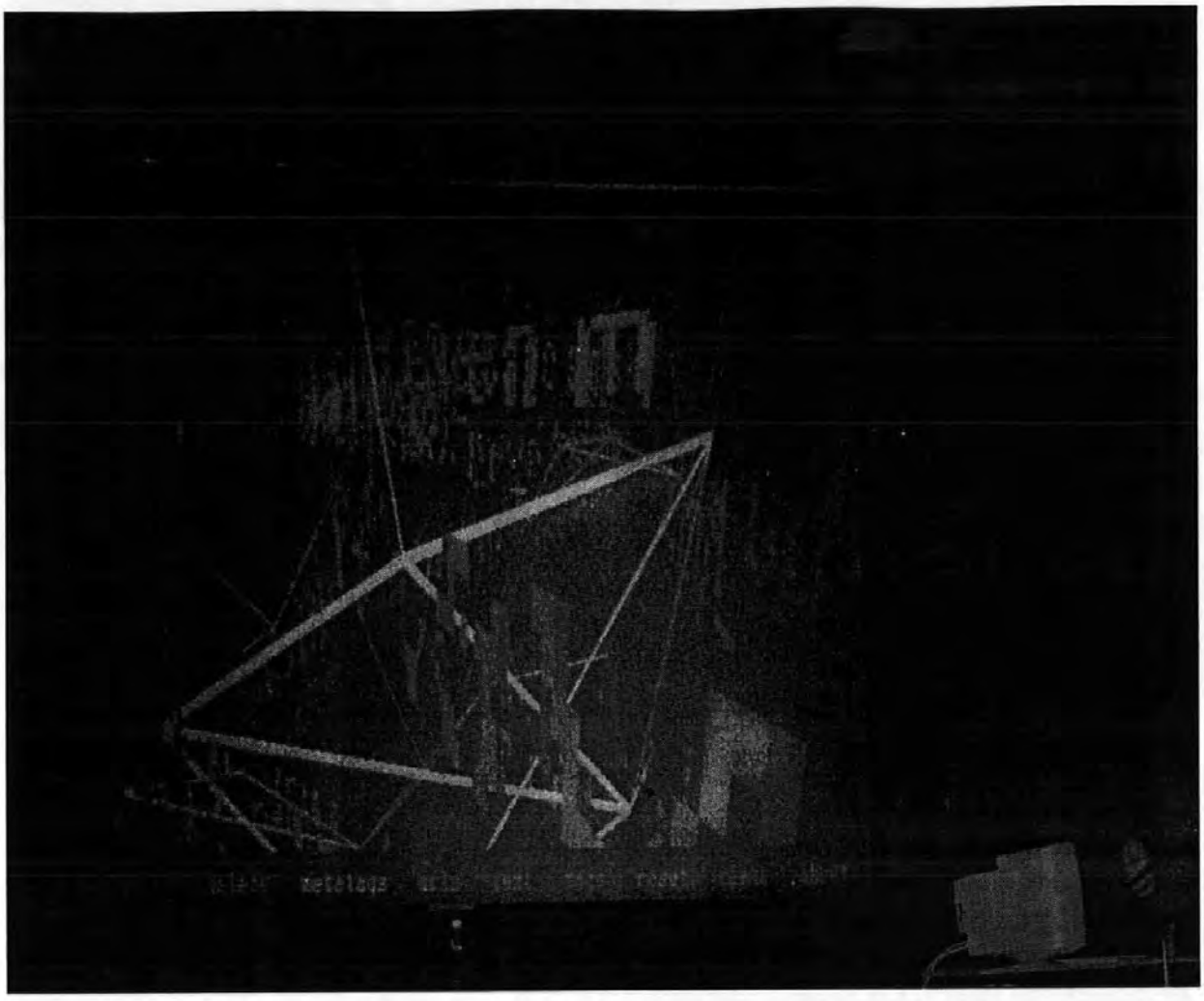


Figure 48: *Reconnoitre 2.0* demonstrated at the Podewil centre, Berlin, February 2000.

6.2.20 Connectivity, and deterritorialization, other influences on the development of *Reconnoitre's* aesthetic

Throughout the development of the project a number of critical and philosophical sources were found to be metaphorically suggestive of *Reconnoitre*. Being both descriptive of analogous non-linear/non hierarchical modes of being, and contemplative of the effect that modern networked communication technologies have on contemporary perceptions of environmental and built space, the ideas were influential in inspiring aspects of *Reconnoitre's* aesthetic.

In the following section an overview of some of these influences is given, followed by a discussion of their relation to the aims of the project.

6.2. 21 Networked urban space

Via deterritorialization the sites of activity that we participate in (and through) when using the Internet are relative to the acts of communication that engender them. New forms of territory/space, follow from a heterogeneous mix of subjectivity, time, interaction, and plurality of agency. Its manifold assemblage of elements its "knot of tendencies and forces" (Lévy 1998, p.24) fulfil Lévy's description of the virtual as a mechanism that excites persistent creative resurgence and generates complex morphologies of space and conditions of being, i.e. via its propensity for connectivity the Internet exists as a result of emergent or bottom up interactions between participating agencies both human and software.

The abstracted spatial outgrowths that occur as a consequence of deterritorialization have also been the focus of anthropology in relation to the experience of the modern city. In his studies of modern urban space, Marc Augé (1995) introduces the concept of "non places", a condition arising from the move from post modernity to supermodernity. Supermodernity, a condition bought about by information overload (via satellite and communication technologies) causes considerable physical (and virtual) modifications to a city's landscape, through movements of populations and a "spectacular acceleration of means of transport"

(p.34). By blanketing the world in information, supermodernity generates excesses: of time, events and "spatial overabundance" (p.32). In traditional anthropology, place is familiar, knowable, and common; characterised by and supporting stability. In contrast non-places are liminal, sites of heterogeneity and fleeting movement, "temporary and ephemeral" (p.78). Nomadic populations, shanty towns, squats, dense networks of transport and communication, clubs, refugee camps, supermarkets and airports, frame a new urban zone of transit and spatial impermanence. As in the Internet non-places mediate a mass of relations which animate socially through complex interrelations of human and communicational flux. In a similar vein Castells (2000), describes the urban as a phenomena of networked forces which he formulates as "the space of flows" (p.412). The space of flows is constructed of "the material organization of time-sharing social practices" that are characterised by "purposeful, repetitive, programmable sequences of exchange and interaction between physically disjointed positions held by social actors in the economic, political, and symbolic structures of society" (p.412). Modern cities, argues Castells, are assemblages of organic/social and electronic/mechanical energies that operate in conjunction, to engender and channel communication and transportation eddies. The condition of such flows does not obliterate physical space, but absorbs it (i.e. physical space is part of the superstructure that supports the network flow). The expanded and layered spaces of the modern city can no longer be represented as a static arrangement of physical structures, as its mutable chaotic flows — directed through the nodes and hubs of its communicational and transportation networks, force a description of space as a fluid process, continuously reformulated by complex and heterogeneous forces.

6.2.22 Baroque folds, rhizomes, smooth and striated space

The kinds of radical spatial and social fluidity characteristic of contemporary conceptions of the city (Augé, Castells) and the Internet, and processes of virtualisation (Lévy), echo Deleuze's investigation of Leibniz's concept of the "Fold" as outlined in *The Fold: Leibniz and the Baroque* (1993).

The Baroque, argues Deleuze, is not simply an aesthetic style, but rather refers to an "operative function" (p.3) that dissolves or encompasses material space. "Baroque machines" do not differentiate between interior/exterior, sky/earth, organic/inorganic, the baroque is in continuous movement defining a condition of being/becoming that "twists, and turns its folds, pushing them to infinity" (p.3). The Fold is everywhere in the world, an intrinsic aspect or element of matter. Individually folds are characterised by their uniqueness and are folded differently to constitute matter as a continuum of pleats. Its concept conceives of matter as a multiplicity, infinitely complex and continuous, that is impossible to formulate in terms of division, solidity or sets of lines/points, insides and outsides; the condition of matter or objects is thus one of fluctuating processes, "vaporous fluid...different flows and waves". infinitely "porous, spongy or cavernous texture" (p.5). Deleuze comments:

> The new status of the object no longer refers its condition to a spatial mold — in other words, to a relation of form-matter — but to a temporal modulation that implies as much the beginnings of a continuous variation of matter as a continuous development of form.
> (Deleuze 1993, p.19)

The Fold is non hierarchical and morphogenic, unfolding is "thus not the contrary of folding, but follows the fold up to the following fold" (p.6): i.e. serves to open up, generate, unveil another. Through "a system of complex interactions" (p.6), matter spreads out everywhere is always in motion and endlessly folded; its processes are not those of "tension-release, contraction-dilation", but "enveloping-developing, involution-evolution" (p.8). This pleated universe has no centre no organising hierarchy or structure, but embraces and is defined by multiplicity/flux:

> Everything moves as if pleats of matter possessed no reason in themselves. It is because the Fold is always between two folds, and because the between two folds seems to move about everywhere. (Deleuze 1993, p.13).

Deleuze continues his explorations of in-between states, irreducible flux, and states of becoming, in his later collaboration with Guattari, first published in 1987 the encyclopaedic, *A*

Thousand Plateaus, in which they introduce the metaphor of the rhizome. The rhizome is an idea borrowed from biology describing a type of root-like plant which has no central structuring root system but which moves out as a series of nodes and intersections that establish themselves as an anarchic de-centred spreading structure. In the philosophical sense meant by Deleuze and Guattari, the rhizome is a proliferating machine, functioning according to principles of connectivity and heterogeneity. Its non-linear structure is contrasted with "arborescent" (p.20) linear or tree-like structures, or hierarchical modes of being, that are representative of "state apparatus" or control (p.474). The rhizome is characterised by continuous movement, it is a deterritorializing mechanism, that functions to connect many disparate lines of thinking, behaviours and modes of being in order to establish new structures and possibilities:

> It is composed not of units but of dimensions, or rather dimensions in motion. It has neither beginning nor end, but always a middle (*milieu*) from which it grows and which it overspills...The rhizome is an acentered, non hierarchical, non signifying system without a General and without an organising memory or central automaton, defined solely by a circulation of states.
> (Deleuze and Guattari 1999, p.21)

In terms of spatial characteristics rhizomatic space is "smooth", arborescent space "striated". Smooth space is open ended, in continuous movement, striated space is "Euclidean" (p.488), functioning to organise territory into controlled and productive modes. Highly compartmentalised and gridded, striated space regulates the complexity and fluidity of the world through transformation of it "into a city"(p.440). In contrast rhizomatic smooth space is "opposed to Euclidean space" (p.371), being a "machinic force that multiplies its effects in pursuit of infinite movement" (p.498). Akin to Lévy's description of the deterritorializing effect of networks, it arises via the social interactions of its inhabitants, i.e. is generated through actions and is not pre-formed (arborescent) — a dynamic described as "nomadic". In the chapter *Treatise on Nomadology: The War Machine* (Deleuze and Guattari 1999, 351-423), the status of the nomad is proffered as a concept opposed to the organising inclinations of State apparatus. Nomos space is smooth, it is within these rhizomatic zones, that the nomad operates, emerging, receding, and performing acts of deterritorialization on the

striated, rigid, hierarchical, formations, of State space. Nomads are network operators, traversing linking and constructing space. Shifting attention from defined place to gaseous liquidity, smooth space is actualised by nomadic social operations, it is fluid situated in and formed by time based interaction, constantly transforming in relation to context.

6.2.23 Summary

There can never be a direct correspondence, or "one to one" mapping between creative practice and the ideas presented, as that would relegate artworks to status of illustration and similarly assign a complex set of theoretical ideas to the status of descriptive reportage. As such the relationship between the presented ideas and creative practice occurs through a metaphoric and aesthetic proximity, that relates material on an allegorical level, whilst respecting their different conditions of language and disciplinary contexts. The above ideas are derived from a disparate knowledge base, but share with *Reconnoitre* an examination of non-linear forces and modes of being, and an interest in the deterritorializing effects that communication technologies have on spatial organisation.

The production of *Reconnoitre* orientated creative practice toward a provision of contexts for outgrowth, change and transformation, signalling a methodological shift away from calculations of form (gridded, striated space) and toward an examination of the fluid structures that arise from and are contingent on social morphology. The proximity of the ideas reviewed to the initial aims of *Reconnoitre* may be articulated on a number of levels, as summarised in the table below.

Aims of *Reconnoitre*	Metaphoric corollaries
Not a simulation of a pre-existing environment	An itinerary of events describing activity in a space, not a map of a place. Auge's "non-place". Castells city as process. Like a language; a knot of forces, a question rather than a particular statement, a potential space not a simulation (Lévy's virtual).
It would directly allow the user to perform or construct the environment as a process, through interaction with external agencies in a social network.	Lévy's deterritorialized virtual company formed wherever its employees are situated. Deleuze and Guattari's space forming restless nomads. Eco's "aesthetic machine" that relies on the creative input of the audience for its subsistance.
Structurally suggestive of the informational flow and social communicational flux of the Internet.	A fluidity of space as opposed to a fixed delineated set of elements. Deleuze and Guattari's smooth rhizomatic vs. state defined Euclidean/striated space. Castells "space of flows".

Table 2: Summary of identified corollaries between creative practice and theory based research.

6.2.24 Connectivity and environmental generation in *Reconnoitre 2.0*

In *Reconnoitre 1.0* a connective principle had already been established: the user generating a material configuration through interaction/communication with the web spider. While in itself this provided interesting results ultimately the material environment was felt to be overly static. A solution lay in extending the connectivity described by the interaction between the user and web spider into the environment itself, by employing "bottom-up" or emanative processes to metaphorically allude to the temporal dynamism and social morphology operative within/throughout the Internet

A wide number of phenomena display the "bottom up" processes capable of producing emergent structure. At the more complex end of the scale a biological model able to literally breed structure was considered as one possible solution, but was abandoned as being overly complex (if not metaphorically inappropriate). Eventually a solution was settled on that would simulate simple electrostatic forces (repulsion and attraction through positive and negative electrostatic charge). The behavioural model was derived from a previous project originally developed by Gavin Baily in conjunction with Richard Brown and Jonathan Mackenzie. While in behavioural terms the model was relatively simple, it was felt that its physical characteristics were metaphorically well suited (in terms of the observable effect) to the conception of the project as an abstracted communication environment subject to all manner of invisible communicational eddies and forces. A number of other decisions were made at this time concerning behavioural and visual aspects of the returned material.

The material that the web spider returned would be limited to textual material (i.e. text stripped from Web pages) and split into data fragments (nodes). Each "node" would be endowed with a behavioural characteristic that would enable it to sense and respond to other nodes present in the environment. Visual structure would take the form of wire frame links, that would connect the fragmentary search term fragments in response to certain engendered states. Rather than map the space with an inert structure as had been the case with the "top down" environmental formations of *Reconnoitre 1.0* , the emanative processes operative within *Reconnoitre 2.0* would be on-going, with the environmental wire frame and textual structure in a continuos state of excitation as a result of the interactions operative between

individual nodes. Further environmental variability would be provided by the application of a decay mechanism, a life cycle applied to each node. As nodes entered the environment, the text would gradually become fainter or more dilapidated. The desired effect was to have an evolving textual space, with a characteristic temporal and visual form; variable densities of textual structure that accreted, thickened and decayed cyclically in response to user request and the "bottom up" connective interactions occurring between search term nodes.

A more detailed description of the behavioural model used in *Reconnoitre 2. 0* is given in section 6.2.32.

6.2.25 Multi-modality *Reconnoitre 2.0* as Internet visualisation, search engine and browser

Many of the public responses to *Reconnoitre 1.0* had requested other ways of interacting with the returned search term material. In deciding how this might be manifest, it helped to return to some of the earlier characterisations of the project as a visualisation apparatus, and/or a dysfunctional Internet browser. On the basis that these metaphors suggested alternative approaches to interacting with the Internet two approaches to devising alternative forms of functionality were examined. Initially a "slider" interface suggestive of some form of tuning apparatus (like a radio dial) was developed, that allowed the user to manipulate search terms by influencing their behavioural character (i.e. by adjusting its positive and negative electrostatic charge), or through adjustment of visual characteristics (enlargement, change of colour etc.). While this increased breadth of interaction, it was felt that the functions were not specific to the activity of browsing or the experience of being online, i.e. the relationship between functions and the returned search term material was somewhat arbitrary, being of the kind that might just as easily be found in a standard computer graphics program. Insofar as the project could be said to deconstruct the genre of the "Internet browser" (i.e. by offering an alternative to the normative method of laying out a readable, carefully formatted 2D Web page), it was felt a more suitable raft of functions might arise from further emphasising the characterisation of the project as a "dysfunctional" browser.

The solution lay in the structure of the returned Web page material itself. A Web page consists of a number of elements, some visible (the text and images on the page) and others hidden (the mark-up language 'HTML' that structures and formats the page). An Internet browser necessarily only displays the required image and textual material as the other elements are purely structural. In *Reconnoitre* as the returned text enters the environment it is cut up, rearranged and distributed throughout it. Being less concerned with readability/coherence as with a visual/poetic/phrastic alignment of material, it was felt that an extension of the projects functionality might include further ways of deforming or mixing the textual elements of the Web page with its normally hidden formatting structure (HTML). Taking this as a point of departure a range of functions were developed allowing the user to display both the normally visible text and invisible structuring elements. Further interface adjustments involved allowing the user to type a search term request directly into the environment (thus obviating the need for URL and search term input fields), and simplifying navigation by changing forward/backward, horizontal/vertical movement from 2D interface to mouse based selections.

A detailed technical description of *Reconnoitre's* interface functions and program structure is given in the following section

6.2.26 General description of the project

Reconnoitre 2.0 is an Open GL application written in C++, that combines an interactive 3D virtual environment, a dynamic behavioural model and a web spider search agent. As in *Reconnoitre 1.0* the project is a "client" program allowing the user to connect to the Internet from a remote machine. The program — as is current habit with much Internet based software (browsers, E-mail programs etc.) was released onto the Internet for users to download.

Using the interface at the bottom of the screen, and a mouse and keyboard combination, the user inputs a search request after a flashing cursor that appears centrally in the program's environment window. The search request activates a web spider software agent which searches the Internet for keyword searches. Search results in the form of material stripped from Web pages are returned and represented in environment, i.e. the work streams

and converts text from a two dimensional Web page to three dimensional environment. A number of separate search results can exist in the environment concurrently allowing a spatio-temporal overlaying of search term requests.

The original search request is represented as a "search term node", a keyword that floats in the environment. Search term results pulled in from the Internet are represented as "result nodes" that enter the environment through the "search term nodes". In this sense the search term nodes act as portholes, through which the search results may enter the environment. The nodes (request and result) are endowed with a behavioural model that allows non-scripted interactions to occur between them (described in more detail below). Environmental structure emanates as a result of a network of interactions between the user, web spider, and behavioural characteristics of nodes.

6.2.27 User interaction in *Reconnoitre 2.0*

Aside from the described multi-level interactions between user, web spider and behavioural nodes, there are six levels of user to program interaction in *Reconnoitre 2.0*:

- *Interrogation* of the Internet through keyboard input of search requests.

- *Creation:* the user participates in creating the environment by seeding it with search term nodes.

- *Navigation*: movement through the environment is achieved through use of the mouse. Holding down and dragging the right mouse button allows movement forward or backward, moving left, right, up or down is achieved by clicking and dragging the left mouse button.

- *Scrutiny:* the user may examine returned search material through navigation, pausing and freezing individual search terms by clicking on them with the mouse, changing the scale of the search results; by right clicking on the search term node and dragging. Dragging left and right causes the distance between

results to change. Dragging up and down changes the scale of the text.

• *Filtering:* using the interface at the bottom of the screen the user can select how he or she wants the data to be represented, i.e. as Web page text, *URL*'s, *HTML Tags* or *Meta Tags*.

• *Destruction/modification*: deleting individual search terms, or entire search sessions and re-scaling search term results.

6.2.28 A Description of *Reconnoitre 2.0's* interface

The list below refers to figure 49.

Two dimensional "browser" interface buttons (points 1-7)

1) *Search*: type a search term request where the flashing Cursor appears on the screen and hit the return key. Searches may be single words or phrases. To create a new search click the search button, and the cursor will appear centre screen.

2) *Pause*: pauses dynamics and decay of selected search term; 3) Delete: clears selected search term.

3) *Delete*: clears selected search term.

4) *Metatags*: displays meta description tags from the Web pages of the search results. *Text*: displays text fragments from the search results. *URL*: displays *URL* addresses associated with the search results. *Tags*: displays HTML fragments embedded within search results.

5) *Reset*: resets navigation to a point of origin in front of the search results.

6) *Clear:* removes all search term material from the environment.

7) *About*: displays a help page describing Reconnoitre's interface and different functions (points 1-7 as above).

Three dimensional environment (points 8, 9, 10)

8) Yellow search term node.

9) Grey result node/material.

10) Wire frame links between result nodes.

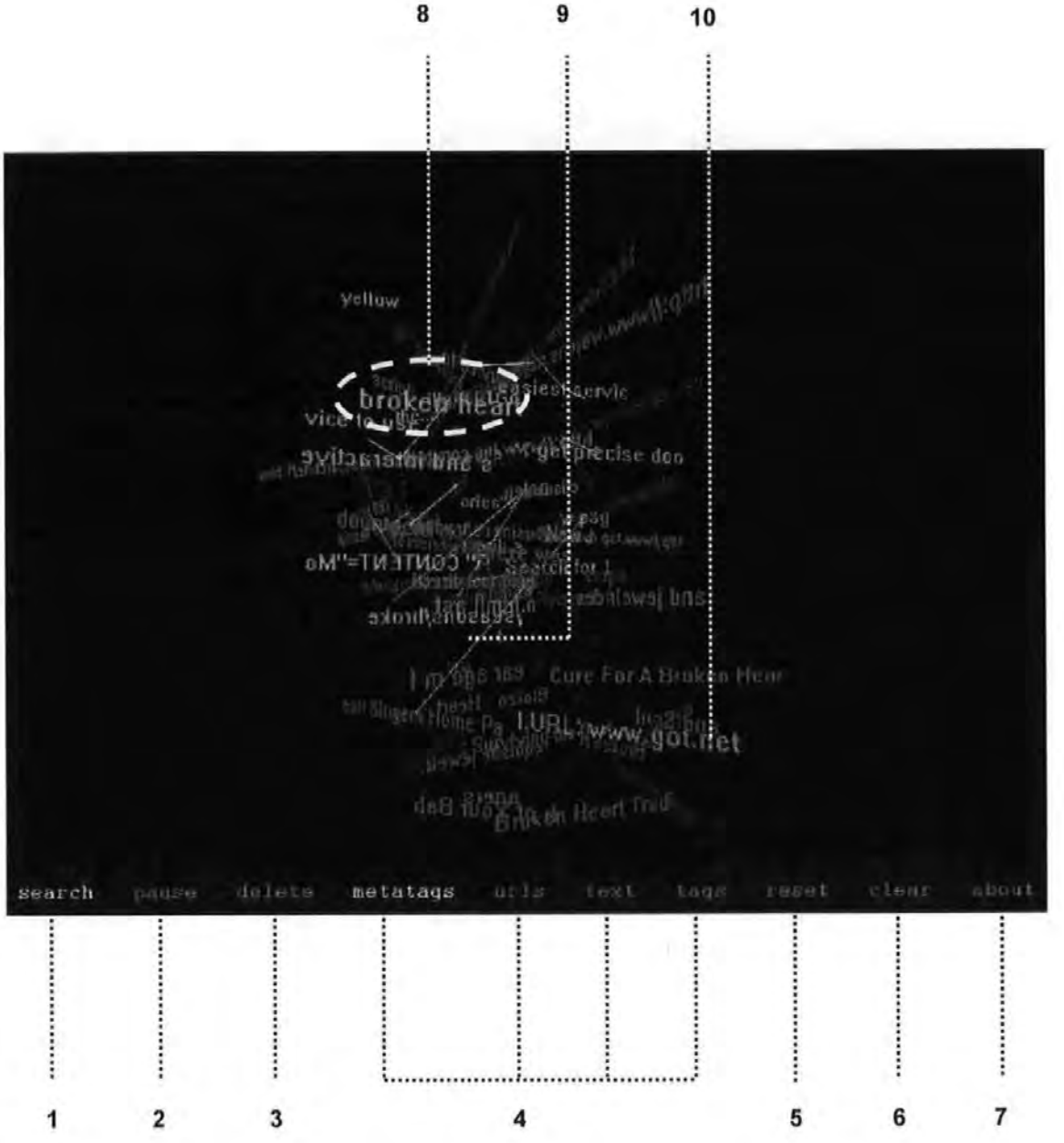


Figure 49: A description of *Reconnoitre's* interface

To prevent disorientation in the environment navigation is constrained within a bounding cone (figure 50) an invisible boundary beyond which the user cannot navigate. If lost a "reset" function also allows the user to re-orientate him/herself within the environment by bringing them back to a fixed point of origin within the environment.

