Mnemovie:
Visual Mnemonics for Creative Interactive Video

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Certificate of Authorship

I certify that the work in this thesis has not been previously submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all the information sources and literature used are indicated in the thesis.

Signed

Date

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For Deborah, Hal and Aurora, my main sponsors.

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For those I have overlooked, there will come a time when all will be revealed…….

Preface

‘While more and more people … are plunged into film history, the experience is far removed from that of the traditional cinema audience bound to a film in its given order at 24 frames per second. In this dialogue between old and new, past and present, the opposition between film and new technologies begins to break down and the new modes of spectatorship illuminate aspects of cinema that, like the still frame, have been hidden from view.’ (Mulvey, 2006) 27.

FIG. 1

When a man is making a speech and you are to follow him, don't jot down notes to speak from, jot down PICTURES. It is awkward and embarrassing to have to keep referring to notes …. but you can tear up your pictures as soon as you have made them - they will stay fresh and strong in your memory in the order and sequence in which you scratched them down. (Twain, 1914)

My initial encounters with the contemporary era of interactive computer-mediated artworks began in 1992. A small Macintosh SE, a single unit incorporating screen and CPU, placed on a table in one of the vast upper loggias of the Royal Festival Hall in London, containing a 'virtual book' of 'animated poems' by the poet and Chinese scholar John Cayley, demonstrated to me the potential of animated motion pictures controlled through computers.[1]

A few days later I visited the Town Hall Gallery in Croydon, south London, and caught sight of myself on a monitor. The artist had captured my image on the way into the exhibition, added it into a database, then retrieved it along with other visitor's appearances, displayed randomly as we moved through the space. Photographic images as dynamic, randomly accessible resources for memory and the moment, as memory-resonant moments of time were experienced firsthand.

Later that year, the Third International Symposium of Electronic Art (TISEA, 1992), was hosted in Sydney and shortly after, I signed up for a Master of Fine Art by Research on the topic of interactive multimedia. Another decade and the need for further advanced research, delivers me to the present.

The act of 'being in the world' of related research, affects directions taken and affordances encountered, as in any other endeavour. The 'snapshot' herein of my research and the research of others is therefore a four-year time exposure of captured written information and thoughts from the recent to the more distant past. Though so many 'leads' and possibilities were assiduously followed-up, it does not claim to be exhaustive. Making connections and establishing relations between aspects of several otherwise specialised disciplines, was motivated not only by understanding more deeply the tools and technologies available to the artist, but also the university culture supporting broader research objectives.

The significance of this became amplified to me for instance at meetings of senior researchers, where documents presented supported in a parallel sense, my personal research objectives. Thus for example in June 2006, one of the

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[1] Later that year I purchased his collection of works, all made using the revolutionary Hypercard software, on a floppy disc (Cayley, 1992). Cayley is now a well-known artist, the winner of prizes and residencies around the world and a prolific experimenter with poetic and generative forms. http://homepage.mac.com/shadoof/net/in/

handful of invited delegates to the *Symposium on Supporting Creativity with Search Tools*, Washington DC, affirmed the activity of searching a database or collection as *"…part of a creative process."* (Kules, 2006).

Creativeness, like memory, has many descriptions and meanings subject to context, particularly when conjoining with the visual image. A famous user of visual memory aids was Mark Twain. At one point he was delivering memorised lectures nightly, but he found remembering the ten phrases he used to structure his presentation difficult. So he tried the first letters of each phrase, written on the ends of his fingers. But he sweated them off during the course of the lecture. So he used pictures instead….

The image of the 6th Century technology of the letters of language dissolving before the speaker's eyes as he determines to aid his memory is a suitable metaphor to commence this written account. Plato would have been equally unimpressed by the muteness of the images Twain chose to stimulate memory. In a world drowning in images of affirmation, invariably set against a backdrop of intractability, this research affirms mutability as a guiding research principle.

Mike Leggett

April 2008

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Abstract

There is a problem with storing and retrieving audio-visual digital media files using information and communication technologies employing text-based indexing systems. Fundamentally, the complexities of language as a semantic system do not serve well the complexities of the motion picture document.

The objective is to propose effective and affecting means by which creators and audiences can store and retrieve the video files with which we work, communicate and entertain ourselves, increasingly each day. The research has employed practice-based research to extend our understanding of the precept of a taxonomy based on the visual mnemonics of the motion picture document.

The research approach draws on the work of Schön: *"…our knowing is in our action…"* (Schön, 1983) 49, together with Norman's description of two modes of cognitive behaviour, the experiential and the reflective (Norman 1993) 16. This is echoed by recent work on 'the configuration of indexicals' (indexicality) where communities of expertise can collaboratively establish *'..shared meaningful objects…'* within a referential network (Sarmiento and Stahl, 2007). It joins many others, who have identified the activity of searching a database or collection as *"…part of a creative process."* (Kules 2006). These researchers have informed the production of evidence in my research, that takes the form of experimental models from which data has been gathered, both in the making of the artefacts and their evaluation.

A series of seven experimental Models have been built using movie files encountered as full screen motion-picture images, navigated with four-way gestural interactivity. Mnemonics – aids to memory – are deployed taking two broad approaches: a schema, (from the Greek *skhema*, meaning shape), imparted with a word description at the outset of the interactive encounter of a primitive to describe navigational principles for each Model; and the images and sounds within the movies, associatively and semantically related mnemonically to the knowledge domain of the collection.

Conclusions emerge from two areas of practice-based research, the artist/designer and the potential user group. Initially, evaluation of the objective of each experiment with the creativity support tool - the Mnemovie engine – revealed the need to design interactive movie Models specifically for each

collection of movies. Subsequently, observational data from the test subjects both confirmed and contradicted the precept, leading to the description by participants of their own navigational designs using the Mnemovie system for personal movie collections.

Further research objectives are reported emerging from the conclusions, proposing specifications for a system, or series of systems, incorporating further development of the Mnemovie engine support tool, live performance collaborative projects, generative systems, and opportunities for interactive sensing systems technology.

1. Introduction

For over a decade, from the perspective of an artist working with time-based mediums, I have been investigating the interaction between human and computer. For much of the previous two decades I had been redefining the cinematic experience, its tools and methods, the sites of encounter and the affect of the flow of image and sound on audiences and myself, as a reflective investigator. The formal research process described in this thesis, continues that artistic project in the context of broader interdisciplinary research agendas.

> *'Art, as much as science, often attempts to put an enclosure around a sequence, a process, in order to isolate it as material to be inspected in a certain way, as distinct. Name a system, exhaust its permutations."*
> *(Fuller, 2005)*

Aphorisms of this kind help describe the interplay of expressive electronic media forms through the period of Millennium change for creative people: artists, scientists and the public who they address. This is the context for the research described herein and Fuller's statement can be taken to be both a pungent critique and benign observation. As critique it suggests practitioners and researchers cynically delineate territory through which they career for their individual professional and economic benefit. As an observation, it is a reasonable description of the approach so many, the altruistic together with the avaricious, take to dealing with complexity - far better to deal with a part of the world in depth than drown in unrelated details.

But crossing academic disciplines is unavoidably a part of interdisciplinary research. At what point is the detail of a process, for instance the making of an artwork, not related to another discipline? Is practice ruled by discipline? Or is it the essence of practice to not only learn from the past but also anticipate the future?

The art historian Ernest