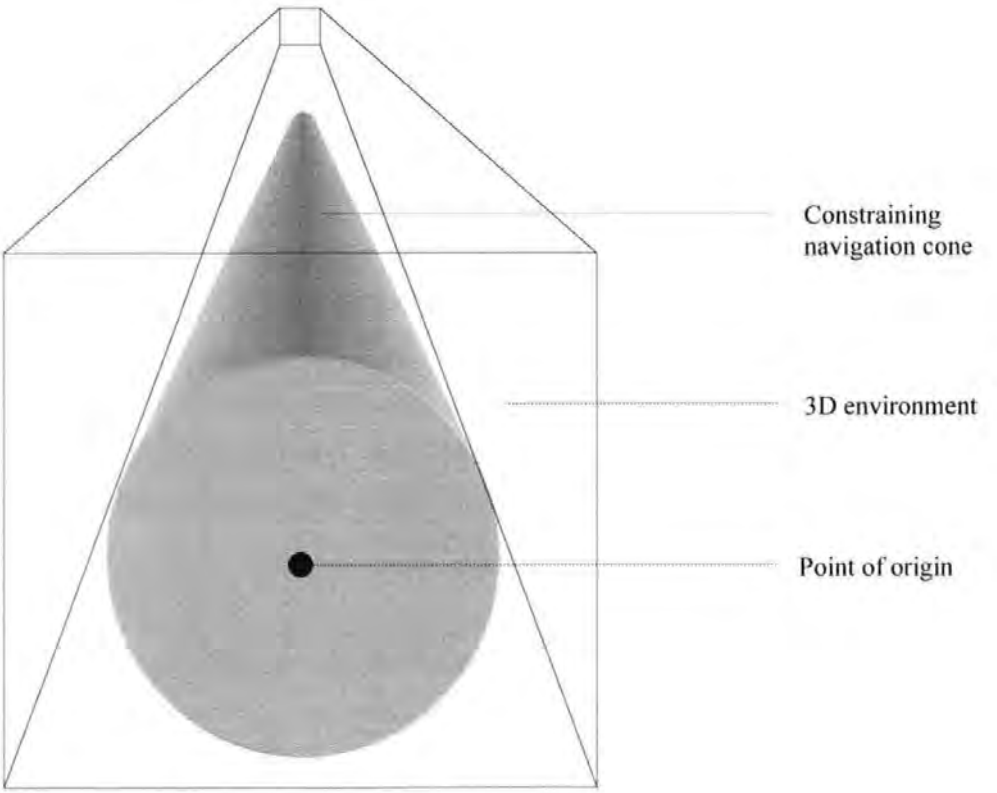


Figure 50: Navigation constraint in *Reconnoitre 2.0*

6.2.29 How *Reconnoitre 2.0* and the web spider interfaces with the Internet

The following list refers to figure 51.

1) A search request is submitted to *Reconnoitre 2.0* which passes it to the web spider.

2) The web spider, interacts with the *Alta Vista* search engine, by passing it the user defined search term and instructing *Alta Vista* to carry out a search.

3) Alta Vista carries out a search of its subject indexes in response to the web spider's request.

4) Alta Vista passes the web spider an HTML document containing a list of search matches, which the spider then returns to *Reconnoitre.* This document does not contain the search material *per se*, but is a list of *URL*'s which *Alta Vista* has identified containing material matching the original search request.

5) The parsing mechanism of *Reconnoitre* takes the first "search hit" off the top of the list and sends a request to that documents server to return the document. In this respect *Reconnoitre 2.0* works differently from *Reconnoitre 1.0* in that material from one "search hit" is more than adequate in terms of amount of material returned, the remaining list of *URL*'s returned by *Alta Vista* is discarded.

6) The returned Web page is "parsed" by Reconnoitre: any hypertext links within it (up to a maximum of ten) are followed but only to a link depth of one (figure 52), e.g. if the top level document contains three HTML links, then a maximum of four Web pages (including the original "top level" page) will provide material to be re-presented in the environment.

7) The returned text material is submitted to the 3D environment.

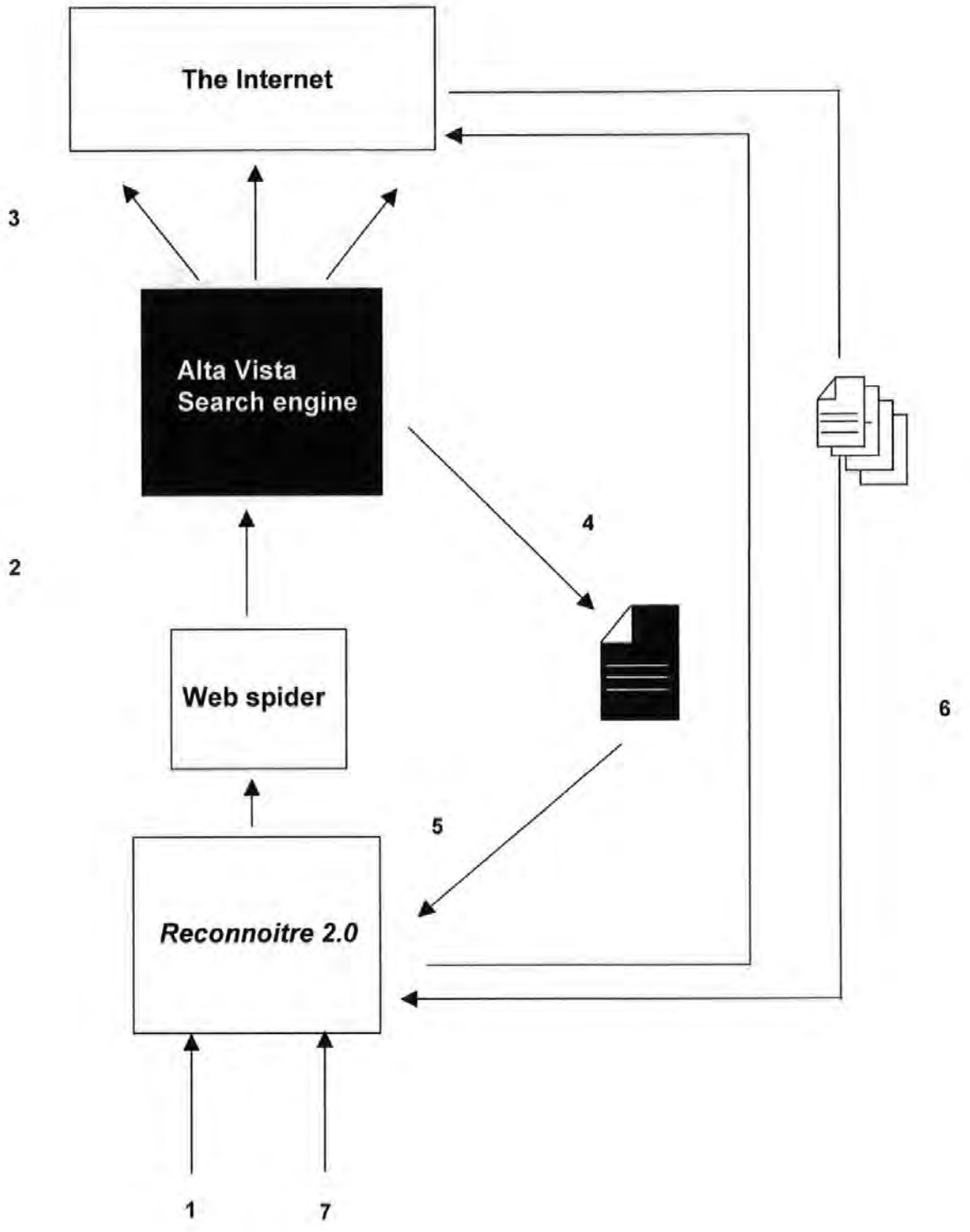


Figure 51: How *Reconnoitre 2.0* and the web spider Interfaces with *Alta Vista* and the Internet

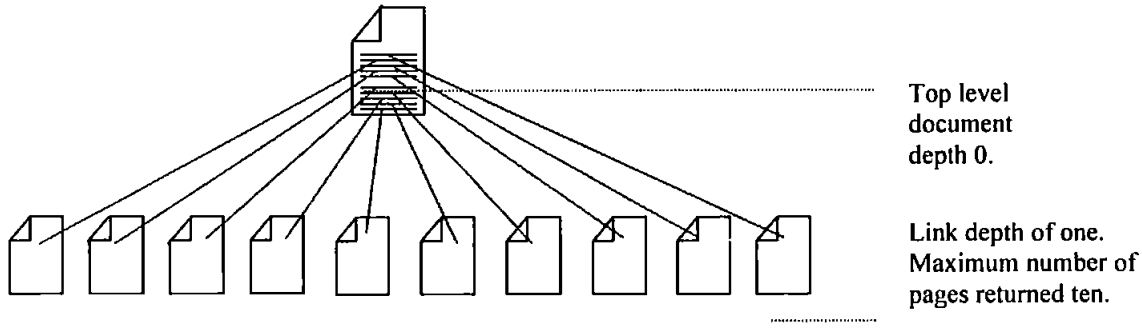


Figure 52: Illustration of depth restraint in *Reconnoitre 2.0* .

6.2.30 How the data is sifted and represented in the environment

The material that constitutes the represented search term results is derived from the different parts that make up Internet Web pages, it may prove useful at this stage to review how such documents are structured before going on to describe how *Reconnoitre* deploys those elements within its environs. Figure 52 shows the normally invisible structuring aspects of a Web page with the different elements picked out in red (*Meta Tags*), green (*HTML Tags*), grey (normal text or content of a Web page). Figure 53 shows how the Web page appears in a normal Internet browser. Points 1 to 3 refer to figure 53, points 3 and 4 refer to figure 53.

1) *HTML* refers to Hypertext Mark Up Language (here shown as green text), the formatting language used to create Web pages. it is normally invisible and takes the form of *HTML Tags* that underpin the visual structure (position, colour size etc.) of text and image material on a Web page, e.g. (US spelling) will centre an item on a Web page, will make an item bold etc.

2) Meta Tags (red text) are special HTML commands embedded in Web pages that provide a keyword description of the content of a Web site. *Meta Tags* give search engines (such as *Alta Vista*) short descriptions of Web pages thus enabling quick identification of the subject area or content of the site.

3) Normal text (grey text) or content of the Web site as visible in browser window.

4) Position of *URL* as input into a normal Internet Web page browser, *URL* stands for "Uniform Resource Locator", the addressing system that describes the location of a Web page on the Internet, e.g. *http://www.bbc.co.uk* would be the address of the BBC's Web site.

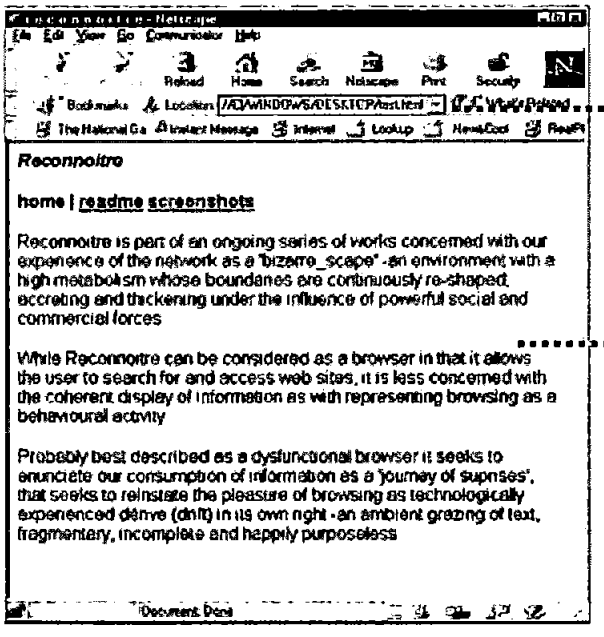
```
<HTML>
<HEAD>

<META HTTP-EQUIV="Content-Type" CONTENT="text/html; charset=iso-8859-1">
<META NAME="Generator" CONTENT="Microsoft Word 97">
<META NAME="GENERATOR" CONTENT="Mozilla/4.04 [en] (Win95; I) [Netscape]">
<META NAME="Author" CONTENT="tom corby">

<TITLE>r e c o n n o i t r e</TITLE>
</HEAD>
<BODY TEXT="#000000" BGCOLOR="#C0C0C0" LINK="#0000EE" VLINK="#664A8B"
ALINK="#FF0000"><B><I><FONT FACE="Arial"> Reconnoitre</FONT></I></B>

<P><B><FONT FACE="Arial">home | <A HREF="rec_2/readme.htm">readme</A>
<A HREF="rec_2/image.htm">screenshots</A></FONT></B>


<P><FONT FACE="Arial,Helvetica">Reconnoitre is part of an ongoing
series of works concerned with our experience of the network as
a 'bizarre_scape'–an environment with a high metabolism whose boundaries
are continuously re-shaped; accreting and thickening under the influence of
powerful social and commercial forces.</FONT>

<P><FONT FACE="Arial,Helvetica">While Reconnoitre can be considered as
a browser in that it allows the user to search for and access web sites,
it is less concerned with the coherent display of information as with
representing browsing as a behavioural activity.</FONT>

<P><FONT FACE="Arial,Helvetica">Probably best described as a
dysfunctional browser it seeks to enunciate our consumption of
information as a 'journey of suprises', that seeks to reinstate the
pleasure of browsing as technologically experienced d&eacute;rive (drift)
in its own right -an ambient grazing of text, fragmentary, incomplete
and happily purposeless</FONT>

</BODY>
</HTML>
```

2

1

3

Figure 53: Elements of a Web page



4

3

Figure 54: Web page.

6.2.31 How *Reconnoitre 2.0* sifts and organises material

The following list refers to figure 55.

1) For each search term input by the user, material from a maximum of ten Web pages is returned.

2) The individual Web pages are then divided into their four constituent elements by *Reconnoitre's Sifting Engine*, (Web page text or content, the separate *URL's* of each page, *Meta Tags* and HTML tags) and split into sets or lists, made up of the sorted elements of the returned Web pages.

3) Aside from *URL*'s (which keep their original length) the sifted elements are randomly chopped up by *Reconnoitre's* "parser" or processor into character segments — between five and twelve characters long. The character fragments are converted into a bitmap image. Each character segment/bitmap constitutes an individual *result node* so while each search request will only generate one *search term node* a single search request may generate a multitude of *result nodes (*dependent on the amount of material/Web pages returned). At this stage both *search term nodes* and *result nodes* are endowed with the behavioural characteristics that constitute the environments behaviour model, this is described in more detail in the next section.

4) Depending on what data type is selected by the audience, material is loaded into the 3D environment.

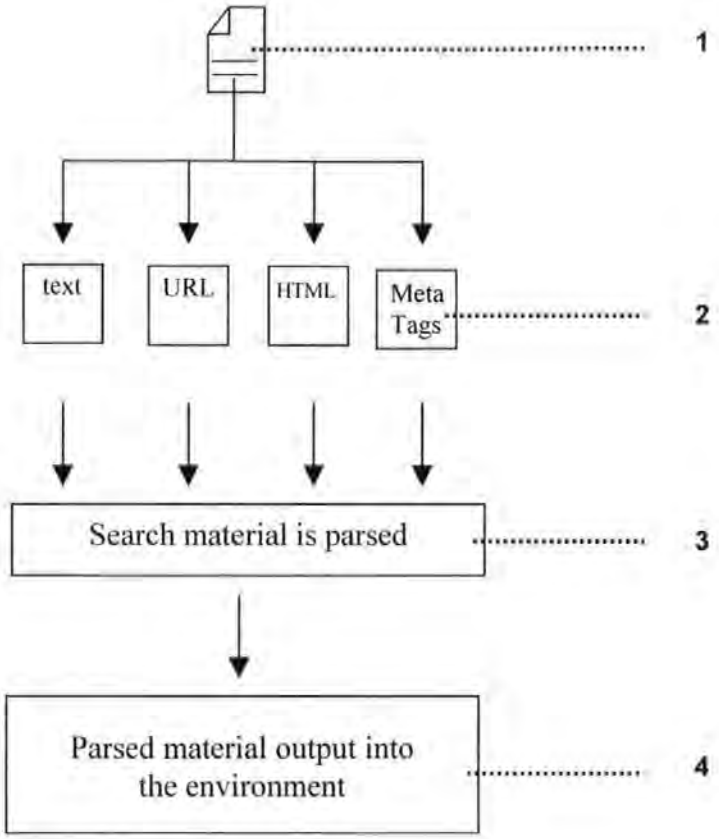


Figure 55: Description of *Reconnoitre's* procedure for ordering Web page material.

6.2.32 The behavioural model

The visible material consists of two types of *node:* a *search term node* taking the form of the word or phrase which the user enters into the search term field of the projects interface, and *the result nodes* made up of the fragmentary character segments derived from returned Web pages. Interactions occur between the nodes as the nodes are endowed with attraction and repulsion dynamics. The behavioural model consists of 2 forces: repulsion (negative charge) and attraction (a positive charge), and is based on the theory of electrostatics, that is, things with opposite, or different charges (a positive and a negative) will attract, or pull

towards each other. Things with the same charge (two positives or two negatives) will repel, or push away from each other. In *Reconnoitre 2.0* search term nodes are static, when the user inputs a search term request they are fixed in place and are charged with both a positive and negative electrostatic charge; result nodes are mobile they are charged with a negative electrostatic charge and also have a repulsion dynamic. The result node's repulsion dynamic is linked to its mass/size, which decreases or decays through time, meaning that the repulsion dynamic weakens in accordance with its decay rate.

6.2.33 Interaction between result nodes and search term nodes

As the result node enters the environment its repulsion dynamic initially pushes it away from the search term node. As its mass decays, its repulsion dynamic weakens and an uneasy structural equilibrium is established in response to the simultaneous positive and negative electrostatic forces of attraction/repulsion that operate between the result node and search term node.

6.2.34 Decay model

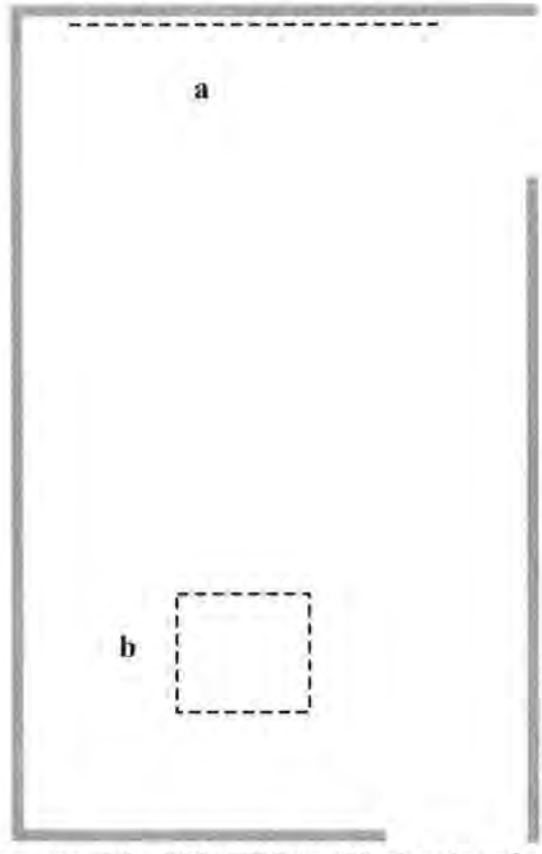
The result nodes have a life span, set randomly between an upper rate of 60 seconds and a lower rate of 20 seconds. Each node decays throughout its life span (thus affecting its repulsion dynamic). The decay rate (speed) for each node is the same irrespective of its life span. Decay functions by stripping random numbers of pixels from the represented bit mapped text, when all the pixels have been stripped from the image of the text, the node has reached its point of optimum decay.

6.2.35 Links

The links are metaphoric visual links, and are not connected to the structure of the Internet *per se*. The linking between node fragments is triggered by the decay rate of the result nodes. Links are made randomly between decaying nodes, after 25% of the nodes lifetime, links are broken after 75% of the nodes lifetime.

6.2.36 *Reconnoitre 2.0* exhibited in Dresden, "COMTEC ART 99"

The exhibition of *Reconnoitre 2.0* at "COMTEC Art 99" provided an opportunity to examine the success or otherwise of the changes implemented in the second version of the project. The artist/researcher was in attendance on a number of occasions in order to observe and aid visitors in using the work. As had been the case with *Reconnoitre 1.0* users were approached and asked whether the would participate in a further discussion of the project by emailing their reflections and comments on it. Possibly due to language difficulties this met with only partial success. Notwithstanding this, some interesting comments were received, some of which are referenced below. A selection of other email responses may be found in the appendix.



a. Projection screen

b. Plinth, supporting, projector, keyboard and mouse

Equipment used:

Siemans Pentium III, tower computer. Oxygen Labs 3D graphics card. Operating system: NT 4 service pack 4, digital projector.

Figure 56: *Reconnoitre 2.0* at "COMTEC Art 99", plan view of exhibition space.

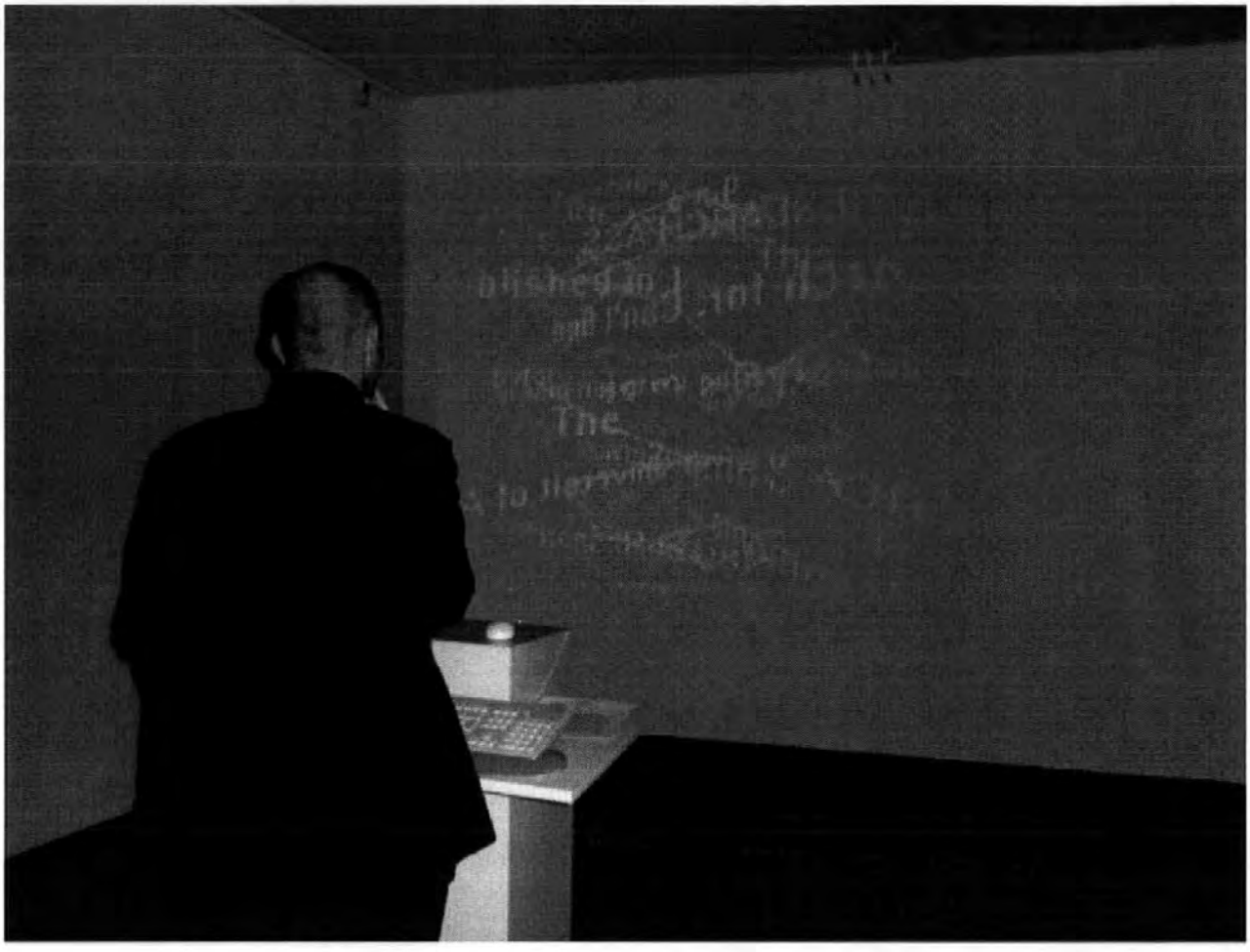


Figure 56 : Installation shot of *Reconnoitre 2.0*. Dresden, November 1999.

6.2.37 *Reconnoitre 2.0*, observations, feedback and reflections from "COMTEC Art 99"

A number of insights were derived from exhibiting the work in Dresden. Generally speaking visitors appeared to have little difficulty in navigating the interface and discovering the work's functions: some limiting themselves to inputting search terms content to passively observe the unfolding environment; others exploring the functional possibilities offered by the project in more depth. A number of users reported intense and intimate and immersive confrontations with the project:

> *Reconnoitre* is: poetic, metaphoric, imaginative, interactive, soft, slow, gentle, feminine, attainable, fluent, quiet, curious, light, generous, safe, intense, beautiful. (Slovenian Internet artist, email received December 5th 1999)

This (entirely unexpected) by-product of removing the URL field and limiting user input to specifying search term requests, meant that visitors searched for specific and sometimes highly personal information. In a very direct way the work could be said to mirror the desires, and interests of the user by functioning as a reflective surface onto which an autobiographical form could be projected/generated. Another positive phenomena involved the degree to which groups of visitors participated in extending the interaction possibilities of the work into a social sphere. Typically this would involve the nomination of a user/operator who would be "fed" search petitions by a group and be responsive (or otherwise) to further requests for navigation and/or manipulation of the returned search results. In this instance the project functioned as a participatory channel; an expansion of a groups social or communicational environment, and/or a structural record of the groups disputes, agreements and negotiations. Most gratifying was that the project operated and was accessible on different levels; rewarding different approaches/forms of use, and groupings/types of user. This aspect of the project's "openness" was also commented upon:

> I liked that I could make the work do something in a couple of ways. Not only that it replies to what I type in but also that it changes its form/certain parameters without losing its basic features. Maybe I liked this balance best. It

> makes the work lyric somehow: it plays with my perception on the theme I gave it...That is really what I liked most. The work is playful in a somehow gentle manner. (German student, email received February 23rd 2000)

This level of engagement occurred as a result of the unpredictable and wilful interactions occurring between the different forms of agency operative in the work. As, such the reported responsive or playful sensibility, may be considered a manifestation of "social presence" as described in chapter 4.
Interestingly the fact that the environment was a 3D virtual space was rarely commented upon. While it is difficult to draw any definitive conclusions as to why this was the case, we may speculate that it can be accounted for by the fact that the project's spatial manifestation occurred primarily along the temporal axis as a result of interactivity. As such, the user's focus of attention was shifted from a navigation of a pre-built environment, toward the processes from which structure issued, i.e. interrogation of the Internet, connectivity, and confrontation with returned search term material. Insofar as users had responded to the work positively, being able to engage with it on both an intuitive and functional level, the artist/researcher considered that the project had demonstrably met its initial aims, i.e. to explore alternatives to the normative paradigms for composing virtual environments by exploiting a process based approach, reliant on high degrees of user involvement and interaction.

6. 2.38 *Reconnoitre 2.0*, summary and discussion

> No line separates earth from sky, which are the same substance; there is neither horizon nor background nor perspective nor limit nor outline or form or center...There exists a nomadic absolute, as a local integration moving from part to part and constituting smooth space in an infinite succession of linkages and changes of direction. It is an absolute that is one with becoming itself, with process. It is the absolute of passage, which in nomad art merges with its manifestation. (Deleuze and Guattari 1999, p.494)

Reconnoitre 2.0 evolved out of, and in response to the identified strengths and weaknesses of *Reconnoitre 1.0.* By balancing functionality (being able to "do" things), with a quieter, reflective engagement (being able to watch/be absorbed/immersed by/in the evolving environment), the project confronted the user with a hybrid set of interactive possibilities that mixed a poetic, emergent representation of the deterritorialzing rhythms of the network, with interface and functional modes derived from Internet browsers and search engines.

Insofar as it possessed no initial geometry or predetermined modelled structure of its own the project was a *tabula rasa,* reliant on social interaction and informational flow occurring beyond its immediate boundaries and the control of the artist/researcher for its material manifestation. *Reconnoitre* unlike earlier projects (e.g. *Bethlem)* continuously assembled and recombined material, to produce new form by reflecting and responding to a network of interrelated forces and agencies: the idiosyncrasies of individual users, the traversal of the web spider, and evolving flux of the Internet itself. In wider terms, i.e. within the context of the research project, *Reconnoitre* had sought to provide an alternative to a dominant mode of virtual environment, (the "world as model"). Compositionally this involved prioritising the organisation of processes by favouring actions and connectivity over modelled objects and spatial allocations. The difference this describes is a significant one in terms of user interaction. Allocated Euclidean space formats interactive possibility by guiding and channelling navigation in a pre-formatted architecture. In contrast *Reconnoitre* confronts the user with a situation that draws out a less rigidly directed and more creatively inclined engagement. Rather than preceding interaction, structure is coupled to and reliant on, action/agency/time. Filtered via acts of connectivity between communication points in a "nomadic" network, user engagement is less concerned with mobility between defined points in space, as with an increased opportunity to engage in a "world building" process by which the artwork is actualised, dispersed and distributed throughout a social network.

A more detailed analysis of this aspect of the project is given in the following chapter, in which a comparison *Bethlem* and *Reconnoitre* is used to explore some metaphors for interaction in computer based artworks and develop a framework within possibilities for creative practice employing virtual environment technologies may be situated.

[9] It is suggested that the accompanying video is viewed in parallel with reading this part of the thesis.

[10] FTP stands for file transfer protocol. FTP allows you to copy files from a remote computer to another computer over a network, such as the Internet.

[11] See: Allderidge P. 1997. Bethlem Hospital 1247-1997: A Pictorial Record, Chichester: Phillimore.

[12] See: Burrows A. and Schumacher I. 1990. Portraits of the Insane: The Case of Dr. Diamond. London: Quartet Books

[13] Foucault used the Panopticon as a metaphor to explore how people carry out acts of self regulation in contemporary societies. He observed that control no longer requires physical domination in the form of prisons, but occurs through the constant possibility of observation. People police themselves because they feel that at any one time they may be watched and therefore have to act properly to prevent punishment. (See Foucault M. 1991. Discipline and Punish: The Birth of the Prison, London: Penguin).

[14] There is a large amount of literature devoted to identifying different genres of computer games. Manovich (1998) lists six basic types: adventure games (*Tomb Raider, Myst*), strategy games (*Command and Conquer, Sim City*) role-playing games (*Diablo, Final Fantasy*), action games (*Hexen, Mario*), flying, and driving, simulators (*Microsoft Flight Simulator*) and most relevant to this particular study, three dimensional virtual environment games, often called "shoot em ups" (*Quake, Doom*). Each genre of game will follow different conventions, e.g. the user of an adventure games, explores the game, gathering resources, strategy games engage the user in organising tactics and resources, role playing games are more conventionally narrative in structure treating the user as part of the ecology of the game. (See: Manovich L. 1998. "Navigable Space", [Internet], University of California San Diego, available from: <http://jupiter.ucsd.edu/~manovich/>, [Accessed 2nd March 2000]. A more detailed study is offered by Peirce (1997) who focuses less on genre than on how games structure the balance between difficulty of completion and the potential for resolution of its puzzles. She lists a five-fold framework: the game must have a goal, made evident to the user at its outset. Games must posses a set of impediments to achieving that goal. Players must be able to have access to certain external resources that help in achieving the set goals. During the playing of the game the player may be rewarded or penalised through either overcoming or failure to overcome a set impediment. Rewards and penalties are different types of consequence. Within the game there is information known to different individual players, information that is known to all the players and information that is private to the game. A successful game according to Peirce combines a balance between all the identified elements within the overarching narrative or "gamespace" of the environment. See:

Peirce C. 1997. The Interactive Book: A guide to the Interactive Revolution. Indianapolis: Macmillan Technical Publishing. See also: Crawford C. 1995. "Lessons from Computer Game Design", The Art of Human Computer Interface Design, Laurel B. (ed.), Wokingham: Addison Wesley.

[15] For a comprehensive overview of Internet based search engine technologies see: The Web Robots Database [Internet], available from: <http://info.webcrawler.com/mak/projects/robots/robots.html > [Accessed 12th Febuary1998].

[16] Software described as "open source" is freely distributed code that the author allows other users/programmers to modify or reuse. The web spider used in *Reconnoitre* was downloaded from the Internet and was written by Jef Poskanzer.
ACME Laboratories, [Internet] available from:
<http://www.acme.com/java/software/Acme.Spider.html> [Accessed 5th April 1998].

[17] Java is an object-oriented programming language.

Chapter 7: Interaction and computer-based art

7.1.1 Introduction

In chapter five some descriptions of interactivity and its structural and symbolic relationship to the environment were reviewed and discussed. Following this themes and issues arising from studio based work were outlined, and complementary concepts from other disciplines, suggestive of an alternative approach to the composition of virtual environment artworks identified.

In order to flesh out and contextualise these emerging threads, it may prove useful to relate them to some earlier classifications of interactivity, which while not specifically oriented toward virtual environments proper, are more directly concerned with structural issues pertaining to interaction within computer based artworks. The review is presented chronologically starting with Roy Ascott's identification of "behavourist" art from 1966 and ending with a more recent taxonomy of types of interaction as proposed by Graham (1997) . Following this corollaries are identified between the reviewed groupings of interactive art, and both emerging creative and theoretical strands of research [18].

7.1.2 Some models of interactivity in computer based art: Ascott, Cornock, Malina, Wilson, Rokeby, Bell and Graham

In 1966 Roy Ascott recommended the development of a "Cybernetic Art Matrix" to provide a supportive framework for the technological and social development of artworks that displayed "evolving and behavioural tendencies" (p.247b). Ascott had identified an increasing tendency in the plastic arts that exploited formal instability, ambiguity and polemic to posit possible new relationships between artist, artwork and audience. This led him to divide art into two categories: "deterministic...centered upon the

structuring of 'composition', of facts, or concepts"(p.248b) and "behavourist" the necessary conditions of which were that the spectator would in some way be involved in a situation whereby the artwork behaves:

> A feedback loop is established so that evolution of the artwork/experience is generated by the intimate involvement of the spectator. As the process is open-ended the spectator now engages in decision making play. (Ascott 1966, p.249b).

Cornock and Edmonds (1973) built on Ascott's earlier definition by describing an art system as either "static" resembling a "declaration by the artist" (Ascott's deterministic), or "dynamic" (Ascott's behaviourist) more akin to a conversation between artist, artefact/artwork and audience. The classification was developed to generate an appropriate language of analysis to describe the new communication possibilities offered by artworks that employ audience participation, time based strategies and computer systems. Cornock (1977) later modified the classification further sub-dividing dynamic art systems into reciprocal, participatory and interactive (figure 58):

> Dynamic art system...defined in the organisational dependence of the artefact on some environmental variable(s).
>
> Reciprocal art system...the user precipitates changes of state within the system. Participatory art system...the interpersonal reactions of a group of participants to a situation specified as a "matrix".
>
> Interactive arts system....exists in a mutual exchange between man and machine, but the successive states through which it passes are elaborately related on either side of an interface....if the artefact is to take the initiative, and is to decide on the basis of circumstances to move to this state rather than that one, then it must be endowed with intelligence...An interactive art system has within it an artefact so organised as to be able to sustain a conversation with the user approaching the kind of conversation we witness between people. (Cornock 1977, p.8-12)

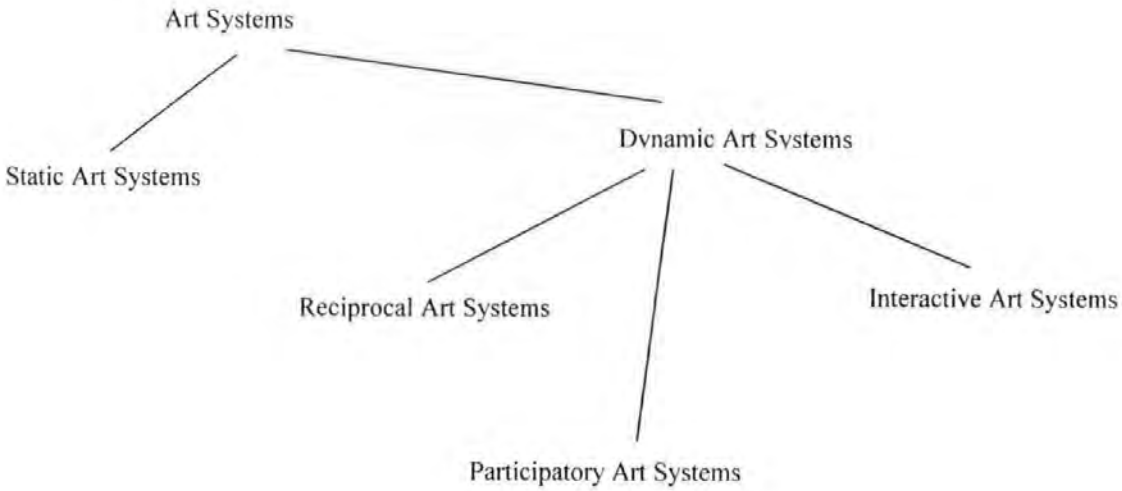


Figure 58: Classification of art systems according to the "static's and dynamics of organisation", after Cornock 1977.

Cornock adds a further hierarchical subset to the category of the interactive art system:

> Level one-The Individual
> Level two-The small group
> Level three-A culture
> Level four-Cross-cultural interaction

The subset reflected Cornock's belief that any consideration of an art system should also be inclusive of a variety of differing types and groupings of user.

A number of categorisations of have been proposed since Cornock, notably Malina (1990), who identified the following capabilities of a computer that might be exploited in the production of interactive art:

> 1) The possibility of carrying out interaction in real time mode, which alters the internal status of the computer;
> 2) The computer's capacity for having learning processes built in so that the internal status of the computer alters while interaction is taking place;
>
> 3) The possibility of linking up the computer with other computers over long distances via telecommunication networks;
>
> 4) The capability of incorporating and assimilating signals with a multitude of modes not all of which are accessible to the human senses, and to link these signals in a sensual, aesthetic way;
>
> 5) The capacity to store vast amounts of information which can then be made easily available. (Malina quoted in Schwarz 1997, p.50)

He expressed a preference for works in which the interactions were open-ended, describing the rule system of such works as being akin to a generative code embedded in the software. Such works he argued, provide the potential for open-ended interactions the processes being of such a complex nature that the that their outcome was unpredictable and different from the initial artwork created by the artist.

A more extensive taxonomy devised as a pragmatic guide to aid artists is proposed by Bell (1991). Following Malina's observation that some interactive works produce unpredictable open-ended interactions, Bell divides works into two types: those whose internal state is reset or returned to its initial condition after use and those whose internal state evolves through time permanently changed through the interaction of the user (figure 59).

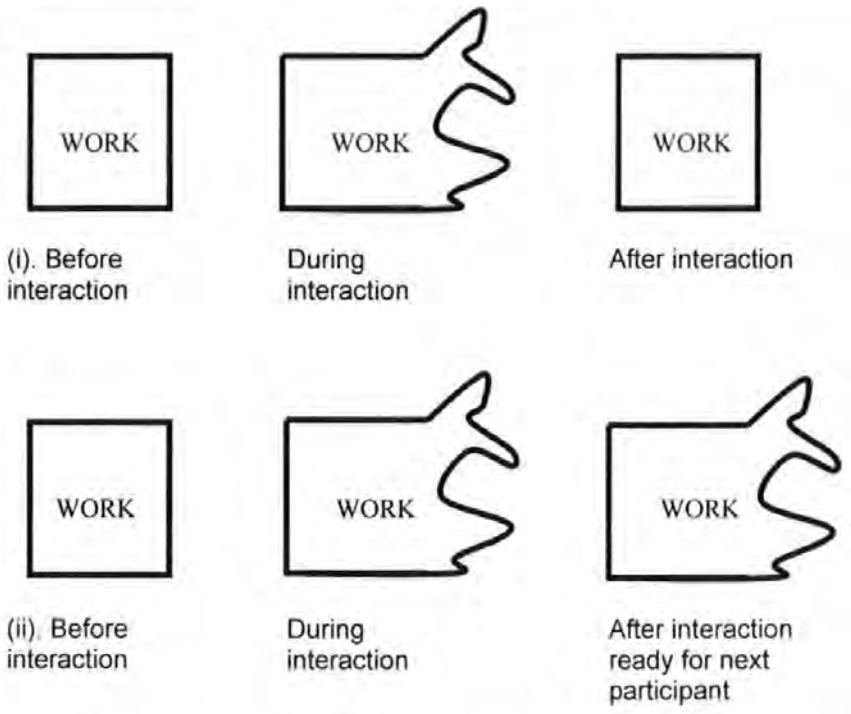


Figure 59: After Bell 1991. Comparison between works which are reset after use and works whose transformation is passed on to the next user.

> The artist can be considered as a participant who has a considerable degree of control when a work is initiated and through its initial development: determining the degree and manner of control to retain in the final realisation of the work, how much will be delegated to the computer and how much to the other participants and how these degrees and manners of control may vary during participation. (Bell 1991, p.180-202)

Bell describes the control afforded to the various participants within an individual artwork as being comparable to the way in which characteristic features in the real world may delineate the choice of pathway, or activity that a user may be able to pursue:

> Characteristic features of the actual world, like hills, lakes, forests etc. can be identified are analysed and, to some extent are composed...it is necessary to map out the routes taken by individual participants to identify, analyse and compose the characteristics of complete works...In works that allow participants more freedom, their behaviours can be expected to be more idiosyncratic (they may ramble all over the countryside). In works that effectively have routes restricting participants' options their behaviours will conform more...(they have to keep to the paths). (Bell 1991, p.204).

While not discussing virtual environments *per se*, Bell's use of the actual world as a model for interaction emphasises how different forms of environment may either restrict or allow user behaviour, usefully highlighting the context specific nature of interaction as both a symbolic and structural form. Wilson[19] eschews descriptions of interactive environments preferring to focus on the relationship between interaction and different forms of user activity:

> Presence...someone has to turn on the computer and start the program... Simple Choice: The user can select a particular event to engage... Choice of Option...the user is systematically presented with arrays of choices... Search for Interaction Possibilities... the user must actively search...

> Contributory: The user can add to the array of choices available to the system... Authoring: The user can actually add new capabilities to the system.
> (Wilson 1993 [Internet])

He argues that increased user control over content in interactive media may "lull users to complacency through a charade of choice" noting that greater user choice does not automatically increase the quality of the experience. In a similar vein Rokeby (1995) throws claims as to the supposedly democratic nature of interactive artwork into critical relief, by itemising differing types of interactive artwork in terms of control structure.

> *Navigable structures*... The artist structures this space with a sort of architecture and provides a method of navigation... a guidance system through which the trajectory of the user through the work may be subtly controlled...*Limited media*... The artist enables the interactors to express themselves creatively. *Transforming mirrors*...the mirror transforms the interactor's gestures largely by amplification. *Automata*...automata survey and manoeuvre through their environment, of which the spectators are only one aspect.
> (Rokeby 1995, p.138-151)

He pointedly remarks that the supposed freedom allowed through the choice structures of interactive media are "a representation of freedom, a symbolic freedom" that exist only in relation to structures established by the artist. (p.141). Graham (1997) in a more recent taxonomy also enlists metaphor. She reinterprets Cornock's earlier classification of artworks as either static or dynamic, by employing a natural language metaphor of conversation to posit work as either "Uninterrupted Monologues", or "Verbal Exchanges". Verbal Exchanges being further sub-divided into three different conversational types:

> *The 'Talking' Car:* such as the simple computer in some cars which, if the ignition is turned on and the seat belt is not fastened, will tell you to fasten your seat belt. If a dog turned

> on the ignition, it would do the same...The artwork equivalent would perhaps be a kinetic sculpture where lights whirled around if a viewer approached.
>
> *Voicemail:* automatic telephone answering systems that take the user through a series of branching conscious choices...The artwork equivalent would perhaps be an interactive CD where pathways are chosen by clicking, or a VR environment were the viewer chooses spaces to move through.
>
> *Hosted Chatline:* some telephone services provide a pre-recorded 'host' to introduce people from relevant parts of the country, or by simple gender choices, but also provide opportunities for people to talk to each other...The artwork equivalent might be an Internet-based work structured so that each visitor can leave a message/image in response to the artwork, and can read and respond to or manipulate other visitor's comments/contributions.
>
> *Real Conversation:* an evolving, unpredictable exchange of ideas. (Graham 1997, p.45)

Graham's primary interest was in elucidating the relationships between artwork and audience; she helpfully points out the futility of attempting to classify an object as intangible as an artwork and characterises her approach by a desire to provide a tool for critical analysis. In this spirit the inclusion of the last category "real conversation" is included to encourage a critical view of interactive computer based artwork, "a check against the unrealistically 'grand claims' made for interactive computer-based art". Questioning whether "real Conversation" is an attainable goal she states:

> Such a mythical program would need considerable social skills in order to assure that actual interaction managed to take place...those highly complex tasks that even humans manage with difficulty seem well beyond what can ever be managed by a computer program. (Graham 1997, p.48)

By expressing doubts as to whether the category of "real conversation" will ever be attainable, Graham usefully places the claims for highly developed forms of interaction within a critical

framework. The categories themselves are easily understandable, but a measure of agreement was felt with Graham when she questions the appropriateness of a metaphor that relies on conversation to describe interaction between user and artwork in a visual art context. Her description of different conversational partners, ranging from the relatively moronic talking car, to the fully-fledged (and no doubt perfect dinner companion) personality "real conversation", describes a symmetrical relationship between audience and artwork, a dialogue between two entities. Setting aside the fact that we might consider the conversation to be taking place between the audience and artist as well as any potentially highly developed art system, one wonders what a conversation with an artwork containing multiple entities might be like?

Implicit in many of the above descriptions of interactivity, is the notion of a cognisant, responsive machine; an intelligence re-embodied in a computational edifice. The category of "real conversation" revisits classical approaches to Artificial Intelligence research and is reminiscent in some respects of Joseph Weizenbaum's, *Eliza* program. *Eliza* developed between 1964 and 1966 was a language analysis program with which one could converse in English. The human user would input his/her part of the conversation via a keyboard, and the computer would analyse the message and output a written response onto a screen.

The program assumes the persona of a psychotherapist, whose questions are always rhetorical, i.e. designed to impel the user toward a self directed realisation and resolution of their problem. *Eliza* functions by applying a series of "canned" responses that are triggered by certain keywords. While initially the conversation can be reasonably convincing, Eliza's limitations (and status as a programmed entity) can be easily exposed by asking it a question it does not have a ready made response to. Weizenbaum's reasons for developing *Eliza* were humanistic, rooted in a critique of some of the ethical and psychic consequences of developing simulations of human intelligence.

For Weizenbaum the issue of whether a computer is capable of displaying the level intelligence necessary to fulfil Graham's criteria for "real conversation" was not a question of if it was technologically possible, but whether it should be even be attempted.

> What I conclude here is that the relevant issues are neither technological nor even mathematical; they are ethical. They cannot be settled by asking questions beginning with "can." The limits of the applicability of computers are ultimately statable only in terms of oughts. What emerges as the most elementary insight is that, since we do not now have any ways of making computers wise, we ought not now to give computers tasks that demand reason.
> (Weizenbaum 1984, p.227)

Aside from the ethical concerns raised by Weizenbaum an anthropomorphic approach to devising interactivity is problematised regarding user expectations of the quality of interaction that the metaphor engenders. These and a number of other issues have long been debated within research into human computer interaction, some of which are examined in more depth in the following section.

7.1.3 Interaction and computer based agency

Implicit in many of the above descriptions of interactivity in computer based artworks, is the notion of a perceiving intelligence (or creative partner) constituted within a computational edifice. That is the artwork is said to exist at the confluence of two agencies (human and machine), which either acting in concert or through proactively pursing separate agendas, instigate a state change in the condition of the work.

In 1977 Cornock had described the "interactive art system" an apparatus "so organised as to be able to sustain a conversation with the user approaching the kind of conversation we witness between people" (p.9 Cornock). Edmonds (1975), Cornock's research collaborator actually simulated such a system in his *Communications Game* series, using human subjects on both sides

of the interface, a strategy clearly inspired by the Turing test[20] Graham's (1997) later description of different conversational partners, ranging from the relatively moronic "talking car", to the fully-fledged personality "real conversation", also posits a computational entity displaying appreciable "human like" intelligence; Rokeby's "automata" also alludes to systems embodying entities displaying degrees of intelligence or self directed behaviour.

Figure 60:
Toynton's cartoon from the inside cover of the exhibition catalogue for *Cybernetic Serendipity*, the ICA 1968.

Computer-based art which formulates interaction as a mixing or coming together of two different forms of "intelligence" aligns itself; (whether consciously or not) with research into Artificial Intelligence. Traditional or "old school" Artificial Intelligence (AI) research has concentrated on developing advanced level intelligent systems. The emphasis being on modelling a single disembodied entity that like Cornock's description of the "interactive art system" might function as a paradigm of human intelligence [21].This is not to suggest that artists are in the business of building apparatus that might pass the Turing test, but that a palpable attitude that formulates the behavioural dimension of the artwork as a perceiving,

responsive, presence is discernible as an undercurrent in much computer-based art (figure 60) [22]. In terms of considering computer-based agency in virtual environments this poses some interesting questions. While human presence is evidently supported in a virtual environment in the mediating form of a vector co-ordinate or floating camera, is the notion of a singular intelligent entity or agency an entirely appropriate metaphor when applied to the behavioural dimensions of virtual space? And if so what kind of simulated presence can a virtual environment be said to display?

As is the case with anthropomorphic systems, virtual environments may also be subject to attributions of agency on the part of the user. Morse has perceptively described "virtuality" as a state inherently uncanny in the sense meant by Freud — a phenomenon by which objects are attributed with significance or agency that they do not in any real sense posses. Revisiting Lacan she describes a virtual environment as being akin to an artificial intelligence:

> It tracks our every move and constitutes itself as a display in response to the indices of intention, the vectors of body position, gaze, and motion — that is, virtual space itself is interactive. The environment appears to be something 'live' or animate. (Morse 1996, p.227)

While Lacan's excavations of the psychology of the "gaze" and the fantastical descriptions of his encounter with a sardine can, in no way relate to computer based artworks, he articulates what Morse describes as a "common structure of feeling" the sense that the environment partakes of some strange life or animus that transcends its status as an image "that we cannot accept as subject or persona in the traditional European sense, and which nonetheless constantly demonstrates that it sees us" (Morse p.227).

In a virtual environment this attribution or psychological projection (of agency) may be reinforced by the behavioural activity of objects that operate within it. That is, as well as being the subject of a private fantasy, a product of the viewer's psyche — agency in a virtual environment may be formulated as a programmed appreciably observable set of behaviours. As in the real world objects we encounter in a virtual environment may behave more or

less as we'd expect — a stone or brick may just be that, an unresponsive object, if we bump into it , it is programmed to be hard, we might bounce of it, however even the physical if rather limited comportment of such objects must be programmed, objects through their programming are endowed with behavioural traits, Anders (1999) writes:

> Using simulation we'd expect our virtual objects to behave like physical ones. They should display traits of longevity, inertia and mutability. Yet these characteristics can't be taken for granted —they require programming ...Though we interact with these symbols as mute objects, as part of an information environment they communicate with the user and to each other. We could say they have 'lives' of their own. (Anders 1998, p.57)

The programmability of a virtual environment means that every item within it is furnished with some form of behavioural attribute. While at one end of the scale the example of the brick may describe a rather limited possibility in terms communication (It would certainly be hard to attribute agency to such an object), more complex programmed objects may display "life like" autonomous behaviour and be capable of carrying out self directed goal based behaviour.

Such forms of simulated agency were employed in *Reconnoitre*. In order to negotiate and arrange for the transfer of material from the Internet to its environs, it employed a "web spider" a mobile, largely self-directed Internet software agent. Once within the environment the material returned by the web spider was subject to the communication and interaction dynamics of individual semi-autonomous nodes, whose activity underpinned the composition and arrangement of material in space. In employing such entities *Reconnoitre* drew upon a range of over-lapping disciplines which have evolved out of artificial intelligence research: variously described as software agents, multi-agent AI, distributed artificial intelligence, artificial life and robotics [23]. Unlike the approach to simulating intelligence favoured by classical AI, based on the development of a singular complex, disembodied intelligence, a software agent does not necessarily have to be complex or particularly intelligent. Concepts central to agent based systems are

"situatedness", that is agents function within environments (typically computer operating systems, networks such as the Internet or virtual environment simulations) and "embodiment", meaning they are structurally instantiated. Software agents may take many forms, including synthetic anthropomorphic actors , interface agents, (sometimes called "bots" or "robots") that are mobile and "live" in computer operating systems and networks, and simulated biological organisms. Being programmed entities in their own right they are able to perceive and respond to the environment within which they are situated. In a single environment a range of different agent types may run and interact concurrently each displaying different behavioural competencies. These might include the ability to "learn" by interacting with their environment and other agents, display flexibility in response to different situations, exhibit autonomous goal directed activity or believable character based "personality" and "emotional states" (Franklin and Graesser 1996). An Artificial Life entity for example. may be able to "mate" with other entities or "hunt" for "food" in its environment, its goal would be survival in its environment and propagation. An Internet agent such as the "web spider" used in *Reconnoitre 2.0* may display a range of functionality, such as requesting the transfer of information between different environments, navigation of a network, or the ability to pass messages to other agents.

7.1.4 Complex interaction in *Reconnoitre*, environment as emergent form

As opposed to the single channel (user to computer, computer to user) of communication implicit in traditional AI approaches to interaction, the number of interactive possibilities opened up by the employment of software agents is potentially great. The multiple communication channels (agent to agent(s), agent to user(s), agent to environment, user to environment), supported by such architectures are capable of engendering highly complex forms of interaction and morphologies of structure.

In *Reconnoitre 2.0* the visual manifestation of the environment occurred through the interactive behaviour of both human and software entities in collaboration. In the compound generation of the

environment, the distinction between the actions of the human and the other behavioural entities (the web spider, search term nodes etc.) became indistinguishable, describing a levelling out of the relationship between the user and other elements in the environment.

Pattie Maes, researcher at MIT Media Lab, has described the "bottom up" dynamics that occur in agent based systems as the key characteristic that distinguish them from traditional approaches to artificial intelligence. The emphasis in agent systems lies less in the "depth" of intelligence they might be said to possess and more in the behaviours (learning, reactive, goal-orientated etc.) they demonstrate when situated in an environment. It is less important that the agent can answer questions, than be able to interact with other agents and the environment to collaboratively produce emanative structure; that is, there is a structural coupling or feedback loop between the various entities and the environment with the resulting structure said to occur through a process of emergent dynamics. (Maes 1998)[24]. Theories of emergence have been inspired by the field of Ethiology, and are sometimes described as "data base amplification"; denoting a process of a synthesis of a complex image from small interacting data sets (Prusinkiewicz 1998). A central tenet of the theory of emergence is that none of the components of a system are ultimately in charge of producing structure as it emerges from the communication dynamics that occur in parallel interactions between individual components/entities. Such dynamics induce a complexity of interaction, which is unpredictable, i.e. not predetermined or scripted in advance.

An example of an emergent property occurred in *Reconnoitre 2.0* where a solution was required to animate the returned search term material as and when it entered the environment. Rather than describe pre-set animation paths for each search term node, describing precise position, velocity and directional attributes, each node was endowed with a simple sensing and reacting behavioural model based on a simultaneous attraction and repulsion dynamic. The internal behavioural model of each node allowed it to sense other nodes in its vicinity, and depending on certain random innate conditions either be attracted or repulsed by it. The resulting vacillating /dilating form of the environment was an emergent property of the complex multi-level interactions between numerous perceiving/responsive nodes, the user and the web spider.

Such works, as was noted in the responses to *Reconnoitre* in Dresden, are capable via their propensity to function as social networks, of engendering "social presence", i.e. a subjective feeling of being immersed or present in a shared social space arises, as a result of communication with other geographically sundered agencies. In *Reconnoitre 2.0* unforeseeable constellations of form emerged both as a result of the autonomous interaction between the various software agents within and without the environment and from the way that material was introduced into it via specified Internet search requests. As each Internet search produced different sets of results or material, a unique form was derived in response to each specific user search request. That is, the environment was generated as a reflection of a specific personal interest on the part of the user, enabling a direct link between the user's personality, interests and inclinations and the work's material manifestation.

The richness of interaction and social presence arising from this approach occurs as a result of the software agents communicating between each other and human users. The kinds of un-scripted outgrowths of form that occur through the "bottom up" dynamics employed in *Reconnoitre* are metaphorically analogous to the descriptions of the rhizomatic smooth space structures described by Deleuze and Guattari, that operate as "acentered, non hierarchical" systems "without a General" (p.21); the effervescent urban flows described by Augé and Castells, and the deterritorializing mechanisms proposed by Lévy. The fact that such artworks are not designed in an *a priori* manner but evolve as a result of a shared and networked "world building" practice, provokes interesting questions concerning authorial provenance. This issue is examined in more detail in the following section.

7.1.5 Summary, a cross comparison between reviewed forms of interactive art

A number of similarities were noted between the different classifications of interactive art:

1) Graham's metaphor of "real conversation" was noted as being akin to Malina's identification of generative works that display unpredictable open-ended interactions; Rokeby's "automata" and Bell's worlds which allow participants to be "idiosyncratic". These models of interaction suggest a elaborate dialogue between a user and the work, with the artwork mirroring some of the complexity of human or other organic life forms. The resulting interactions arising from such works are improvised and unpredictable they may also arise from works that allow direct human to human contact, e.g. through an Internet based chat/communication space (MUDS). Social presence/immersion is a strong characteristic of such systems.

2) Graham's "hosted chatline" structured so that users can leave a material and read or manipulate other visitor's contributions; Wilson's "contributory" and Rokeby's description of "limited media" all shared the potential for the user to or manipulate the work creatively. These works posses additive qualities, by allowing the user to change or expand the surface conditions of the work they allow mediated human to human communication.

3) Rokeby's description of "navigable structures" shared structural similarities with Bell's works that have routes restricting participants; Graham's "voicemail" and Wilson's "choice of option", and closely matched Bertol's description of "static worlds". These models of interaction lack the behavioural complexity of types outlined above, and are not greatly changed through user interaction.

Table 3 summarises the above classifications and suggests correspondences between the differing definitions of interactive art, and the earlier classification of "static worlds" and "dynamic worlds".

Table 3: Summary of typologies of types of interaction in computer based art with suggested corollaries

Bertol (1997)	*Static worlds*... the only interaction available is movement of the viewing position.			*Dynamic worlds*... Individual components of the world can be moved, rotated, scaled, mirrored, and stretched.		
Slater & Usoh (1994)	← Interaction may be magical or mundane →					
Graham (1997)	← Verbal Exchanges →					
	Talking Car...will tell you to fasten your seat belt.		*Voicemail*... take the user through a series of branching conscious choices.	*Hosted Chatline*... each visitor can leave a message/image in response to the artwork, and can read and respond to or manipulate other visitor's contributions.		*Real Conversation*... an evolving, unpredictable exchange of ideas.
Rokeby (1995)			*Navigable structures*... a guidance system through which the trajectory of the user through the work may be subtly controlled.	*Limited media*... enables the interactors to express themselves.	*Mirrors* transform interactor's gestures .	*Automata*... automata survey and maneuver through their environment.
Wilson (1995)	*Presence*... someone has to turn on the computer	*Simple Choice*... user can select a particular event to engage	*Option*...the user is systematically presented with arrays of choices	*Search for Interaction Possibilities* ... the user must actively search	*Contributory* ... user can add to the array of choices available.	*Authoring*: The user can add new capabilities to the system.
Bell (1991)	← Programmed World →					
	Works that effectively have routes restricting participants' options their behaviours will conform more...(they have to keep to the paths)			*Works that allow participants more freedom*, their behaviours can be expected to be more idiosyncratic (they may ramble all over the countryside).		
Malina (1990)				*Open ended interactions*...the rule system of such works akin to a generative "code" embedded in the software.		
Cornock (1977)	← Dynamic Art Systems →					
	Reciprocal ...the user precipitates changes of state within the system.		Participatory art system... reactions of a group of participants to a situation.	Interactive art system...an artefact so organised as to be able to sustain a conversation with the user approaching the kind of conversation we witness between people		
Ascott (1966)	← Behaviorist Art →					

7.1.6 A cross comparison between practice and identified forms of interactivity

Much agreement was felt with Graham in questioning the usefulness of classifying anything as diverse as an artwork. However, armed with the knowledge that any such attempt will inevitably fail around the edges, it was found useful to develop an overarching classification of my own. Its purpose was threefold:

1) To tie up and make communicable the various strands of the study.

2) Highlight emerging aspects of research by relating and comparing the different identified data.

3) Introduce relevant findings from practice.

The classification will build on a comparison between the structural differences between two studio practice based projects *Bethlem* and *Reconnoitre*; using them as a base to relate both the identified classifications of "types" of interactive art, and the theoretical insights discussed at the end of chapter six.

In structural terms *Bethlem* could be described as a hermetic environment — a bounded space containing a fixed set of relations with user interaction primarily limited to navigation. *Reconnoitre* in contrast was unbounded. Unlike the self-sufficient spatial status of *Bethlem,* it possessed no visible geometry of its own, and its environment characterised by fluidity and unpredictability was dependent on the user, autonomous software entities and external Internet search material for its manifestation. In its behavioural and spatial form *Reconnoitre* approximates to Lévy's description of virtualisation as a mechanism of outgrowth and change, as differentiated from a weaker conception or form of the virtual, which like the Euclidean structures of *Bethlem* simulate aspects of the physical world.

A number of similarities were noted between the reviewed types of interactive art, and the differing structural and interactive possibilities offered by the two projects, which are summarised in table 4 below.

Bethlem	**Reconnoitre**
Bounded space containing a fixed set of relations, structurally self sufficient; interaction primarily through navigation. Euclidean structure, simulates aspects of the physical world	*Unbounded environment; fluid and unpredictable; possessing no visible geometry of its own, reliant on user, autonomous software entities and derived Internet search material for emergent spatial manifestation.*
Types of interactive art: Bertol, Bell, Graham, Malina, Rokeby, Wilson	
World in which users have to "keep to the paths" (Bell)..Rokeby's "navigable structures", Graham's "voicemail" . Structurally unchanged through interaction, end boundaries same as initial boundaries (Bell). Bertol's "'static".	Displays certain evolutionary traits (Malina). Initial boundaries were different to it's end boundaries (Bell). Employs automata in the form of the web spider and the behavioural data nodes (Rokeby). Allows the user to add to, or manipulate the work creatively; mediated user to user interaction (Wilson, Graham). Navigable space (Rokeby, Graham, Wilson, Bell, Bertol).

Table 4: Summary of correspondences between *Bethlem* and *Reconnoitre*, and reviewed "types"'of interactive art.

In the light of these observations it was evident that the different classifications of interactive art, while not specifically related to virtual environment works, could be readily applied to their analysis. We may also note that the "types" of interactive art aligned with the *Bethlem* and *Reconnoitre* correspond to the earlier discussions concerning the virtual and the discussion of some of the higher level forms of immersion identified in chapter 4. That is, the column on the left being characteristic of the pre-set structures of the simulative approach, and those on the right describing an approach that directly integrates the audience as productive units in an ongoing creative process, and displays high degrees of social presence through the inclusion of heterogeneous forms of agency.

Following the above findings we may identify two base conditions for virtual environments: which we may distinguish as the "fluid" and the "formatted" virtual (figure 61). To recap, Lévy proposes that the virtual is not a condition in opposition to the real; (i.e. a simulation or copy of the physical world), but a constructive mode of being, a verdant condition or apparatus promoting act generating structures. It possesses a many in one quality and works in tandem with the actual. The movement from one to the other involves a transformation that happens as an event in the here and now. The virtual is an inexhaustible resource — there is no limit to the amount of times it may be actualised. The fluid sense of the virtual proposes a heterogeneity of spaces and manifold individuated forms (e.g. *Reconnoitre*); the formatted form characteristically describes a predetermined, self sufficient allocation of walls enclosures and openings (e.g. *Bethlem).* Whereas the Euclidean structures of the formatted virtual may be experienced or navigated in many ways, interactive possibility is largely characterised by a switching of viewpoints through navigation; in this sense the user is less a genuine creative partner, as a randomising agent operative within pre-set structures that ultimately retain a global coherence. In contrast the many potential worlds, actions and experiences of the fluid form, are actualised through a performed process, by which aspects of the user's creativity are bought into direct contact with space provoking mechanisms and/or other forms of agency. That is, an integration of the user as an active element in the work, is an absolute prerequisite for the manifestation or appearance of structure at all.

We should not mistake the relationship between virtual/actual and fluid/formatted for the same thing. The movement from the virtual to the actual describes a general process applicable to a vast range of phenomena, the two conditions are not opposed but work in conjunction with each other. The division between the formatted and fluid virtual is descriptive of a particular set of conditions germane to and arising from the many potentials of virtualisation, and in the context of this particular study is specifically applied to the conditional states of virtual environment artworks. Both formatted and fluid forms partake of the phenomenal characteristics of the virtual, and both display movements from the virtual to the actual, but the fluid mode does so with far greater velocity by deploying a greater understanding of the potentials of the virtual. The formatted form of the virtual compromises its latent effects by employing them in support of simulation. The formatted and fluid forms of the virtual may also be equated with Deleuze and Guattari's opposition of smooth and striated modes of space and/or some of the other spatial practice discussed in relation to the development of *Reconnoitre* in chapter 6; figure 61 summarises the distinctions drawn above.

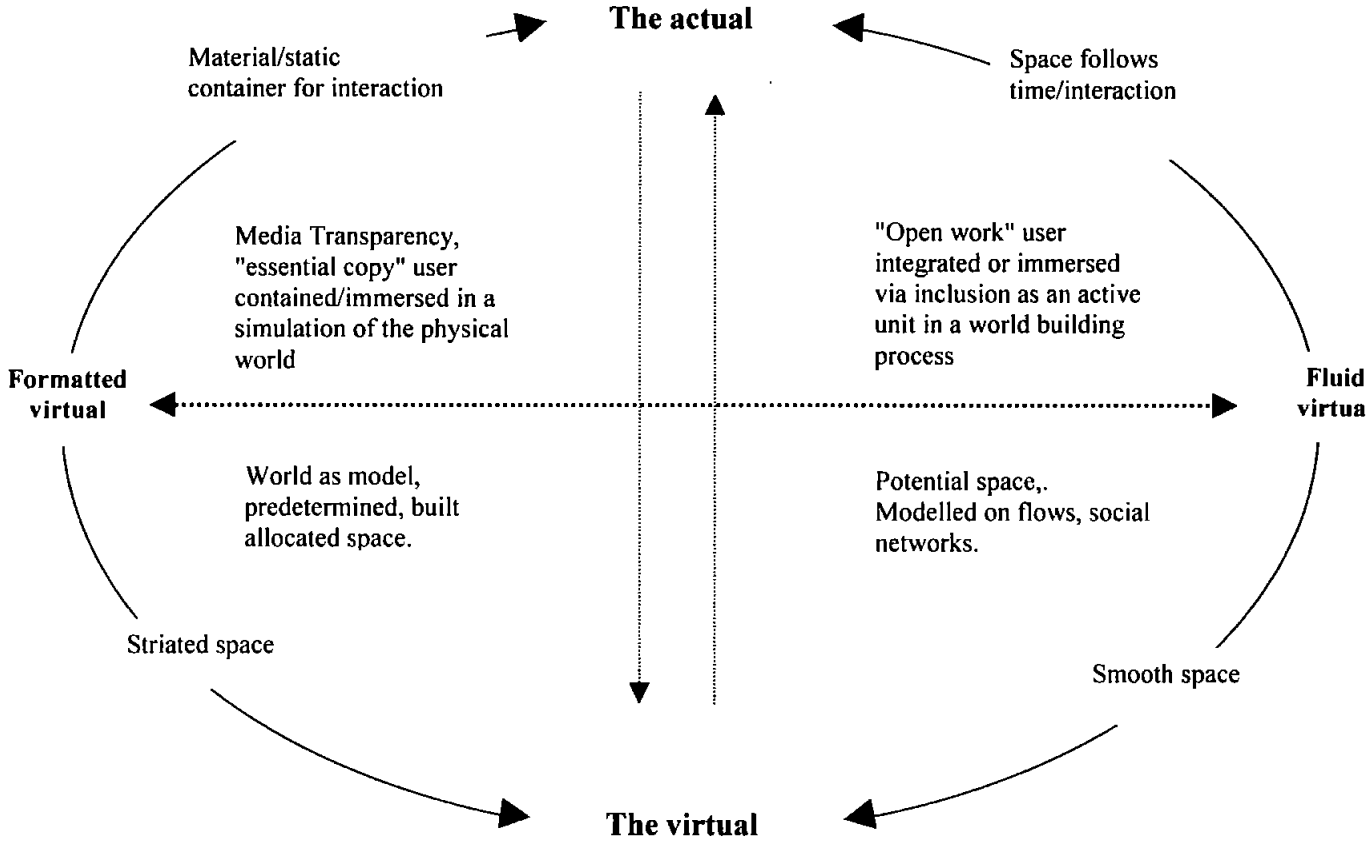


Figure 61: Summary of two identified base conditions for virtual environments, as either fluid or formatted forms of the virtual.

7.1.7 An analysis of the distinction between the formatted and fluid virtual with reference to practice

Such binary schema's are useful but also problematic, particularly when related to the complexities of practice. For example in the diagram relating the types of interactive art to the two practice based projects it was evident that interaction in a particular work may be highly variable with different "types" coexisting within the same work. As such although the terms "formatted" and "fluid" virtual have been employed they are not proposed as rigid distinctions. Such oppositions while interesting as forms of heuristic signage, should be considered as limits or extreme states to be moved toward or away from, and not prerequisite conditions of practice. Indeed while seemingly promoting an opposition between smooth (fluid virtual) and striated modes of being (formatted virtual), Deleuze and Guattari warn "never believe that a smooth space will suffice to save us" (p.500). What interests them is less a phenomena of smooth and striated as pure states, as to what happens when a condition of "double articulation" or "machinic assemblage" (p. 504) mixes the regimes of smooth/striated, allowing deterritorialized, reterritorialized states to coexist. When this occurs an intersection between striated structuring forces and radical smooth movements interact to formulate other productive conditions, assemblages, organising striations and nomadic movements.

In *Bethlem* for example, while its predominantly Euclidean structure situates it on the left-hand side of the diagram, conceptually it fulfils some of the phenomenal dispositions to the right. Similarly in *Reconnoitre* we might say that metaphorically its compound manifestation is a result of a smooth/striated dyad. Sometimes smooth space is reterritorialized and converted into striated space, other times striated space is deterritorialized and converted into smooth space provoking a polytonal condition or assemblage of tensions/interactions through which form becomes manifest or actualised. These complex behavioural mechanisms invite the user

to participate in an actualisation of unique spatial formations arising from an oscillation between conditions of flow (material streaming from the Internet), and structuring behavioural mechanisms set up by the artist.

Such works actively "nourish" the creative intelligence of the user (Lévy 1998, p.63), by integrating them or immersing them as active progenitors in a world building process. If we can equate the processes of actualisation with the amount of creative input required of the user to manifest the work, in *Bethlem* we can see that the demands for creative actualisation are far weaker, there is less need for it to occur as we might say that the environment is already partially actualised or pre-authored by the artist. The distinctions pose some interesting questions regarding the role of the artist and levels of creative input required of the user in regard different types of work. This issue is discussed in more detail in the following sections, in which the distinction between the formatted and fluid virtual is examined through the application of other metaphors, and some discussion is offered examining the effect the distinctions have, in regard the role and function of the artist as an authorial presence.

7.8 Interaction and contribution of the user

Following the above findings if we are to match the different demands of actualisation to the creative input of an empowered audience, do works such as *Reconnoitre* describe a situation in which the artist's authorial presence is distanced or even negligible? And is this displacement of authorial voice, less evident in works such as *Bethlem*, whose visible structural conditions appear partially actualised or pre-authored?

There are some complex issues here: firstly the notion of a weakened authorial voice predates computer based art by a number of decades, being a focal point of much critical theory and visual arts practice, e.g. Duchamp's (1973) description of the artwork as existing in a raw state "*l'état brut*" that must be refined "as pure sugar from molasses" (p.139) by the involvement of the viewer;

Iser's (1980) theory of reader response in which the reader is described as creatively actualising a text by bringing it into contact with their personal history; Barthes's (1977) proclamation of the death of the "Author God" (p.146) in favour of the "birth of the reader" (p.148).

While interactive computer based art offers nothing new in respect of empowering its audience through interaction, its form is of a different order in that it is manifested through visible perturbations in the computer generated surface condition of the artwork, and as an object may be geographically distributed via telecommunication networks. In these terms we might say that it partakes of the same modes of psychological engagement as other non interactive art, but adds another raft of actualising potential through the ability of the user and other multiple participants to actualise it as a visible/tactile event.

Both Bell (1991) and Graham (1997) suggest the artist's control over the work shifts in response to the interactive imperatives of the work, as a work's authorial disposition exists in a balance between different variables: the user, computer and artist. In contrast Rokeby argues that the apparent authorial freedom that is experienced in an interactive work only exists in relation to a pre-established structure "it is a representation of freedom, a symbolic freedom" (Rokeby p.141); that is, the selection of differing types of interactive structure, whether the static arrangements characteristic of the "world as model" or the more open ended contexts offered by works like *Reconnoitre* reflect organisation and choice on the part of the artist, whose presence is implied by externally defined design decisions. Similarly Eco (1976) notes that while a work may describe the possibility for "numerous different personal interventions" on the part of an audience, it does not describe a work which displays disorder in its internal relations, as in essence the work retains the "structural vitality" given it by the author/artist:

> We can say that the 'work in movement' is the possibility of numerous personal interventions, but it is not an amorphous invitation to indiscriminate participation. The invitation offers the performer the opportunity for an oriented insertion into something which always remains the world intended by the author...In other words, the author offers the

> interpreter, the performer, the addressee a work *to be completed.* He does not know the exact fashion in which his work will be concluded, but is aware that once completed the work in question will still be his own. It will not be a different work, and, at the end of the interpretative dialogue, a form which is his form will have been organised, even though it may have been assembled by an outside party in a particular way that he could not have foreseen. (Eco 1976, p.19)

Issues of user empowerment and subsequent questions concerning authorial provenance are multi-dimensional, and highly complex. Needless to say, at some point in the process the artist's voice is present, even if it remains distanced or operative at the meta level of providing open ended contexts for user interaction. These interactive contexts may operate as both visual physical phenomena, and on the level of psychological engagement, presenting a doubling or extra raft of possibility in terms of actualisation.

As suggested by the Eco quote, the user interacts within a context that may demand greater or lesser degrees of creative actualisation on their part, this context is defined in some manner by the artist. Some metaphors exploring what this context is like are discussed below.

7.9 Some metaphors, what is the work "like"

How might we clarify what this context that the artist provides is; what is the work like; and what descriptive metaphors might be applied to the processes of production of such works?

In terms of works modelled on the physical world a long tradition of architectural and urban planning exists, whose methodological practice is directly applicable to their planning and construction. Without wishing to overly characterise a complex practice, there are of course significant differences, not least that architectural planning deals with real materials situated in the physical world, and is not generally concerned with temporal issues of interaction, and the

integration of other media such as sound and animation. In architecture the planning design stage, and building stage occur separately; once plans are accepted and agreed, building commences with little or no improvisation or deviation. In producing artworks; even those drawing on architectural metaphors such as *Bethlem,* the production processes need not be so rational and systematised. During the project's development, sketches that roughly equate to architectural plans were employed, allied with an extended notational system describing the various navigational and behavioural possibilities assigned to parts of the environment. The organisation of the different elements of the work combined a mapping of spatial form with a concern with directing human activity in it. Aside from the urban/architectural corollaries discussed above such works provide structural contexts for user activity metaphorically similar to:

- Theme parks, and other organised events (fairs etc.).
- Hypertext documents or web sites.
- Art installations.

Following this we might say that artist provides a schema which can be described as a hybrid between an architectural plan, and a scored, itinerary of events/actions. The artist's role is also hybridised taking on a number of functions:

- *Architect, or urban planner*: systematic approach to designing and building environments.
- *Film/theatre director or music composer*: the choreographing and scoring of multiple elements through time.
- *Multimedia/web site designer:* providing navigational contexts and routes between and through fixed blocks of information.

- *Event organiser:* devising itineraries of activity, and multiple options for visitors/users.

Such metaphors are less appropriate when considered in relation to experimental works, like *Reconnoitre*. Works falling within the orbit of the fluid virtual are performed spaces that arise through unpredictable processes. The artist's personality or "touch" is not literally present in such works but operates at a meta level by providing a form of script or invisible aesthetic mechanism that is actualised through the intervention of participating agencies. In the case of *Reconnoitre* this included both a human audience/user, self-directed software agents employed within and without the work, and the contributions of other anonymous external collaborators (the constructors of the web pages used as material source).

There are similarities with the approaches of artists such as Sol Le Witt, whose work is characterised by an exclusion of the presence of the artist, he writes:

> The idea becomes a machine that makes the art. This kind of art is not rhetorical or illustrative of theories; it is intuitive, it is involved with all types of mental processes.
> (Le Witt 1997, p.834)

Le Witt formulates his wall paintings as potential or "meta works" originating as sets of instructions. The works are acted on independently by networks of collaborators, and may be produced in a variety of conditions, places, and by different people. The production of the work is influenced by a number of uncontrollable factors, leading to commensurately variable actualisations. Similarly, Bell (1991) describes interactive computer artworks as being like musical scores, whose potential effects may be composed through time. The effects of *Reconnoitre* were also described as being analogous to music (see appendix 1) but rather than a self contained score, *Reconnoitre's* performance required a more open-ended type of engagement, dependent on emergent networks of creative interaction between participants. In a manner similar to improvised jazz, a base "score", melody, or musical theme is employed as a generative improvisational framework from which

form issues; agents (musicians) improvise structure in time and through space, by observing, interacting and responding to each other.

Such works provide productive contexts for user activity that are generative of communication events and new structures, metaphorically analogous to:

- Social communicational environments on the Internet, (Web based chat rooms, Multi-User-Domains, Internet Relay Chat channels).
- Participatory social forums and networks.
- Contexts for improvised activity (music, dance, sport).

As is the case with works such as *Bethlem* the role of the artist is similar to that of an event organiser, or composer but is taken to a further level of complexity due to manifold technological problems faced, and lack of clear methodological models from which to draw. The production of *Reconnoitre* demanded a collaborative approach whereby knowledge was sought out, exchanged and combined in response to particular idiosyncratic demands of the project as it unfolded. This flexible approach defined the role of the artist as a creative researcher; a hybrid role demanding the ability to synthesise across heterogeneous and variable fields of knowledge. Reflecting the overall issues revealed in practice, this form of working necessitates the artist exercising social, communicational and organisational ability by being able to seek out specialist advice, develop forms of collaboration and organise and maintain the overall focus of the project over extended periods of time. Table 5 summarises the discussions above.

<table>
<tr><th></th><th>Formatted virtual</th><th>Fluid virtual</th></tr>
<tr><td>Artwork metaphors</td><td>Architecture, mapped space, like a route map or flow chart.

Theme parks, fairs, art installations etc.

Hypertext documents or web sites.</td><td>Like a musical score, or framework/rule base for improvised performative activity

Social spaces, Internet chat rooms, and other participatory social forums and networks.</td></tr>
<tr><td rowspan="2">Artist's role</td><td colspan="2">←→
Film/theatre director or music composer: the choreographing and scoring of multiple elements through time and space; Multimedia/web site designer, event organiser, provides navigational contexts and routes between and through information; devises itineraries of activity.</td></tr>
<tr><td>Architect, or urban planner: systematic approach to designing and building environments, "top down" approach to composition of elements.</td><td>Artist's touch not directly present in the environment, formulates potential contexts for user based actualisation. Operates as a creative researcher; sets up and regulates production networks, sources specialist knowledge and experts.</td></tr>
</table>

Table 5: Metaphors examining, the role of the artist in relation to differing types of artwork.

The distinctions between fluid and formatted virtual are not intended to be prerequisite conditions of practice; as such the metaphoric distinctions are necessarily generalised and overlap in a number of areas. While it is acknowledged that the reality of constructing artworks is a highly variable process, the distinctions further develop the fluid/formatted virtual framework by examining it in relation to other metaphors, and relating it to the different conditions, roles and functions of the artist suggested by its insights.

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[18] While specifically concerned with defining art systems, many of the classifications follow existing computer science guidelines for conceptualising human-computer interaction. These broadly identify three forms: user operation within a simulated environment (desktops, spreadsheets, simulated world's VR); mediated user to user communication, via web sites, hypertext, multimedia CDs etc. and interaction and communication with complex responsive systems that simulate human or other biological behavioural or cognitive traits (e.g. artificial intelligence and/or robot/A-life systems). For a comprehensive overview of interface metaphors see: Preece J. (ed.) 1997. Human-Computer Interaction, Harlow: Addison-Wesley.

[19] Wilson S. 1993. "The Aesthetics and Practice of Designing Interactive Computer Events", [Internet], San Francisco State University, available from: < http://mercury.sfsu.edu/~swilson/papers/interactive2.html> [accessed 24th September 1998]

[20] In 1950 Turing published his famous paper "Computing Machinery and Intelligence", in which predicted that by the end of the century computing would have developed to such a degree "that one will be able to speak of machines thinking without expecting to be contradicted" (1950). He described a test for machine intelligence, the imitation game, now known as the Turing test. The test involves two humans and the computer subject. One of the humans (the interrogator) is separated from the computer and other human by a barrier but is able to communicate with them by using a keyboard and computer screen. On the basis of the responses to the interrogator's questions a decision must be made as to whether he or she is communicating with the computer or the other human. The interrogator is allowed to ask any question that he or she thinks will allow a correct identification, and the computer is allowed to provide any answer in its

attempt to convince the interrogator that he or she is communicating with another human. For example the computer may lie in response to the question "are you a computer?", (see: Copeland J.1999. Artificial Intelligence: A Philosophical Introduction, Oxford: Blackwell).

[21] The notion that complex human cognitive, and personality traits could be reduced to symbolic computational processes and handled much as other abstract processes (e.g. mathematics) has generally fallen out of favour. Early optimism that a truly intelligent system might be developed, gave way to a more pragmatic approach that focused on the development of "expert systems" (chess playing computers, medical diagnostic tools and air traffic control systems) that displayed advanced competencies within specific specialised domains; which while variably successful, in that they exhibited behaviour that could be described as intelligent when confined to the specific domain for which they had be encoded, fell far short of what most people would describe as intelligent in the broader sense, that is, by being able to display the kind of intuitive, common, everyday knowledge that humans rely upon, and which is grounded in our experience of being in, and interacting with our environment (see: Woolley B. 1992. Virtual Worlds: A Journey in Hype and Hyperreality, Oxford: Blackwell).

[22] Already as far back as the Cybernetic Serendipity exhibition at the Institute of Contemporary Arts in 1968 we see artists experimenting with the aesthetic possibilities of computer based agency; some examples being, *CYSP 1* (Nicolas Schöffer), described as an electronic brain with "almost organic life and sensitivity" and *Colloquy of Mobiles* (Gordon Pask, Yolanda Sonnabend, Mark Dowson, and Tony Watts) an installation of computer programmed "male" and "female" mobiles that communicated by flashing lights and sound. (See: Reichardt J. (ed.) 1968, Cybernetic Serendipity: The computer and the Arts). More recently we might mention the work of Stephen Wilson who has for many years developed artworks (*Is Anyone There* 1992, *Excursions in Emotional Hyperspace* 1986, *Time Entity* 1983) that employ artificial intelligence techniques to critically examine human computer interaction and simulated human intelligence. (See: Wilson S. 1994. "Artificial intelligence Research as Art", [Internet], Stanford University, <http://shr.stanford.edu:80/shreview/4-2/text/wilson.html>), [accessed 10th April 1999]. In Luc Courchesne's *Portrait no.1*, 1990, the user engages in conversation with Marie, a young women who appears to answer questions which the user is able to select from the bottom of the screen. No real conversation with Marie is possible because her conversational gambits take the form of "canned" pre-recorded responses — as she warns us at one point during the interaction "I only have my past. For me time stood still the day I became what I am now". (See: Schwarz H. P.1997 Media Art History, Munich: Prestel-Verlag, p.94-95). Naoko Tosa's *Neuro Baby* (1994) and Naoko Tosa and Ryohei Nakatsu's *Mic and Muse* (1996) in which a computer generated characters detect emotion in a human voice and responds with appropriate facial and bodily expressions (see: "Artistic Communication for A-Life and Robotics" in Digital Creativity Vol. 9. No.1. p.53-61. 1998).

[23] For a good non-technical introduction into the phenomena of software agents including descriptions of Internet agents, anthropomorphic "chatterbots", and

numerous other forms of software entity see: Leonard A 1997. Bots. San Francisco: Hardwired. For a more detailed description of the range of research covered by these terms see: Bradshaw J. M. 1997. Software Agents, Cambridge: MIT Press.

[24] The theory of emergence is predicated on the notion that the organisation, of higher order structure/results/meanings can arise from the compound interactions of small component units/entities. That is, the whole is greater than the sum of it's parts, the individual units by themselves do not display any higher order structure. Emergence theory is often cited as being inherently critical of reductionist approaches to knowledge. Reductionist approaches to knowledge posit that an object may be understood by dissecting it into its component parts analysing them out of context and adding them back together to produce a full understanding of the object/system. Theories of emergence have been applied to a wide range of subjects including economics, physics and anthropology and even language. The oft quoted example of naturally occurring emergent structure is that of the co-operative behaviour of nest building termites, used to underscore the idea that in emergent systems there is no single organising director or designer, but that structure results from a system of relational properties (see: De Landa, M. 1992. "Virtual Environments as Intuition Synthesisers" [Internet], ISEA, available from: <http://isea.qc.ca/symposium/archives/isea92/essay4.html> [accessed 12th March 1998]).

Chapter 8: Summary and conclusions

8.1.1 Introduction

This section reviews the key points and conclusions that have arisen from the research. While many of them have been discussed in previous parts of the thesis, they are examined here in relation to the key questions identified in chapter 1, and the rest of the study as a whole.

The outcome of the research is in three parts:

i) The exhibition of artworks completed during research.

ii) The written thesis.

iii) The supporting video documentation.

The original rationale for the project was that there had been little practice based PhD level research into the use of virtual environment technologies in the context of fine art practice. In particular the research sought to explore in detail the relationship between interaction and virtual space and associated issues concerning immersion of the audience in the artwork. By explicating the above questions, and by identifying pertinent compositional elements, the research aimed to suggest routes and organisational strategies for artists engaging with the medium. The lack of practice based research from a fine art background necessitated an exploratory approach that examined the questions intuitively "on route" through creative work. As material derived from creative practice was interwoven with knowledge gathered from other disciplines, the overall approach to the study is described as "hybrid" (Graham 1997).

In terms of sustained art practice the medium has a history of little over a decade. From the contextual review it was possible to see that its ability to combine disparate media types, an interdisciplinary approach to practice and a propensity to integrate an audience within a spatial participatory schema, place it within an ongoing tradition of 20th century avant-garde art activity. While a small amount of work has been made exploring the use of fully immersive displays (Davies), the majority of projects produced throughout the last decade of the century have explored alternative procedures for "immersing" or displaying environments within/to the audience (Shaw, Hoberman, Krueger etc.). These have been broadly characterised as being either investigations into the relationship between real and virtual space, or the newer smaller scale Internet sited projects and multi-user environments enabled by the introduction of VRML. Creative practice acknowledges this contemporary context, and the development of artworks and the conclusions arising from them are set against it and the expositions of immersion and interactivity given in chapters 4 and 5.

8.1.2 An overview of immersion and interactivity

Initial research was led by an exploration of characteristics pertinent to the medium:

> It is claimed that virtual environment technology "allows you to explore a computer generated world by actually being in it"...the audience somehow being 'inside' the representation. Immersion and interactivity are the 'buzzwords' most associated with the medium, in relation to art practice how might these concepts be more fully explicated.

In answering the question, specific forms of interaction and immersion and a number of variables deemed necessary for their support were identified. Table 6 summarises the findings.

Types of immersion/presence	Types of interactivity
Mental/psychological engagement/physical sensory engulfment. The sense of being present in an environment, other than the one you are actually in: "surrogate travel", "you are there", "it is here" and "we are together".	A change of place occurring through navigation or manipulation of the environment. Social interaction/communication, occurring via networked multi-user environments.
Routes to immersion	**Conditions that support interaction**
Sensory substitution: involves the use of input/ouput technologies to hook up the parts of the audience's sensory system to the environment. The provision of familiar contexts for user activity, i.e. the use of representations that emulate the dimensions and attributes of the physical world. Engagement through interactivity: a bond is created between the user and environment through participation in a physical/literal, or psychological act of world building, i.e. Eco's "open work". Aesthetic attributes of the environment: the provision of empathetic, compositions to invite user engagement. Social presence: conversing or interacting with someone or something else in a mediated shared environment, may facilitate feeling that you are present in that environment.	Continuous response of the environment to user input. High bandwidth and multiple input/output channels. Multiple, simultaneous input/output channels (use of HMDs, DGs etc.) Many degrees of freedom. Provision of familiar and predictable contexts for user activity. The use of the physical world as a model within which to situate user interaction ("world as model"). Body centred interaction, simulation of human presence in the real world. The use of "avatar" representations and first person point of view (virtual camera).

Table 6: Summary of "types" of immersion and interaction, and supporting conditions.

Discussion of immersion is problematized by the "fuzziness" of the term and involves a disentangling of the medium from the technological myth of VR. A need to continually juggle terms (engagement, presence, and immersion) illustrates the difficulty in pinning down an experiential condition that is multilevel and complex. In its most commonly understood term immersion is understood to involve a complete blocking out or substitution of the physical world with a simulated one, via the use of a fully immersive HMD. The goal of this particular technique is to induce/seduce the audience into believing that what they are experiencing is something other than a representation, i.e. to replicate the sense of bodily centred presence we feel in the physical world. For presence/immersion to occur the medium must be transparent, that is, the status of the representation as an artefact must be hidden from the audience. Connected to this historical formulation of the medium as a form of "post-symbolic" language, is the use of the simulative "world as model". The premise behind such an approach being, that user immersion is more likely to occur if the environment's behaviour and physical structure is consistent with the physical world of our daily experience. Similar arguments are extended to support the "world as model's" usage as a context for structuring user interaction, i.e. in order to intuit functionality, the audience is able to draw upon their experience and memory of interaction with the physical world without the need to learn any special interface conventions.

While useful in certain situations the predominance of the "world as model" as an armature for situating the audience, and its close historical connection with technological forms of sensory immersion (Sutherland 1965, 1968), describe a somewhat limited set of creative possibilities rooted in a an older perspectival/Euclidean representational tradition. As such, it was decided that creative practice should formulate alternative environmental propositions and explore differing interactive and behavioural possibilities to that described by the paradigm. In relation to immersion, a number routes to the condition not connected to particular technologies had been identified. Using Eco's definition of the "open work" as an historical exemplar of an alternative methodological procedure/tradition, creative practice largely eschewed technologically derived immersion in favour of an exploration of these other identified "higher level types", i.e. by focusing on the

integration of the audience as productive units within the work; developing and providing empathetic and aesthetically interesting contexts for the user, and by exploring the potential for inducing immersion via social presence.

Much of the focus of creative practice was directed toward and channelled through the Internet. In the contextual review, it was noted that beyond the examples of multi-user environments that predominate, the Internet offered a potentially rich and under explored resource for creative practice. Taking its propensity to display high levels of social and connective activity as a point of departure, it was decided to employ it as both a site within which to explore aspects of social presence and a resource through which to examine alternatives to the "world as model".

8.1.3 A summary of the development of creative practice

Creative practice sought to explore alternative models of interaction and environmental organisation beyond the image of "VR" as a medium of sensory immersion, and the methodological approach to composing environments described as the "world as model". This exploration was forwarded in a number of ways:

• Beginning with the earliest project *Bodies*, and culminating in the two versions of *Reconnoitre,* a number of different process based approaches to generating environments were advanced, that derived their form from, and reflected on, the Internet.

• Modelling techniques were developed — in particular the wire-frame approach to describing form.

• Influenced by a heterogeneous range of processes and cultural forms, alternative metaphors for describing interactive and environmental possibilities were experimented with, developed and applied.

8.1.4 *Bodies*, a process based approach, to structuring environments

In *Bodies* a process based method of accumulating information, and organising the environment was devised based on a loose rule set. Resultant from a series of Internet searches, its material form was largely derived from material existing beyond its boundaries in the guise of images downloaded from Internet Web pages. It was hoped that through its evolution as an aggregate of Internet searches, the project would manifest or mirror some of the Internet's character as a parallel, decentralised, socially enabled environment.

When shown at the ICA, public responses to the conceptual thrust of the project were positive, however a number of problems were noted. One of the aims of the project had been to provide an alternative to the "world as model" by devising some form of plastic equivalent to the Internet. In doing so, insufficient thought had gone into developing how this might be articulated. In removing the metaphoric "safety net" of the physical world, it was noted that users had difficulty in comprehending and navigating the abstracted agglomerate structures. Further to this, it was felt that the graphical quality of the environment was crude and that interaction possibilities were somewhat limited: confined to navigation the user was excluded from the processes of developing the environment and thus denied a deeper engagement/immersion with(in) it.

Following these findings and observations, it was decided that the user should have a greater stake in influencing or being integrated into the set of processes that underpinned the environment's manifestation and that technical developments should be instigated to develop more visually interesting modelling techniques. The knowledge and techniques derived from this part of research were both carried forward and extended by subsequent research — both in *Bethlem*, through the development of the experimental wire frame modelling technique, and in *Reconnoitre* which was to continue the exploration of the Internet as a site and material source for creative practice and further scrutinise ways of integrating/immersing the audience as active units in a "world building" process.

8.1.5 *Bethlem* and the wire frame modelling technique

The move away from a realistic description of environments was advanced in different ways by the development of the wire frame modelling technique and its implementation in *Bethlem*. Rather than attempt a "photorealistic" simulation of an object's surface properties, the technique described an alternative approach to modelling that "laid bare" the status of the object as a virtual entity. The production of a number of smaller models/maquettes allowed the development of a range of approaches, and techniques, including the "tangle" method which was later to be influential in the development of *Reconnoitre's* aesthetic, and the architectural fragments that were to be employed in *Bethlem.*

In response to problems noted in regard audience response to *Bodies,* in *Bethlem,* it was decided to use a physical and behavioural model that alluded to the physical world. Rather than employ a simulative approach to describing surface detail, texture, lighting etc. a series of architectural motifs, in the form of a Panopticon were modelled using the wire frame technique. While not attempting verisimilitude the environments behavioural aspect and its architectural form, functioned to guide and direct the audience, by suggesting certain routes, and revealing and leading the user toward particular pieces of information and material.

The decision to use the Panopticon was related to the project's subject matter. Aspects of the work were concerned with providing a commentary on the relationship between institutional architectures and their psychologically formative effects; with particular reference to their role as mechanisms that function to guide/school/and constrain marginal subjects, i.e. the mentally ill, poor, criminal etc. The Panopticon as a directional and enveloping architecture was thus an apt metaphoric conceit when considered in relation to its use as a formal guiding and restraining architecture in regard the experience of the audience in the environment.

Positive responses to the project when exhibited at the ICA confirmed the value of the modelling technique proving that only the sparsest of contexts need be necessary for engaging the user. That is, by requiring the user to mentally "flesh out" the environment the approach can be considered to be a further

exploration of an alternative approach to immersing the user in the work. Another issue to emerge from exhibiting the work at the ICA involved the degree to which users reportedly drew on their experience of computer games, in order to intuit or decode the interactive possibilities of the work. This led to further developments in the project including the borrowing of techniques derived from games and the use of a 2D Web page interface to add a further lay of textual information to the work. This mixing of interface conventions confronted the user with a granular and hybrid set of interaction possibilities, involving them in a process of oscillation between moving through, or navigating space, and/or reading/navigation of the textual information displayed in the projects 2D interface. By confronting the user with a hybridised form, the resultant assemblage extended the base or default condition of the environment as a derivation of the "world as model" by being inclusive of other modalities of interaction, and interface languages.

8.1.6 Dramatising connectivity, *Reconnoitre* a distributed artwork

Much of the knowledge revealed from earlier work was integrated into, and furthered by, the final project *Reconnoitre,* i.e. *Bethlem's* use of wire frames, its multi-modal 2D/3D interface, granularity[25] of interaction (oscillation), and the process based approach to environmental form developed in *Bodies.*

In terms of chronology, while *Reconnoitre* followed *Bethlem*, its interests, subject matter and development position it as the direct heir to the earlier piece *Bodies*. As was the case with this earlier work, the project was concerned with exploring aspects of the Internet that tied its evolution to social processes of action/interaction. In *Bodies* this social activity was manifest through the employment of traces/artefacts left by Web site builders who became unwitting participants in the processes of the work. In *Reconnoitre* this aspect of social morphology was expressed, through the engineering of a technically more complex project that automated much of the earlier piece's rule base by employing search

agent technologies, and through the development of a more subtly devised and involved set of visual and behavioural references.

One of the main problems identified in *Bodies* was that insufficient consideration had been given to providing metaphoric "entry points" to the user of the work. That is, the projects visual and behavioural demeanour expressed little of the complex social and communicative patterning that the work was alluding to. In *Reconnoitre* this problem was resolved in two ways. A number of smaller studies had been developed that mixed some of the earlier wire frame "tangles" with text fragments stripped from Internet Web pages. Visually the results were considered reminiscent of amongst other things: processes of communicational flow and flux, complex emanative or "bottom-up" systems and other non-linear or rhizomatic structures, i.e. more directly expressive of the networked social dynamics that the work was citing. Secondly, the textural environments were suggestive of a kind of functionality that would provide the user an "entry point" or enable them to intuit how to use the work. The reformatting of the text in space alluded to the operations of an Internet Web browser, albeit of a dysfunctional variety that would deform material as and when it encountered it. Conceiving of the projects functionality in terms of "browsing" allowed the development of a hybrid 2D/3D interface which depending on the version, allowed the user to define either Web page addresses or search term requests and manipulate and navigate the results.

Unlike previous work whose environmental structure existed *a priori* of audience interaction, both versions of *Reconnoitre* were entirely reliant on the activity and interaction of the user to instigate a generation of form, i.e. engage/be immersed in a "world building" process. The two versions of the work differ in the amounts of connectivity they display, the type and manner in which the returned material is displayed in the environment, and in the forms of interaction allowed between the user and returned search material. *Reconnoitre 1.0* responds to a user request by organising returned search term material according to a top-down randomising algorithm. Once generated the structure is inert, interaction being limited to navigation and manipulation of the returned material. When tested in public responses to this first version of the project were mixed: requests were received to increase the possibilities for

interactivity, and some confusion expressed concerning whether the project was an artwork or a functional piece of software.

In response to this it was decided to reconsider the manner in which the material was organised in the environment, by introducing "bottom-up" and connective processes into the environment itself. In the first version of the project interaction between different forms of agency (human to web spider) projected a static representation or snap shot of the Internet. In *Reconnoitre 2.0* an increase in connectivity endowed textual fragments with a quasi or semiautonomous agency, leading to a vastly amplified and unpredictable range of material configurations. In conjunction with the implementation of the decay mechanism this network of human and software actors participated in a dramatising of connectivity that metaphorically alluded to, drew upon, and poetically represented the flows of social and communicational energy that operate throughout the Internet.

8.1.7 From structures to actions, a summary of findings revealed through creative practice

Through a comparison between the different methodological approaches to constructing artworks, it became possible to propose a framework in which to situate and relate different production possibilities and procedures for pursuing creative practice.

Reconnoitre possessed no intrinsic geometry or modelled form of its own. Entirely reliant on the user, a network of other computer based agencies and unwitting anonymous collaborators, it offered a reflective surface onto which the audience could project their varied, inclinations and interests. Each usage of the work produced a context sensitive individuated form arising from, and sensitive to, the different personal histories bought to it by separate audience members. It signalled a shift away from the more common methodological approach taken in *Bethlem*, toward the provision of a set of generative possibilities, that being inclusive of a range of heterogeneous elements, interacted to produce unpredictable, ephemeral and fluid structures. The difference this describes in terms of composing works involves the significantly increased demands it places upon the user. *Bethlem's* architecture functioned

to allocate space and guide the user toward certain predetermined possibilities. In production terms the artist was involved in a "top down" mode of production, modelling a "built" space that pre-existed user interaction. The project confronted the audience with a homogenised world through which they were able to choose different navigational routes but were unable to structurally extend.

Reconnoitre in contrast existed in a potential state. Entirely reliant upon the audiences activity to engage in a more involved and creative manner, its main compositional issues involved the planning of actions through time and the arrangement and regulation of communication networks between different forms of agency. Resultantly, the organisation of activity and the temporal character/rhythm of the work took precedence over the modelling or provision of built form — structure followed the processes of user interaction and did not precede it, as was the case with *Bethlem.*

These methodological approaches and modes of interaction they present, were further explored by relating them to some previous typologies of interaction in computer based artworks. Confirming the value of findings arising from creative practice, corollaries were noted between the two areas of knowledge, allowing insights from creative practice to be situated in, and related to, an emergent tradition of interactivity in computer based art. Using this as a platform, it became possible to integrate some of the earlier theoretical discussions to develop a metaphoric framework the "fluid/formatted" virtual. Drawing on an older post-structuralist tradition epitomised by Eco's description of the "open work" and a more contemporary consideration of the phenomena discussed by Lévy in terms of the effects of virtualisation; the framework provides a structure within which the disparate strands of research are bought together and made communicable. Table 7 summarises the distinctions between the two forms of the virtual, and then relates them to other areas of research: the differing methodological approaches arising from the comparison between *Bethlem* and *Reconnoitre*; the identified types of human-computer interaction; and the differing approaches to immersion discussed in chapter 4.

Formatted virtual	**Fluid virtual**
World as model. Virtual as simulation. Euclidean. Classical world view. Like a statement or answer. Perspectival. Homogenous self-sufficient object. State space.	Open work. Virtual as potential. Postmodern/post-structuralist world view. Like a language. Like a question. Multiple viewpoints. Heterogeneous phenomena. Rhizomatic, nomadic space.
Bethlem	**Reconnoitre**
Architectural, built form. Material. Static. Pre-determined space. User re-orders pre-set structure. Map of fixed points describing a place. Self-sufficient space. Delineated enclosed place. Artist models objects and allocates space. Artist's function akin to architect, or urban planner. Artwork guides user, like a route map or flow chart. Singular artist's voice.	Fluid space, generative structure. Transitory. Process orientated, in continuous movement. Performed space. User intrinsic to spatial manifestation. Open-ended. Itinerary of actions forming space. Networked distributed phenomena. Artist organises events through time. Artist's touch not directly present in the environment Artwork akin to a musical score or participatory social forum. Distributed deterritorialized authorship.
Immersion	**Immersion**
Media transparency "VR". Simulative approach ("essential copy"). Sensory subordination to the authority of the image.	Immersion through social presence. Integration of the audience as active presence in a world building process (the "open work"). Provision of empathetic contexts for user action.
Interactivity	**Interactivity**
"Top down", classical model of artificial intelligence. User operation within a simulated environment (desktops, spreadsheets, simulated world's VR). Fixed predetermined structures, hermetic systems.	Emergent "bottom up" model of artificial intelligence. Connective systems, social networked interaction. Emanative, generative system, User integrated as productive unit in a social network (chat spaces, MUDs).

Table 7: The fluid/formatted, framework related to the other areas of research.

One possible weakness of framework is that it is overly general, being as applicable to a wide range of phenomena as the identified area of study. As a hybrid medium that borders with and overlaps many other disciplines, this should perhaps not be considered surprising, being an inevitable outcome of a multidisciplinary approach.

While it runs of risk over simplifying some complex issues it is not intended that the framework should be definitive or restrictive but rather suggestive. The structure functions heuristically to reveal possibilities. It does not describe preconditions of practice but rather operates to formulate extreme states to move toward or away from. Artworks are highly variable and complex, and are likely to oscillate between both fluid and formatted forms of the virtual and the differing identified approaches to interaction and immersion within the same work. Whether artists find such characterisations useful is a moot point. Artists are eclectic and wilful, operating and applying varied forms of knowledge in relation to need and the particular demands of creative practice. Nevertheless it is hoped that the framework might be of some use in signalling certain possibilities and relating particular phenomena pertaining to the medium within a reasonably memorable structure.

8.2 Conclusions and suggestions for further research

The lack of previous models on which to draw necessitated an exploratory approach to the study that gave free reign to the divergent dynamics of creative practice. Research can be described as a move from the specific — the questions identified in chapter 1, via the pursuit of the personal, and the offbeat — the construction of artworks; through to a development of communicable knowledge as extrapolated from findings revealed through art making. Being largely derived through the idiosyncrasies of creative practice the results of this research should not be considered definitive or restrictive but suggestive. Applied back to research as a whole, findings represent a small contribution to a subject that possesses

plenty of scope for further research. As the study recognises that non-verbal, plastic and visual types of knowledge are as valued as more traditional textual forms, findings are embodied both in the artworks produced, and in knowledge revealed through creative and other forms of practice (reading, writing etc.).

The contributions are set against the current manifestations of virtual environment media highlighted in chapter 2 (i.e. multi-user Internet sited worlds), and the identified forms of immersion, interactivity and environmental organisation discussed in chapters 4 and 5. In general findings encourage a critical attitude toward the medium that throws some of the wilder claims associated with immersive VR technologies into relief. The identification of a number of differing routes to immersion and the exploration through creative practice of alternatives to the "world as model", offers artists an expanded view of medium that does not tie it to any particular technology or simulative approach to organising spatial and interactive contexts for user activity. Specifically, findings involve the identification of some compositional approaches to making virtual environment artworks, and the formulation of some metaphoric structures within which to situate and relate creative practice — the "fluid virtual/formatted virtual" framework.

Through its exploration of the Internet as a socially dynamic communication environment, much of this study's contribution to knowledge is embodied in and was developed through the final major project *Reconnoitre*. Following Lévy we can see that rather than being a simulation (the "world as model"), the virtual may be described as a potential, effect, a mechanism for outgrowth and change. Described as a matrix of forces "act generating structures" (Lévy 1998, p.174) the virtual nourishes constructive activity. By acting like a language it establishes experimental communication spaces that engage humans in an inherently creative activity. A contemporary example of this phenomenon is found in the form of the Internet. Lévy discusses this in terms of deterritorialization. The Internet as an environment has no distinctive geographical position, or fixed structure and is rich in "social presence". Its fluid environs arise from, and in response to, the actualising and communicational activity occurring between a globally dispersed community of users. The Internet, as in Eco's formulation of the aesthetic machine of the open work, is a fecund mechanism that both brings into play, and

relies upon its user's capacities for interaction and communication for its subsistence and success.

By employing "bottom up" networked processes of communication between different forms of agency, *Reconnoitre* confronts the user with a poetic representation of this process i.e. the object/artwork is made manifest as a result of compound acts of communication between human and non-human agencies. Aside from engaging the audience through an invitation to participate in a world building process, the reported positive responses to the work are also ascribed to the effects of "social presence" as outlined in chapter 4 (i.e. conversing or interacting with someone or something else in a mediated shared environment, helps facilitate the feeling that you are present in that environment). While not in any sense anthropomorphic, the project visibly displayed behavioural agency. This responsive sensibility, was noted by users of the work in Dresden who reported strong feelings of engagement or absorption with(in) the work describing it as "playful", "generous", "intense" etc. The positive responses to the project suggest that it was successful in exploring its stated aims, i.e. offering alternatives to the world as model. In doing so it also offered support to the suggestions made in chapter 4 that beyond the impact of the visual and tactile interfaces of sensory immersion, artists might more fruitfully explore the identified alternative or "higher level" forms of the condition.

Works that fall within the orbit of the "fluid" virtual can be aligned with a post-modern/post-structuralist tradition or understanding of the artwork and the manner in which the audience is engaged as an active authorial presence. Modern technologies such as the Internet increase the velocity of this dynamic (or extend or reinvigorate the tradition) by providing multiple entry points for potential participants. By laying bare, and working with, the Internet's propensity to function as a social and fluid milieu, *Reconnoitre* offered an alternative approach to the majority of Internet sited virtual environments that use avatar representations and pre-formatted spaces modelled on the physical world. *Reconnoitre* functioned to integrate/immerse the audience as progenitors in a world building process. By involving manifold participants (human and non-human agents) the artwork evolved as a distributed,

ephemeral, phenomena, functioning according to principles of connectivity and social morphology.

While this study's main contribution comes in the identification and development of alternatives approaches to the medium, other important implications of this research concern the demands placed upon artists wishing to experiment with it. In *Reconnoitre* a need emerged to understand aspects of computer science pertaining to software agents in order to further the project. Ultimately the complexity of the project necessitated a collaborative approach involving the input of an external specialist. The development of artworks of this kind is difficult. Production requires that artists digest complex technical and theoretical knowledge from other disciplines in sufficient depth in order to exploit the potential of the technology and comment with confidence on its wider aesthetic and social relevance. The artist in this sense is involved in a hybrid practice that is informed both by contemporary art contexts, and knowledge integrated from other disciplines, in particular computer science.

This necessitates that the creative practitioner become involved in a process that extends practice beyond the model of the artist as single progenitor and producer of the artwork. It is not unreasonable to state, that further development of the medium is likely to be advanced through a methodological approach akin to film production, whereby costs and required skills are spread between different specialists, and the development of the artwork occurs as a result of participation between a network of collaborators. We might say that this unexpectedly mirrors the findings revealed through creative practice, i.e. that the "bottom up" collaborative processes necessitated by the hybrid nature of the medium mirror some of the identified dynamics emergent from practice, whereby the artwork is actualised via communication between different participating agents.

8.2.1 Suggestions for further research

The investigation pursued an idiosyncratic route largely determined by creative practice. Knowledge revealed through this process helped form some conceptual structures within which to situate practice, and allowed the development and identification of some

possible routes for artists faced with the manifold challenges offered by the medium. While the study came to focus on the possibilities and opportunities offered by a particular form of "open" work, characterised as the "fluid virtual", by no means should this be seen as the only serious or definitive option available for artists engaging with the medium. The research presents some of the first involving creative usage of virtual environments within the context of fine art practice, in doing so it represents a modest start to a large and continuously expanding subject area. Many possibilities for further research exist.

Ironically the fetishizing of VR technologies as spectacle has obscured debate as to how immersive devices may be integrated into the composition of an artwork in a more considered manner. Artists are adept at deploying meaning through encoded images and in providing empathetic contexts for audience engagement. What is less certain is what such technologies offer artists beyond what they are traditionally skilled in, or that might be provided by other less complex (and expensive) input/output technologies. In order for a greater understanding of the aesthetic potential offered by the technology to emerge much further work needs to be done. Char Davies as part of a PhD program at the University of Wales College, Newport, is currently undertaking research into this area, which should provide some much-needed insight. Above and beyond this a "critical mass" of creative experimentation needs to build based on artists having widespread unhindered access to the technology, before a more comprehensive understanding of the issues at stake can emerge.

The development of *Reconnoitre* focused research on the potential for artworks to emerge via social processes of communication/interaction. Via deterritorialzation the artwork becomes a distributed object, functioning and structured according to principles of connectivity. As in the case of Lévy's "virtual corporation" the artwork exists or is actualised as a result of geographically distributed agents whether human or software that collaborate in its manifestation. Creative practice intends to further explore some of the issues raised by this part of the study. In *Reconnoitre* the work allows a network of interactions between human and non-human software agents to participate in engendering the environment. Modifications to the work are planned that will

allow multiple human participants to use the work, either in an extended local installation space or geographically distributed throughout the Internet.

Further projects are also planned that examine the relationship between software agents and human participants. Our increasing reliance on mobile software agents to find and process information on the Internet and disseminate it to humans and increasingly to other agents is growing exponentially. The chaotic and unpredictable structures that arise as a result of open-ended, networked interactions between agent based systems present a number of pertinent issues to the creative practitioner. Matters such as delegation of decision-making (authorship and control), questions of value of all types (financial, aesthetic, ethical) and the increasing ephemerality of a distributed, emergent object, problematize the respective roles and relations between software agents and human users/collaborators, providing a number of further fascinating areas of research.

[25] My thanks to Colin Beardon for suggesting this term.

Appendix 1: Production diary/extracts from the artist's log

Sections: A 1996; B 1997; C 1998; D 1999.

Section A: 1996

March/February
Basic framework for *Bodies* devised, similar in many ways to *The Infinite* Web *Page:* images derived from Internet searches, will be reformatted within the environment. I'll use Hotbot to carry out the searches, as it enables media specific searches.
February 15th - 30th
Carry out Internet searches, and begin downloading images.
April 1-20th
Practice programming and devising basic behavioural routines.
April 30th
I've used Superscape to construct the worlds, it is (relatively speaking) easy to use, allowing quick construction of simple environments, also the research unit at Chelsea has been using it for some time and gets good support from the company. However it does have drawbacks, it currently does not support gouraud shading, so all models tend to look clunky and very angular — no smooth curves (this also produces facet ordering problems). Its handling of textures and sound is limited — this is extremely frustrating, meaning that visually the worlds are ugly; I'll have to find a workaround for this as it is driving me mad! Decide to overcome problem by texture mapping search term material to simple cubes. This should speed up things a bit. Complex interactivity can be programmed into the environment using Superscape's own programming language SCL (Superscape Control Language) which is similar to C and just as difficult if your not a hard-core programmer (like me). Although I can program simple routines in SCL I will need to find a friendly programmer to assist if the work is to progress or become richer. In the mean time I'll continue to cut and paste the library of scripts provided by Superscape.
May 1st -20th
Continue to add search term material to the environment. Results are beginning to look quite interesting, but overall the construction process is very slow, and software unstable. May have to prune back the environment, as it is getting to slow to navigate.

June/July

One thing I have noticed when constructing the pieces, is the amount of time I spend thinking about the audience. As the environment is abstract, its rather difficult to navigate. Try to overcome the problem by introducing architectural elements (walls, buildings etc.) but they don't really fit the conceptual thrust of the piece. Compromise by employing a wire frame grid that seems to function well as a visual/spatial guide, and is also visually interesting. Despite increasing interest in its potential, building virtual environments is still a painstaking and difficult process. Whilst the price of the technology has dropped to affordable levels, "real time" 3D graphics software is difficult to master and requires a good grasp of difficult computer graphics concepts. Although I was already well versed with multi-media and Internet applications, familiarisation with the technology requires a steep learning curve. This is further complicated by conflicting technical standards, i.e. what you learnt yesterday, may not be useful tomorrow, becoming obsolete/superseded (and thus not technically supported) by a new software/hardware release. At the time of writing the industry is moving away from expensive installation type "stand alone" proprietary hardware/software packages (such as Divisions DVS package) toward Internet specific virtual environments. This requires that a formal standard for real time 3D graphics be developed that is platform independent, and fast enough to run on an already slow and over subscribed Internet. At present there are a number of conflicting standards. In the forefront is VRML (virtual reality modelling language currently version 2.00) supported by major companies such as Silicon graphics and Sony, others include SVR from British company Superscape, and Java 3D supported by Sun technologies. Choosing a path through this minefield of conflicting standards is a tricky business particularly given the time-bounded nature of research.

July 23rd

"Deep Screen Diving-building the Cyber-city"
presentation at the ICA. I have an opportunity to show the results of my initial early fumbling at the ICA. Very much a test pieces, will show *Bodies* as an on-going "work in progress". By presenting a scaled down version of the project I hope to avoid crashes.

August/September

Experience showing *Bodies* in public has shown that in avoiding "real world" environmental models extreme confusion can ensue! People became quickly disorientated at the ICA often ending up-side down or stuck in the corner, unable to move. Nevertheless, responses to the project as an alternative Internet sited and process oriented work have been positive. Will continue to explore the idea but need to reconsider how to arrange the environment and make the work more interesting in terms of interaction possibilities. Not really sure how to proceed, but possibly by allowing the audience to search for and input material directly into the environment as in *The Infinite* Web

Page. This will involve significant amounts of technical research, and possible the involvement and support of specialists in network engineering. In the meantime will try to produce some smaller pieces in order to keep work ticking over.

September 2nd

Considering building a more conventional environment based on the real world. How "real" does the description of the space have to be as a suggestion of space often "feels" more satisfactory than a realistic approach, point clouds rather than textures and lit surfaces?

September 12th

Initiate research into Internet communication and data protocols. Begin experiments with VRML.

November/October

Develop and explore wire frame modelling technique, ditch VRML, too slow, will continue to struggle with Superscape VRT, at least its modelling tools are quite good.

December

Make further wire frame models and continue research into Internet protocols.

Section B: 1997

January/March

Now have a wide selection of "types" of wire frame model. Bits of architecture, and more abstracted "tangle" pieces. What next? Decide to put *Bodies* project on the back burner, and develop some of the architectural pieces. They look rather bleak....like jails or other institutional architectures...bits of old railway station or machines...quite powerful. Not sure, but feel that a theme is developing. Architecture guides but also imprisons and can be used to correct and teach in the sense meant by Foucault ...*vis a vis* the Panopticon...a good metaphor for a virtual environment, users won't get lost, if architecture and pathways clearly delineate and guide navigational choices.

March 13th

Visit "Bedlam: Custody, Care & Cure, 1247 - 1997" at the Museum of London. Some fascinating archival material is displayed and wonderful images of the different sites that the hospital has occupied. Have long considered doing a project about the hospital as live near the old Southwark site, now the Imperial War Museum. Will contact hospital archives and Imperial War Museum and arrange a visit...possibilities here for

some subject matter to apply to wire frame models, also fits with "Panopticon" metaphor.

April 16th

Visit Imperial War Museum, and talk to archivist, look at plans of the original hospital....very complex to model...a bit daunted by the prospect.

May

14th and 15th May 1997 visit to the *Bethlem* archive in Hayes, Kent. *Bethlem* is the oldest recorded mental institute and was founded in the middle ages. The reason for the visit is to study its archives. I'm particularly interested in the Diamond photographs from the mid 19th century — the first time photographic material was used to observe and aid classification of patients and illness. The reasons for choosing *Bethlem* (as opposed to another institute) are mainly historical — it has a rich past and provided treatment for many famous patients (Njinksy, Dadd etc.), has good archives, and was at one point in its history situated in Southwark ten minutes walk from where I live.

I was able to examine the original Diamond photographs, and some case studies from the 1880s. All the material is cleared under the hundred year rule, I feel a bit squeamish is it ethical to use this material? Some of the faces in the photographs look remarkably contemporary, the kind of people you can see walking around south London any day of the week, i.e. not like the sepia clichés we expect from Victorian photographs. The photographs don't give names just initials, a plate number and a diagnosis, some of the photographs are pairs — before treatment and after. The archivist tells me that the "after" photographs were rather staged — the patients much smartened up with new clothes, haircuts etc...In one of the photograph you can faintly see another pair of hands "holding" the patient in place long enough to be photographed — very sinister and absolutely heartbreaking. Explain reasons for visit to archive, and gain permission for use of material.

Selection of case notes taken from the case studies

These notes are taken from the case studies archive and date from 1888 (archive reference no.C/B133 &CB/134). The notes are transcribed as accurately as possible, sometimes the handwriting of the doctors is difficult to follow (nothing new in that). All the notes were taken from "reasons for admittance" and "observations on admittance". The notes don't directly refer to the Diamond photographs but are contemporaneous.

Female patients

Ella Christina age 52.

Called from the window to a policeman in the street and directed him to give information to the inspector of police in Paris of the robbery from her chest of a manuscript with her defence against Jesuit agents. Miss Christina

states that the Jesuit Fathers in Paris refused to administer the Sacrament to her and instigated the Mother Superior to place her in an asylum. Began to think that the Jesuits with whom she had disagreed were following her and gloating at her...thought she had been poisoned

Marion Waller age 45.

Suffering from delusions that she heard God's voice speaking to her and ordering her to do certain things...that she had seen the saviour and all eternity from heaven to hell. Is confused and constantly looking in the mirror. Thought that a gentleman at St. Margaret's was going to marry her. When she went to chapel that people where looking at her. Tried to jump out the window. Thought that the socialists wanted her to be sacrificed.

Elizabeth Shayer age 58

Says her chief trouble is that unfortunate penny; "my trouble is" she says "is whether I gave it to the wrong man: I might give offence by giving it to the wrong person there's the trouble. I'm afraid they will give it to the police, i.e. the person I gave the penny to a very long time ago. I fancy the police have heard of it...faces are not very nice". She hears the voice of her dead mother.

Male patients

James Thompson solicitor age 29

"I was bought from a bed of sickness in a cruel and brutal manner by three cowardly blaggards"...
He is quite incoherent in his talk rambling from one subject to another without any connection, with frequent references to God, dividing between them and similar religious appeals. He does not know the day of the week or the month where he is, or how long he has been in England. He asked me to lock up his razors that he would injure some one. The next day he tried to burn his clothes and then threw his socks into the fire: was incessantly talking on religious subjects. His cousin informs me hat he accused him of giving him ether....this was not the case. His attendant Mr. Cole tells me that he twice threatened him with a poker.

James George Callaghan age 17

Christina Callaghan (his mother) says that he came to her saying Jesus was in the garden, that he must go .
Smashed things in room, assaulted a missionary who came to see him, refuses food, refused to be dressed this morning, wanted to run out without clothes. He went out of house stayed out all night, was found in Hatfield, said he lost his way was detained by the police.

Benjamin James Pickery age 26

He told me he must go that a hidden power was impelling him to commit suicide, that he must do it although he did

not want to. Has been out of health for six months and suffering the effects of malarial fever. Would not attend church, thought that the sermons were preached at him about Xmas for the last four years. Thought that his nerves were gone and his flesh dropping off.

Richard Linshaw age 55

Refused to sit down saying he was in a fearful state of contagion the result of venereal disease. He said he infected the bystanders. He looks depressed and melancholy and all his conversation is about the awful state of his contagion. He says he contracted venereal disease at the age of eighteen. Delusions that he is bankrupt, ruined in every way...that he is deserted by the almighty, that he is more wicked and depraved than anyone else.

May 17th

Draw up plans for project, using archival material, both image and text. Will "embed" in architecture and allow users to explore and discover it. Still undecided about the form that the building will take. The problem with making the wire frames is that it is very time consuming It might be easier to use a single room or ward....less modelling required. A full wing of the Southwark site would take months. Decide to use some of the architectural models already built....the tower pieces are similar in form to the Panopticon image from "Discipline and Punish"...not really anything to do with *Bethlem*, but will use anyway and close conceptually...both *Bethlem* and the Panopticon being "corrective" institutions. Develop some plans (figure 69).

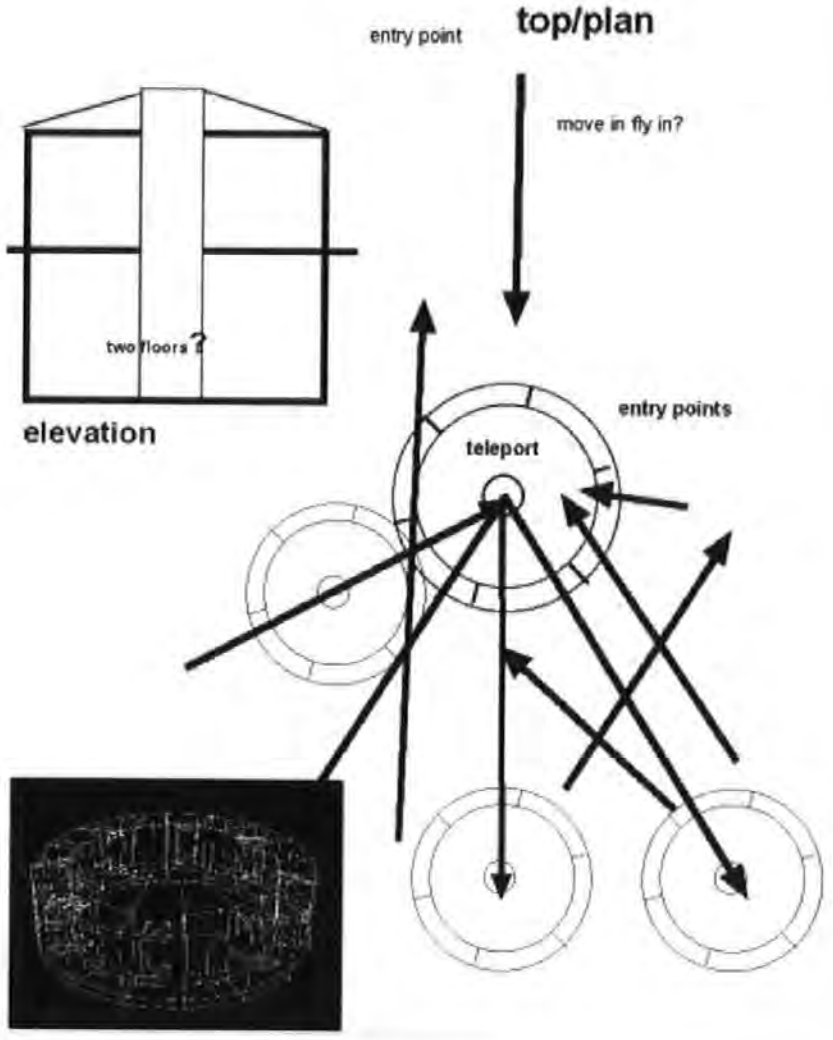

Figure 62: Developmental plan for *Bethlem*.

May 20th-
Build "Panoptic" wire frame structures using early "tower" pieces, and devise basic behavioural and interactive model, include gravity and collision detection.
May 28th-
Working prototype finished.
July 4th
Set up work and test at ICA.
July 5th
Prototype shown at "Parallel space", the ICA, London.
August
Showing the work at the ICA has given pause for thought. Good points: the project was stable and relatively easy to navigate, an

improvement on *Bodies*. People also responded well to the look and feel of the wire frames even if the project was an unfinished prototype. Lots of people mention games...could be an opportunity to spice up interaction by using game type strategies...must be careful, as I don't wish the project to become a game, the material is too sensitive. Web pages might be a good way of including extra material from the archives, linking objects in the space to external material....even out on the Web?

September 12th

Begin integration of archive material in environment.

September 17th

Animate Diamond Photographs

November/October

Format archival text in Web pages, program links between visual/3D material and Web pages.

December 1st

Program teleport behaviours into environment, to allow jumps between structures. Complete project, de-bug and test.

Section C: 1998

January

Return to *Bodies* project, with the intention of employing the wire frame tangle aesthetic. Building on the research into Internet and communication protocols, a proposal is drawn up employing a web spider search agent. Developmental sketches and further wire frame maquettes are developed to explore how the project might appear and how it might function.

February 5th

Some time is spent presenting the wire frame models and proposal to various media companies and individuals who it is hoped may be interested (possibly from a research and development point of view) in offering technical programming support to the project.

February 17th

Meeting at OKUPI to give presentation of project idea with the intention of getting some programming support. OKUPI are a commercial company specialising in networked virtual environments. Present: Tracey Mathiason, Gavin Baily, Steve North. The company aren't interested but one of their programmers Gavin Baily contacts me afterwards and expresses interest in helping out.

February/March
Early production procedures and forms of communication, meeting frequency established with Gavin Baily. Production meetings to occur at a minimum once a week and regular contact via email. VRML is chosen to develop the project, we both know it reasonably well, and feel it is suited to the project, being specifically designed for Internet use. Other possible software solutions are considered including Java 3D (not yet fully released), and C++. I began to conceive of *Reconnoitre* as being primarily a mechanism for reflection on the temporal dynamics of the Internet, an open system whose boundaries, via the unrelenting flowing and accretion of data and communication are continuously thickened and enlarged. The project isn't concerned with representing underlying structures, but like a landscape photograph taken from a moving train, conflating a record of place with the dynamics of movement through it. Taking the photographic metaphor further it was possible to conceive of it as functioning like a telescopic lens, with the environment acting in a similar manner to an exposure plate, onto which a temporal imprint of data activity may be recorded...its developing into a kind of "data camera" that like a telescope or Web browser functions to bridge two geographically distant places, or a device that allows the user to dip into a specific time and place in the evolution of the Internet and take a "snap shot" of the activity,

March/April
First pieces of collaborative work are made, exchanged via e-mail. Need more powerful equipment and a faster Internet connection. Decide to check out alternative funding possibilities from the arts council and maybe commercial companies. The equipment at Chelsea, while good is not specialist enough. A particular requirement is a powerful graphics card for rendering purposes.

May 2nd
The choice of data that is pulled in is obviously a crucial matter, if the work is not to be purely about "process". Choice of data could give the work real "bite". On the "text" side of things, taking data from newsgroups may be a good idea as they already classify an area of interest, they provide socially based unpredictable and fluid data traffic...all human life is there. I think it would be interesting to look at quite extreme news groups dealing with fundamental areas of human experience. The wire frame pieces are developing nicely. Virtual space suggests unfathomable depth, the way in which the wire frames overlay each other, simultaneously veiling and unveiling the space help articulate this, suggestive of flows of electro-magnetic energy and communication events, human/biological traffic as well.

May 12th
Test runs of completed work using various types of Internet connection, VRML browser and computer configurations. It

appears that VRML is too slow and unreliable. Java 3D seems a better bet. Research focuses on the potential of Java 3D to deliver the project, and research into Web search technologies begins. Decide to ditch VRML for the moment and use Java 3D,

June 1st - 15th

Initial experiments with Java 3D encouraging, it's faster and enables more complex functionality to be built into the work. The rendering of the shapes and text isn't quite as nice as VRML but with a decent graphics card in the computer would look fantastic. A Java based "web robot" has been found more properly called a "web spider". The web spider being Java based is able to talk to Java 3D, and can now begin the first real experiments that hook the Internet directly to an environment. Decide to make the work an independent program that the user connects to the Internet through, similar to a Web browser.

June 17th

Meeting at the ICA. Present: Sholto Ramsey (director of the New Media Centre), the ICA has extended an invitation to develop the project as part of the artist in residency scheme, using the New Media Centre. This would give a great chance to work with Gavin (Baily) on a day by day basis.

June/July

The web spider works! We now have live text and image data streaming into the environment, this is very exciting, the project really seems to be getting somewhere.

September

Commence artist in residency the ICA September to November 1998. Develop different versions of *Reconnoitre 1.0*: *WebStruct*, *SearchFrags*, *ImageQuad* and *PointCloud.*

September 8th

Navigation and keyboard and mouse input enabled.

September 14th

Interface developed allowing input of search term and URL requests.

September 22nd - 23rd

The work is exhibited in the New Media Centre. In contrast to previous exhibitions the time and space available to show the work is extremely limited. Also the ICA has imposed a charge to attend what was in fact a demonstration of the piece. Feel unhappy about this. An introduction to some of the background ideas informing the work is given and early development work shown. Following this, the latest implementations of the work are demonstrated and users are able to try it for themselves. Get email addresses from attendees in order to garner more feedback.

October

Following feedback from the ICA it is clear that more work is required on interaction. But how? I've begun to think of the environment not so much in terms of specific blocks of static data coming into the space (as we have got with web spider)but in a more abstracted sense as a data flow, that is dynamic. As such interaction and environment needs to be implemented that highlights these aspects. Given that the project is based/about the

Net. Interactions can be styled to mimic the way we use the networks: navigation, passing messages, retrieving data, modifying data etc. As a one to one mapping of this kind of activity is probably impossible (not to mention pointless), techniques need to be devised that can suggest it or represent it. As the Internet evolves in an unpredictable manner according to it's own internal set of rules or dynamics then so should *Reconnoitre*. I've begun to conceive of *Reconnoitre* as having a kind of ecology, where there might be global characteristics that impinge on data elements that come into the environment, coupled with material having some form of behavioural patterning or life cycle, i.e. they react/interact with *each other*, as well as the user. It may be possible to employ A-life techniques but divorce them from any attempt at simulating natural processes?.

October/December

Another issue to come out of the ICA residency was that due to the fact that Java 3D was not stable or fast enough to develop the work in the direction required. This requires re-writing the whole piece in another language. Candidates so far include Direct 3D and Open GL . A decent machine with a high specification graphics card is also required. Time needs to be spent thoroughly investigating the possibilities as the hardware is very expensive and I can't afford to make a mistake and buy a wrongly configured machine! Initial tests with Direct 3D and Open GL are initiated. Open GL seems the best bet, and the process of translating the work completed to date, into Open GL can begin. Discuss with Gavin the possibility of employing A-life techniques to represent the dynamics of information exchange on/in the Internet. He has some knowledge of A-life through work and may be able to implement some of the ideas I've come up with.

Section D: 1999

January

Brain storming session with Gavin to discuss A-life techniques and how they might be applied in *Reconnoitre*. I've been thinking back to the earliest descriptions of data spaces and kind of imagine a relatively active accumulation of decaying forms probably using Internet data selected by the viewer (possibly even using a browser), i.e. completely heterogeneous. The key issue here is I think connectivity, In *Reconnoitre 1.0* connectivity

occurs outside the environment but not inside. In this version it might be good to extend it internally.

February 27th

Good news: I've got dynamic text in space working at last! it's only a start but it looks great. Text is bitmap not 3D, renders much faster.

February 28th

Develop behaviours. Gavin has suggested using an electrostatics behavioural model that he has toyed with in another project. Works very simply and much easier to implement than the genetic/biological model previously discussed. Will call this new version of the project *Reconnoitre 2.0.* The behaviours function to regulate interaction between returned search material: gravity acts to pull all physically related nodes together; repulsion acts to push all physically related nodes apart; friction acts to damp node motion (viscosity of environment); electrostatics either attracts or repulses nodes depending on their individual charge. Currently when a node goes below a threshold decay level the node will link to its 3 nearest neighbours with springs and a visible ribbon. This means that linking is arbitrary in terms of data content. When the decay level goes below another threshold level, all the nodes links are broken. Another strategy would be to re-link nodes for a number of decay level thresholds, varying the number of links, e.g. a node might link to one other node initially, re-link to two nodes etc. As decay progresses linking decreases. Beyond the aesthetics and the effect on form, I think the linking suggests some kind of temporal semiosis.. .no rationale beyond that. The interactions posses a kind of rhythm. To pursue a musical metaphor a barely definable pulse emerges from the complex set of interactions that occur between the data nodes. This suggests an underlying structure or pattern that is akin to listening to an improvised jazz session in which a basic musical framework, underpins the emergence of improvised musical themes. The relationship of the user to work can in this circumstance be described as being one voice amongst many, where multiple entities ("musicians") are involved in a polyphonic or participatory situation through which structure emanates.

March/April

Next task is to experiment with colour, transparency/blending etc. and also see if I can get some elementary sound in.

May 8th

Mouse working with the parameter... looks great!

For the interaction between the two applications I'm wondering again whether it's best to have one search term entered at a time. If the 3D application picks it up immediately, issues a "search term entering space" sound and enters a new node source, it should be clear what's happening. The 2D application could be an edit window at the top and a text window below showing each new URL picked up (like a browser window), but just in ASCII text. For simplicity you could download all the URLs listed in

the altavista search return rather than using the spider at all.

May 20th

Develop slider interface figure

Slider control and mouse control possibilities mean that it is possible for the user to manipulate the environment in two different ways. The slider controls allow a more accurate and easy manipulation but look a bit clunky. The mouse controls are more transparent but more difficult to understand if you come to the work without prior knowledge. Quite good fun to play with allows direct manipulation of data nodes, similar to a "DJ" mixing deck.

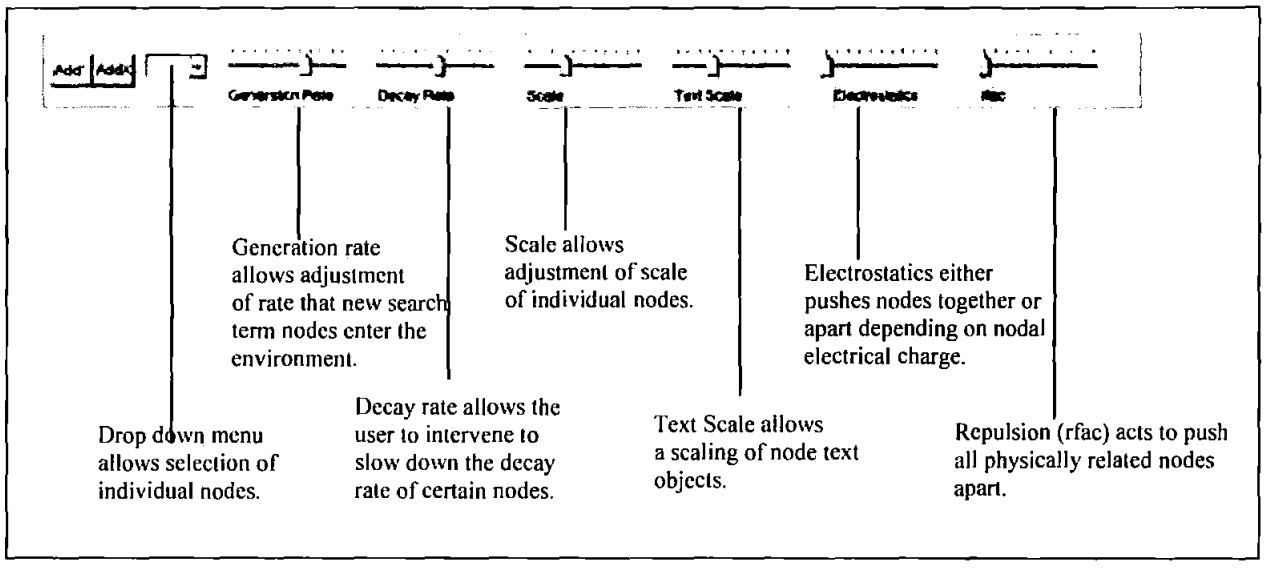

Figure 63: Slider version of interface for *Reconnoitre 2.0*

April 10th

Some doubts.

The "mixing deck" form of user interaction feels unsuitable. This kind of direct manipulative interaction while interesting on a certain level in that it allows the user to control the evolving forms, don't really relate to the environment or Internet in any form and aren't' consistent with the look and feel of the piece as a kind of "dysfunctional" browser.

April 1-20th

Work commences on a version uses images. This is quite successful, the images look very strange. However the image piece don't seem to have the depth of the text based piece. I think this is for two reasons: 1) the colour of some of the images flattens the space out; 2) the shapes are too regular, the environment spatially similar to cubist paintings...not really what I'm after.

Figure 64: Image version of *Reconnoitre 2.0*

May 2nd
Applied for two competitions Ars electronica, and Comtec Art 99 in Dresden, not too hopeful about Ars Electronica.
May 14th
Meeting with Benjamin Weil the new director of the ICA's New Media Centre. He has expressed some interest in following up from last years residency. Has some interesting insights on the work. He definitely considers it to be part of the "net.art" *zeitgeist*. This is an interesting take on the work, as I'd already begun to consider it in these terms. A couple of works exist that share similarities to *Reconnoitre*, IOD's Web*stalker*, which maps a two dimensional schematic of the Web, and *Potatoland*, which

takes Web pages and mashes them up, a kind of Web collage machine. *Reconnoitre* shares more with these types of work than most of the 3D virtual environment artworks reviewed. What differentiates *Reconnoitre* from these works is that it is 3D and has a sophisticated behavioural engine attached to it. This is quite encouraging *Reconnoitre* appears to be unique in the context of both existing virtual environment artworks, and the newer 2D net.art works that it shares conceptual interests with. He also made a couple of interesting suggestions regarding interaction, instead of just having text returns and URL's coming into the environment it might be possible for the user to select information types e.g. meta tags, URL's etc.

June 5th

Some ideas about how to progress with *Reconnoitre* in terms of simplifying and refining: construct Internet interface as part of the 3d environment either as 3d text or as a transparent overlay, experiment with rules for generation, transformation, relationships and decay, write gif to bmp converter for images (jpeg already done), make CD install version.

June 9th

Been thinking of the piece in terms of a kind of Web browser. Last week following Benjamin (Weil's) visit had this idea for a simple, interface with some pre-set content types that could be mixed in: HTML. Meta tags etc. Experiment with different "text" interface and ditch sliders.

June 18th

Text input and single application works. The piece that was two applications is now one, with a search term interface built into the environment.

June 28th

Beginning to think that more interesting emergence at the level of the in-coming data might be nice... at the moment the linking and decaying is arbitrary... wonder if it might be good to keep the form as it stands, but give the dynamic properties meaning, i.e. genuinely self organising: sentences containing the search term might linger; URL's with high hit counts linger, HTML might separate from content etc. With this scheme the dynamic would represent agency/ordering. All the above sound plausible, I like the idea of temporality attached to high hit counts, and sought of envisage HTML breaking off and forming separate HTML entities, e.g. HTML sound properties would be different from text sound properties or be more or less emissive etc.The more I think about this particular piece the more emergence seems to be its catchy aspect, making work is all about finding out which part is the catchy bit and then developing that. Its like a good pops song, its got a hook that pulls you in, not so good pop songs don't have it, with this work the search input possibilities are one hook, but the emergence hook is also compelling.

July 9th

Watching Benjamin Weil use the piece, to have interruption with the search term node might be crucial: allows for:

- readability
- saving interesting bits
- deleting boring bits
- changing the mix of content

If this functionality is important, the really tough bit is going to be the interface, the simple text interface looks much more elegant than the sliders, and fits in with the "browser" type apsects of the work. This is definitely the way forward.

July 12th

I'm still tidying up the interface colours and perhaps a strip of translucent background might help... also icons are a possibility (just as easy as text once they're made) at the moment there's: search, freeze, delete, and help (figure 65).

Figure 65: Colour interface experiments

July20th
Good news from Comtec art 99 the work has been selected for the exhibition in November, and has also been nominated for a prize. I've got a system of small text buttons within the Open GL frame. When you hit the search button a cursor comes up centrally in the scene, so you type directly into the environment as a means of positioning the search origin.
July 27th
Browser interface finalised
August
Finalise and debug release copies of project. Extensive testing period.
September 1st
Reconnoitre 2.0 public release as part Readme.txt - Browsing online art. Museo de Monterrey, Monterrey, Mexico. Curated by Benjamin Weil.
November
Reconnoitre 2.0 shown at: COMTEC Art 99, the Kunsthaus Dresden. Audience members polled via email in order to record responses to and opinions of the work.

Appendix 2: Responses to email questionnaires

- **Section A**: Email responses received in relation *Reconnoitre 1.0* shown at the New Media Centre, the ICA, September 1998.

- **Section B:** B: Email responses received in relation *Reconnoitre 2.0* shown at the Kunsthaus Dresden November 1999.

Figure 66: Email questionnaire sent out to user's of *Reconnoitre 1.0* (September 1998, New Media Centre, ICA) and *Reconnoitre 2.0.* (November 1999, Kunsthaus, Dresden).

1) What aspect of the work most interested you?

2) What aspect frustrated you or felt didn't work?

3) How do you think the work could be made more successful? And how do you think it should be developed.

4) What experience of computing do you have? Do you play 3D games (such as quake or doom)?

5) Are you an artist or do you have a background in the arts? If not how would you classify your professional background?

6) Are you aware of any other artworks that use VR technology, and do you have any opinions regarding artists using this technology?

Section A : Email responses received in regard *Reconnoitre 1.0* shown at the New Media Centre, the ICA, September 1998

Subject: *Reconnoitre*
Date: 30 September 1998 10:03
Dear Tom,

I'm happy to tackle your questions regarding the *Reconnoitre* demo. If I may I'll take questions 4 and 5 first, since inevitably these have a bearing upon the other answers.

5) I trained as a painter, after which I took a degree in the philosophy of education at London University. I did not pursue an academic career, and eventually I wound up in publishing, where I happened to witness the introduction of computers in design and production. At that time I resisted any involvement with the digital revolution, as I was far more interested in traditional art practices — printmaking in particular. At the beginning of the 90s I discovered the Internet, and since then have been very much focused on the Web, and related distributive technologies.

4) I have acquired the usual set of scripting skills, and now Java/Java beans, in pursuit of client-side programming. The latest browsers will, thankfully, avoid the need to query server-side script, with the persisted information saved to the client using a couple of functions! Recently I have got interested in streamed video, with the hope that this may offer more creative possibilities, and imagine — should I be able to afford the processing power — eventually getting into more sophisticated graphical environments.

6) In general I avoid technologies that are beyond the desktop and modem, and apart from some obvious instances, as say Stelarc, have no direct experience of artists using VR, or advanced computer technology. 1,2,and 3) The spider software linked to the 3D rendering engine builds, over time on the basis of a search, a kind of representation of the data space. However this search data must necessarily be represented in an entirely arbitrary form; as it moves across the information from the network fills the navigable space, and while offering viewers the heady illusion of being able to voyage through the ether between

URL's no other interaction is possible. What I like about *Reconnoitre* is the fact that it is reflexive, and that it struggles with the difficulties of representation, when what is described are interior relations between points on a system of communications. There are, I know additional features that you are still working on, however the most frustrating aspect is that the user is excluded from any interesting interaction. Unfortunately, I'm not sure what kinds of action could plausibly increase involvement, or make the experience more stimulating, but it might involve forcing interaction between different domains, or the modification of behaviours. Though I've no technical bases for saying so, I feel that *Reconnoitre* can be developed far further, and that it will most certainly inspire other programmes with an aesthetic/philosophical bent.

Michael Bloom

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> 1) What aspect of the work most interested you?

A fresh approach to presenting Web information is long overdue. I think that Web spider might have some interesting implications for developing a more immersive environment for viewing net data.

> 2) What aspect frustrated you or felt didn't work?

Nothing really.. Maybe I would have liked to have seen the information presented in a more usable way, as well as just going for an aesthetic. I know I am missing the point, though.

> 3) How do you think the work could be made more successful? And how do you think it should be developed.

As I have said, I think that the project could have a future as a piece of commercial software.

> 4) What experience of computing do you have? Do you play 3D games (such as quake or doom)?

My experience:- I am in the final year of a CS degree, with a major focus on 3D environment design. I also play quake.

> 5) Are you an artist or do you have a background in the arts? If not how would you classify your professional background?

I do have a great interest in the arts. I studied Art and Design to A level and I am always especially interested in digital art (hence me coming to *Reconnoitre*).

> 6) Are you aware of any other artworks that use VR technology, and do you have any opinions regarding artists using this technology?

I mentioned Char Davies's Osmose at the discussion. I have seen some more interesting work at MOMA and the Guggenheim in New York — but I can't remember who was showing. Personally I believe that VR is a very important area, and is one I would really like to get involved in myself.

>Ben-

>1) What aspect of the work most interested you?

I found the whole project really fascinating. The image based version seemed to work the best in the way that you can recognise sites pretty much immediately. The visual impact of experiencing the Internet in this way is stunning. It was also very important that the data was retrieved and added in real time. It also takes another dimension when you see a site you've done yourself. WHICH REMINDS ME: where are those screen shots of the camberwell college site you promised me?

>2) What aspect frustrated you or felt didn't work?

The rendering speed, mainly. I'm not sure if the nature of what you're doing is more complex from a 3D point of view, but compared to results obtained on my PII 233 by Unreal in software mode it seems really slow. One suggestion would be to get in touch with the videogame industry as I imagine they have had the time and money to develop the best VR engines.

>3) How do you think the work could be made more successful? And how do you think it should be developed.

The experience could be made more immersive. A full screen (rather than windowed) version, for example; unless of course you go for an installation. Also, VRML controls are notoriously uninstinctive. Why not use a videogame based keyboard + mouse combination to navigate the 3D? Sound would help, but I don't feel it to be crucial.

>4) What experience of computing do you have? Do you play 3D games (such as quake or doom)?

>5) Are you an artist or do you have a background in the arts? If not how would you classify your professional background?

I am a recent graphic design graduate and work mainly with computers. My uses of computers includes flat work (photoshop, quark illustrator), Web design, video editing. I have also played around with 3Dsmax. I used to own a commodore 64, and learnt how to code assembler on it when I was about 10 (as well as play innumerable videogames). I play Quake II and Unreal. I am fascinated with the level of realism attained by this kind of game, esp. in combination with a hardware accelerator. That's actually the only reason I play them. I've never been a big fan of first person shooters.

>6) Are you aware of any other artworks that use VR technology, and do you have any opinions regarding artists using this technology?

Not VR technology per se. Angela Eames, whom I mentioned when I was at the ICA works in 3D rendering and animation, with a strong conceptual approach. I have also heard (but not experienced) of "system maintainance", by Perry Hoberman, recently showed at the Hull Roots festival.

Good luck with the doctorate. Please keep me updated with future developments of this project.

Ben O'Hear.

Tom, here are my answers, I very much enjoyed seeing your work. Found it all very intriguing particularly as I know very little about computers and the net. Enough to use them relatively competently but I have absolutely no idea of how they actually work.

1) What aspect of the work most interested you?

the thinking behind it, the idea of the Web as a 'living space' rather than flat dead thing. The 'connections' and the fact that if you left it running long enough the whole Web would be 'mapped'. The ability the explore the Web in a completely different way.

2) What aspect frustrated you or felt didn't work?

None really, if I knew a bit more about computers then maybe I would have been frustrated by not understanding how you had got where you got. But as i don't understand at all this is not a problem. I don't expect to understand therefore it doesn't matter.

3) **How do you think the work could be made more successful? And how do you think it should be developed.**

just more of it, you seem to be going in the right direction and I like the idea of being able to 'walk' through a projected spider.

4) What experience of computing do you have? Do you play 3D games (such as quake or doom)?

competent word user, average excel and powerpoint and the occasional game of Minesweeper and Patience!!!! i.e. extremely low level, last time I played computer games with any regularity was in the Pacman era! Have since proved utterly useless at even the most basic level of Tetris.

5) Are you an artist or do you have a background in the arts? If not how would you classify your professional background?

I work for the Association of Business Sponsorship of the Arts and therefore have both a professional and personal interest in the arts.

6) Are you aware of any other artworks that use VR technology, and do you have any opinions regarding artists using this technology?

Not aware of names and places of others but am very aware of it going on. Intriguing area of work in which interest can only increase. Hope this is useful. good luck with the project i would be interested in hearing about any 'exhibitions/installations' that you develop.

Kind regards

Sue Sandle

---

1) What aspect of the work most interested you?

3D environment

2) What aspect frustrated you or felt didn't work?

I felt that was a very experimental piece in a lot of way. I didn't quite understand who it was aimed at.

3) How do you think the work could be made more successful? And how do you think it should be developed.

Perhaps the addition of sound would intensify the veneers experience. In my opinion sound association would benefit your work by feeding the viewer almost. I imagine any computer "game" without sound effects! I also think that you could add icons to make the work more interactive in a way that the viewer can come away feeling more entertained (and informed).

4) What experience of computing do you have? Do you play 3d games (such as quake or doom)?

I play quake and doom. personally, I prefer quake. And also I play games such as Nintendo 64. I am waiting for Dreamcast to come out. I 'm going back to Japan this winter!

5) Are you an artist or do you have a background in the arts? If not how would you classify your professional background?

I am a 1st year fine art student at St. Martins.

6) Are you aware of any other artworks that use VR technology, and do you have any opinions regarding artists using this technology?

Maurice Benayoun / Jean-Baptiste Barriere: Their work "World Skin" raises artistic questions on seeing and images. I like the way of presenting its three-dimensional space with flat pictures. Christa Sommerer / Laurent Mignonette: Christa Sommerer and Laurent Mignonette are artists who design excellent user interfaces. Their work explores interactivity, virtual reality, communication and artificial life. A conversation between human plant, and between human views via plant. Akitsugu Maebayashi: His piece "Audible Distance" gives the experience which become aware of the relationship between the self and the others. Its presentation is quite simple so that the visitor feel more direct communication with the work.

I hope that you understand my English... It was really nice to meet you. I learned and got ideas from your work. I would like to see your other work. And also I would like to tell my friend about your work. So if you have your homepage or something we can visit and know about your activity, please tell me.

Yours Sincerely,
Sheesha

Tom-

here are my answers. I'm afraid I don't have much to say on that subject. My background is too theoretical. But this doesn't mean that I didn't enjoy the presentation!

>1) What aspect of the work most interested you?

I am interested mostly in the representation of Web-information in and especially around the Web - unusual ways of representation. Usually, I am more interested in the textual than the visual/structural, but out of
curiosity this was interesting, too.

>2) What aspect frustrated you or felt didn't work?

I would have liked to relate to the text a little bit more, i.e. see more what the pages in question were actually about (this works

well on the graphic one). It seemed too abstract and therefore potentially repetitive.

>3) How do you think the work could be made more successful? And how do you think it should be developed.

Well, basically in the direction that I was missing (see question 2). I am afraid I don't at the moment have any idea on how that could be done. Maybe better equipment (better monitor) and an environment in which one could try out could help.

>4) What experience of computing do you have? Do you play 3d games (such as quake or doom)?

I use a PC for word processing mainly and for email and Web-searches (plus a few other features). The only 'programming experience' I have is basic HTML. Not really anything! And no - I don't play 3D games.

>5) Are you an artist or do you have a background in the arts? If not how would you classify your professional background?

My professional background is academic. I am currently teaching as well as doing a PhD myself.

>6) Are you aware of any other artworks that use VR technology, and do you have any opinions regarding artists using this technolgy?

The only thing I've seen is Osmose.

Good luck with the future development!
Please let me know when the Website is working!

Maren

Section B: Email responses received in relation *Reconnoitre 2.0* shown at the Kunsthaus Dresden November 1999

Hi Tom,
it's time for some mail, don't you think.
Are you back in London?

1) I liked that I could make the work do something. In a couple of ways. Not only that it replies to what I type in but also that it changes its form/certain parameters without losing its basic features. Maybe I liked this balance best. It makes the work lyric somehow: it plays with my perception on
the theme I gave it... That is really what I liked most. The work is playful in a somehow gentle manner. How come?

2) It depends on the net, so it slows down or stops working if the connection is slow. It is different to use it when the machine is attached to a monitor. 3) So I think it should be on display with a big screen only. Perhaps a big screen changes the attitude of the user. I enjoyed it much more then. And it takes a while until you know how to play with it. Maybe the users need some encouragement for fumbling around with it.

4) I'm studying English literature and History. How would you classify that? Interpretive academia? I hope you still need the answers. If not, it was fun to answer anyway:)

Susanne.

---

hi tom,

here are the results of the slovenian jury :)

1) What aspect of the work most interested you?

the fact that *Reconnoitre* is:

- poetic
- metaphoric
- imaginative
- interactive
- soft
- slow
- gentle
- feminine
- attainable
- fluent
- quiet
- curious
- light
- generous
- safe
- intense
- beautiful

2) What aspect frustrated you or you felt didn't work?

i'd like to click on the texts, words or URLs. i'd like to have them as real links, but *Reconnoitre* doesn't allow me to do that.

3) How do you think the work could be made more successful?

you should make a deal, a contract with netscape communications co. so that would distribute *Reconnoitre* as a part of netscape communicator (or navigator).

all the best to you,
igor

Appendix 3: Exhibitions, lectures, presentations etc.

All exhibitions and demonstrations of creative practice, published writing and lectures given, relevant to the research are itemised. Those exclusively concerning the PhD are marked *.

Talks/lectures/presentations

1997 Sept,	"Virtual environment artworks and the audience", paper given in the early stages of research, Mesh conference, The London Institute. *
1996 Sept.	Lecture, "Building the Cybercity", Bartlett School of Architecture, University College London.. *
1996 Sept.	Research seminar, presentation of research proposal, Chelsea College of Art and Design, The London Institute. *
1997 March	Presentation of ongoing work, research colloquium, The London Institute. *
1998 Feb.	Seminar, ongoing research presentation, Chelsea College of Art and Design, The London Institute. *
1998 March	Lecture, Art History option in virtual reality, Chelsea College of Art and Design, The London Institute. *
1998 March	Presentation of creative practice, Exeter School of Art and Design-University of Plymouth. *
1998 July	Presentation of on-going research, London Institute Summer School. *

1999 March Presentation of creative practice, Exeter School of Art and Design, University of Plymouth. *

1999 Nov. Dresden, panel talk and presentation of *Reconnoitre 2.0*, at "COMTEC Art 99". *

1999 Nov. Presentation of creative practice, Exeter School of Art and Design, University of Plymouth. *

2000 Feb. Presentation of *Reconnoitre 2.0* and panel discussion, "Transmediale", Berlin. *

Public exhibitions/presentations of creative practice

1996 July *Bodies* shown at "Building the Cybercity", ICA, London. *

1997 May *Curatour 1*, Online virtual environment, commissioned by the ICA, London. Made in collaboration with Peter Maloney.

1997 May *The Infinite Web Page* shown at: "Digital Diaspora", The Camden Arts Festival, London.

1997 July *Bethlem* shown at: "Parallel space, international conference on virtual environments", ICA, London. *

1998 April Wire frame maquettes shown at: "The Shape of Things to Come", ICA, London. *

1998 Sept. Artist in residency, New Media Centre, ICA, London. *

1999 Sept. *Reconnoitre 2.0* shown at: "Readme.txt - Browsing online art". Museo de Monterrey, Monterrey, Mexico. *

1999 Nov. *Reconnoitre 2.0* shown at: "COMTEC Art 99 3rd International Festival for Computer Aided Art and Interdisciplinary Media Projects", Kunsthaus, Dresden. *

2000 Feb *Reconnoitre 2.0* shown at: "Transmediale 2000, International Media Art Festival", Podewil Centre, Berlin. *

2000 May *Reconnoitre 2.0* shown at: "[d]vision 2000 — Interfaces for Digital Culture", Schikaneder Theatre, Vienna. *

2000 Sept. *Reconnoitre 2.0* shown at: "Ars Electronica Festival 2000: Next Sex", Ars Electronica Center, Linz,.*

2000 Sept. *Reconnoitre 2.0* exhibited in "City". International media art award 2000 exhibition, ZKM/ Galerie K + S, Berlin. *

Awards

1999 Nov. *Reconnoitre 2.0*, festival prize: Interactive Art System, "COMTEC ART 99. International Festival for Computer Aided Art and Interdisciplinary Media Projects". *

2000 Sept. *Reconnoitre 2.0* , honorary mention: "**.net**, Prix Ars Electronica", "Ars Electronica Festival 2000: Next Sex". *

2000 Oct. *Reconnoitre 2.0*, nominated for the "International Media Art Award 2000", Zentrum für Funst und Medientechnologie (ZKM). *

Publications and artist's statements

1996 ICA lecture Building the Cybercity, ICA audio tape. London: ICA. *

1999 Artist's statement, COMTEC Art 99, exhibition catalogue, COMTEC: Dresden. p.24-25 & 172-178. *

2000 Artist's statement, Transmediale 2000, exhibition catalogue, Berlin: Transmediale. p.61*

2000 Artist's statement, Cyberarts 2000: International Compendium Prix Ars Electronica, Leopoldseder H. and Schöpf C. (eds.), Vienna:Springer-Verlag. p.21, & p.44-45. *

Reviews and publications featuring creative practice

1998	Anders, P. Envisioning Cyberspace; Designing 3-D Electronic Spaces, McGraw-Hill. p.217, *
1999	Weil B. "Readme.txt Browsing online art: An exploration of various directions in networked art projects" [Internet], Museo de Monterrey, available from: <http://www.museodemonterrey.org.mx/english/mediateca/tours/docs/weil/index.html >*
2000	Baumgaertel T. "Software-Kunst II" (German text), [Internet], Nettime, available from: <http://www.nettime.org/rohrpost.w3archive/200005/msg00137. html >.*
2000	Stocker G. and Schöpf C. (eds.), Next Sex: Sex in the Age of Procreative Superfluousness, Ars Electronica 2000, Vienna: Springer-Verlag. p.408.*

Appendix 4: Virtual environment artworks referenced in the text

Artworks are listed alphabetically. References include instances when projects were seen and bibliographic information.

Avolve (1994), Christa Sommerer and Laurent Mignonneau

Avolve is an artificial life project that allows users to define and propagate simulated organisms. The installation consists of a darkened room and a plinth supporting a water filled pool (5m x5 m x 5m). The pool in conjunction with gesture recognition software acts as both the interface and projection space for a virtual environment. The projection placed beneath the pool is reflected via a mirror giving the illusion that it occupies the same space as the pool. An editor program allows a number of users to draw the profile of a creature on a pressure sensitive monitor. The drawing is converted to 3d form; colour, shape and texture values are assigned it to make up a complete genetic profile. A movement characteristic whose character is determined by the conjunction of an algorithm and the form of the creature decided by the user enables movement; once formed the creature is transferred to the pool and is given "life". In the environment the creature can be communicated with/influenced by a movement of the user's hand. The creature's behaviour is unpredictable — sometimes avoiding the hand sometimes playing with it. Survival of creatures is determined by "fitness", the fittest creatures surviving by preying on the weaker. The user is also able to protect a creature from predator creatures and can encourage it to mate by pushing it toward other life forms, if successful the offspring inherits the genetic material of its parents. Creatures have a life span and can die; death occurs in three ways: through hunger, (being unsuccessful predators), by being eaten by other predators or by reaching the end of their life span.

References

Sommerer C. and Mignonneau L. 1994. "A-Volve, Golden Nica Award", Der Prix '94 Ars Electronica: International Compendium for Computer Arts, Leopoldseder H. (ed.), Linz :Veritas- Verlag.

Sommerer C. and Mignonneau L. 1998 "Avolve" [Internet], ATR Advanced Telecommunications Research Lab, available from: <http://www.mic.atr.co.jp/~christa/WORKS/CONCEPTS/A-VolveConcept.HTML> .

Bodies Incorporated (1996), Victoria Vesna

See Section 2.26

References

Experienced online.
Bodies Incorporated Internet site, The University of California, available from:
< http://vv.arts.ucla.edu/projects/installations/*Bodies*_inc_sfai.htm>

Vesna V. 1999. "Marketplace: Building a World of Agents and Avatars or Information Personae?", Digital Creativity. Vol. 9 No.3. 129-136.

Bar Code Hotel (1996), Perry Hoberman

See Section 2.2.8

References

Experienced at ZKM, Karlsruhe, November 1998.

Hoberman P. 1995. "Bar Code Hotel", Immersed in Technology Art and Virtual Environments, Moser M.A. and MacLeod D. (eds.), Cambridge: MIT Press.

Hoberman P. 1995. "Bar Code Hotel: Diverse Interactions of

Semi-Autonomous Entities Under the Partial Control of Multiple Operators". Conference proceedings of the Stereoscopic Displays and Virtual Reality Systems II, San Jose.

Huhtamo E.1997. "Hoberman vs. Junkman", Unexpected Obstacles: The Work of Perry Hoberman 1982-1997 exhibition cat. Tolmitus L. (ed.), Espo Finland:Galleria Otso.

Éphémère (1998), Char Davies

Figure 67: Screen shot of *Éphémère*

Éphémère builds on the Davies' earlier project *Osmose* (section 4.1.1) by employing the same "chest-hugging" interface. The work is split vertically into three levels: landscape, earth, and interior body. Navigation through the different levels is accompanied by a continual cycling of dawn, day, evening and night, winter, spring, summer and autumn. A corresponding blooming and decaying of organic life forms is triggered in response to the presence of the user.

Artist's statement

EPHEMERE's iconography evolved through Davies' long-standing practice as a painter, and, as in OSMOSE, is grounded in 'nature' as metaphor: archetypal elements of root, rock, and stream etc. recur throughout. In EPHEMERE however, this iconographic repertoire is extended to include body organs, blood vessels and bones, suggesting a symbolic correspondence between the chthonic presences of the interior body and the subterranean earth...throughout, the various elements of trees, rocks, seeds, body organs, etc, come into being, linger and pass away. Their emergings and withdrawals depend on the immersant's vertical position, proximity, slowness of movement, and steadiness/duration of gaze, as well as the passage of time: for example, in the earth, seeds sprout when gazed upon for any extended length of time, rewarding patient observation with germination, inviting entry into the luminous interior space of their bloom. The only constancy is the ever-changing river: when the immersant surrenders to the pull of its flow, it metamorphosizes from river to underground stream or artery/vein and vice versa, summoning in the corresponding visual/aural elements of each realm. This strategy serves to provide a non-linear means of navigation through the three realms, in addition to that of the immersant's breath and balance.

Deep within the earth, rocks transform into pulsing body organs, eggs appear, and aging organs give way to bone. After fifteen minutes of immersion, the experience slowly draws to a close, its endings dependent on the participant's location, as the landscape's autumnal leaves, the earth's roots and rocks, the body's bones, give way to drifting ashes, embers and dust. No journey through EPHEMERE is the same.

References

Char Davies' Web site, [Internet] Immersence, available from: <http://www.immersence.com/immersence_home.htm>

*EVE (*1993-95), Jeffrey Shaw

See Section 2.2.8

References

Shaw J. 1993. "EVE-Extended Virtual Environment", MultiMediale 3: 5 - 13 November 1993, IWKA-Halle, Lorenzstraße ; das Medienkunstfestival des ZKM Karlsruhe, exhibition cat. Klotz H. (ed.). Karlsruhe: ZKM.

Shaw J. and May G. 1994. "EVE:Extended Virtual Environment". London Virtual Reality Expo 94. Proceedings of the Fourth Annual Conference on Virtual Reality Held in London in Februrary 1994.

Morse M. 1997 "Extended Virtual Environment (EVE)", Hardware, Software, Artware: Confluence of Art and Technology. Art Practice at the ZKM Institute for Visual Media 1992-1997, Blase C. and Morse M. (eds.), Karlsruhe: Cantos Verlag.

Modalities of Interactivity and Virtuality, artist Jeffrey Shaw, VHS video (48 mins.) 1994: Documentation of lecture from the ZKM video library (vid0205).

Handsight (1991), Agnes Hedegus

The project employs a thrice recurring circular leitmotif. The circular form functions as a metaphor for the eye. The interface consists of a positional tracker concealed within a hand held model of the human eyeball. A transparent globe with an opening (iris) in the top, invites examination by the eyeball tracker. Examination of the globe by the "handsight" corresponds and is translated into an exploration of a virtual space projected in circular form in front of the interface. The virtual environment contains a tableaux of the crucifixion and is based on a Hungarian folk art object — a passion jar. A passion jar is an object that "evokes belief by giving

it visual representation...access to a transcendental realm that is sealed in time". (Morse p.41.1997)

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The world inside the virtual environment is seen through anamorphic projection, which distorts the scene producing abstracted, vertiginous spatial relationships. The bright coloration of the objects in the scene heightens its connections with symbolism and it's folk art origins. By accessing what is otherwise inaccessible an imaginary transcendental space is externalised and recast as virtual space.

Figure 68: Installation shot of *Handsight*

References

Experienced at ZKM, Karlsruhe November 1998.

Hedegus A. 1993. "Handsight", MultiMediale 3: 5 - 13 November 1993, IWKA-Halle, Lorenzstraße ; das Medienkunstfestival des ZKM Karlsruhe, exhibition cat. Klotz H. (ed.) Karlsruhe: ZKM

Morse M. 1997 "Handsight 1991-93" Hardware, Software, Artware: Confluence of Art and Technology. Art Practice at the ZKM Institute for Visual Media 1992-1997, Blase C. and Morse M. (eds.), Karlsruhe: Cantos Verlag.

Interactive Plant Growing (1992), Christa Sommerer and Laurent Mignonneau

Interactive plant growing is concerned with simulating the growth patterns of plants. The installation consists of a darkened room containing a projection screen faced by five plinths. Each plinth supports a real plant. The room is spacious enough for a number of people to either use the piece (five at a time) or observe others using it. The plants function as an interface through which virtual plants can be created, grown and manipulated. The virtual plants inhabit a 3D virtual environment that is projected onto the screen in front of the plinths, the interface of the real plants share a thematic continuity with the virtual plants projected in front of them. By touching the plants the users can instigate the growth of new plants and manipulate their characteristics. The interface contains positional sensors that measure the distance or pressure of the users hand in relation to the real plants and passes the data to a growth algorithm housed on a computer. Reaction to the human touch is instant allowing real time feedback between the virtual plants and the users. More prolonged usage of the piece enables the user to discover that sensitivity and variety of touch enables change in the size, colour and position of the virtual growth. The growth of five different plant species are possible. Each species can be varied in more than 25 different ways determined by a random algorithm whose variables are defined as size, length, colour, translation and rotation. In relation to user interaction it is

theoretically possible for the entire gamut of random growth possibilities to be exhausted, however the great range of differing human touch inputs, conflated with the random growth patterns generated via algorithmic processes mean that a great number of unpredictable outcomes can accrue.

Figure 69: Installation shot of *Interactive Plant Growing*

References

Experienced at ZKM, Karlsruhe, November 1998.

Schwarz H.P. 1997. "The Interactive Plant Growing: Christa Sommerer & Laurent Mignonneau", Media-Art-History : Media Museum : Zkm - Center for Art and Media Karlsruhe, Munich: Prestel-Verlag.

Sommerer C. and Mignonneau L. 1997. (eds,) Art @ Science Vienna: Springer.

The Forest (1993) Tamás Waliczky

The project confronts the user with a fog-enshrouded forest of dead trees, which extend infinitely in all directions. The audience may progress forward or backward, left or right, up or down, through the environment by using an hydraulic platform as a navigational interface.

Figure 70: Screen shot of *The Forest*

References

Morse M. 1997. "Der Wald 1993", Hardware, Software, Artware: Confluence of Art and Technology. Art Practice at the ZKM Institute for Visual Media 1992-1997, Blase C. and Morse M. (eds.), Karlsruhe: Cantos Verlag.

The Golden Calf (1995), Jeffrey Shaw

The work takes the form of a pedestal to which is connected a hand-held flat display monitor. The monitor displays an exact 3d representation of the exhibition space in which the piece is displayed and a model of a golden calf sitting on the pedestal. As in Shaw's other work an alignment is created between real and virtual space The user by picking up the monitor and placing it in front of the empty pedestal walking around it, reveals the virtual sculpture. Interaction occurs through the user revealing the hidden sculpture. The sculpture cannot exist or be seen without the user literally activating the electronic "window". As in *EVE* Shaw makes reference to separate image traditions, conflating an older tradition that refers to a framed picture space, and an emerging modern interactive tradition evolving through the use of new digital media.

References

Shaw J. 1997. "The Dis-Embodied Re-Embodied Body" , Jeffrey Shaw- A Users Manual: From Expanded Cinema to Virtual Reality, Manuela A. (ed.) Manuela A. Choma A. Dusinberre *et. al.* (trans.), Karlsruhe: Edition ZKM Cantz.

Shaw J. 1997. "Virtual World Voyage" , Jeffrey Shaw- A Users Manual: From Expanded Cinema to Virtual Reality, Manuela A. (ed.) Manuela A. Choma A. Dusinberre *et. al.* (trans.), Karlsruhe: Edition ZKM Cantz.

The Legible City (1988), Jeffrey Shaw

See Section 4.1.1.

References

Experienced at ZKM, Karlsruhe November 1998.

Schwarz H.P. 1997. "The Legible City: Jeffrey Shaw", Media-Art-History : Media Museum : Zkm - Center for Art and Media Karlsruhe, Munich: Prestel.

Seifert O. 1996. "Jeffrey Shaw: The Legible City, 1988-91" MEDIASCAPE: Guggenheim Museum SOHO, exhibition cat. New York: Guggenheim Museum Publications.

The Televirtual Fruit Machine (1993), Agnes Hedegus

The primary function of the *Tele-virtual fruit machine* is to explore social and participatory interaction between geographically sundered sites. Two computers at separate locations are linked via an ISDN connection. At both locations are video monitors with live camera feeds, and a large projection screen. In front of the screen is a plinth supporting a joysick. Two halves of a texture mapped globe are shared between the two separated sites. Each participant can control one half of the globe, which can be manipulated by using the joystick. A successful outcome joins the two halves together. Completion of the task induces a shower of virtual coins. The video monitors at the separate sites display a live video image that allows the participants to see each other and communicate whilst attempting to join the two halves of the globe. Although the piece is seemingly limited in its aims, its interest lies not in the successful joining of the two halves of the globe, but in the way that the separated users skilfully use the two channels of communication — the virtual space occupied by the globe and the video feed between them. The interweaving of different forms of interaction with two separate forms of communication makes any outcome unpredictable, making for an experience that is open ended and

rich in potential for playful and exploratory computer mediated social interaction.

References

Morse M. 1997 "The Televirtual Fruit Machine 1993", Hardware, Software, Artware: Confluence of Art and Technology. Art Practice at the ZKM Institute for Visual Media 1992-1997, Blase C. and Morse M. (eds.), Karlsruhe: Cantos Verlag.

The Virtual Museum (1991), Jeffrey Shaw

The Virtual Museum is concerned with two issues: it questions the relevance of the traditional art museum in the era of the digital image by proposing "an architecture that is as provisional as the culture it em*Bodies*" (Shaw p.67 1992), and the dialectical relationship between virtual and real environments. The installation consists of a 3D virtual model representing the museum it is displayed in. As in *The Legible City* the interface through which the user explores the representation emphasises the conjunction of the real museum and its virtual representation by aligning and translating movement between environments. A circular mechanised dais supports a chair which faces a large video projection screen. The monitor displays the computer generated virtual museum, an exact simulation of the room in which the installation is displayed. Turning the chair causes the mechanised dais to swing around producing a corresponding rotation of the users viewpoint in 3D space. Moving the chair backward and forwards on the dais causes a synchronised movement backward and forward in the representation establishing a navigational contiguity between movement in the real space of the museum and its simulation.

Navigation of the virtual museum reveals a number rooms. The entry or default room further emphasises the conceptual thrust of the work by displaying a model of the interface. Running around walls of the room is a horizon line which acts as an entry point to the other four rooms. Three rooms refer to traditional creative media (painting, sculpture and cinema) one to a specifically

virtual experience. The sculpture room consists of word assemblages representing the five senses: touch, sight, hearing and smell. Japanese Kanji characters (a haiku) criss-cross the cinema room. A Muybridge film projected onto their surface refers to the emergence of time based representation and the possibility of mixing differing temporal forms. The final room contains three animated, lit, 3D model letters. The letters act as light sources which illuminate the room via their travels. The room emphasises the virtual in relation to the real i.e. the unique quality of synthetic virtual light as differentiated and "different" from natural light.

Figure 71: Screen shot *The Virtual Museum.*

References

Schwarz H.P. 1997. "The Virtual Museum: Jeffrey Shaw" Media-Art-History : Media Museum : Zkm - Center for Art and Media Karlsruhe, Munich: Prestel.

Shaw J. 1992. "VIRTUAL REALITY: A NEW MEDIUM FOR THE ARTIST?" Conference proceedings of the 2nd Annual conference on virtual reality international: Impacts and applications, London.

Osmose (1994-1995), Char Davies

See section 4.1.1

References

Davies C. 1998. "Osmose: Notes on Being in Immersive Virtual Space", Digital Creativity Vol.9. No. 2.

Morse M. 1998. Virtualities: Television, Media Art and Cyberculture, Indianapolis: Indiana University Press.

Davis E. 1996. "Osmose" Wired, no. 4.08, Aug. 1996, 138-140, 190-192.

Wertheim M. 1996. "Virtual Nature: Osmose - Char Davies' Organo-Virtual Odyssey", Metropolis, Sept. 1996. 58-61.

Broadcast

Cyberspace: The Undiscovered Country. Documentary. Antelope Film Productions, aired Dec.1996, ITV, UK.

The Net (Series 3, no. 1) Illuminations Productions, 39 min., aired 14 Dec. 1996, BBC Television, UK.

World II, Jenny Holzer

World II confronts the user with a series of "ethnically cleansed" Bosnian villages. Each village contains a series of buildings situated in a war blasted landscape. Navigating the environment

and entering the structures triggers an anecdote concerning an atrocity, relayed either by its perpetrators, victims or witnesses.

Artist's statement

> It was clear that the strategies used in the Bosnia are all too common techniques of war, so I thought about how to translate this sort of content into a virtual world, and it seemed that it would be much more immediate if the material was spoken by men and women rather than printed out...the real problem is whether you're talking about the most important thing and whether you're doing it in a way that's accessible to almost everyone. Whether you can do it in a way that's not didactic, and what you're conveying is felt as well as understood; the same problem with any medium.

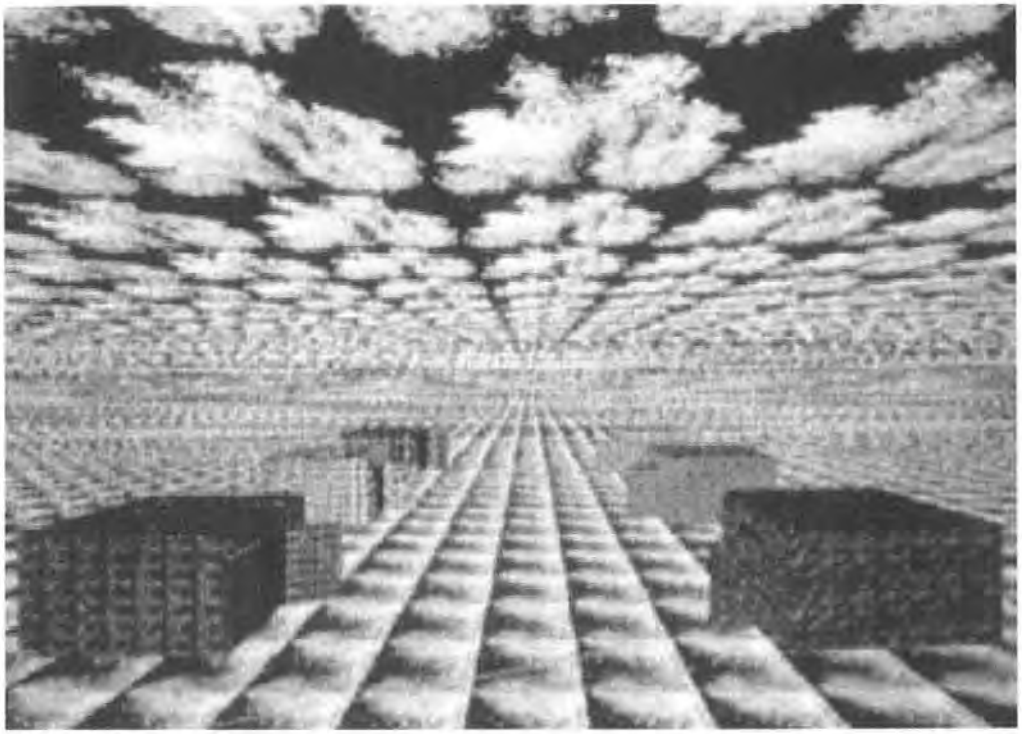

Figure 72: Screen shot of *World II.*

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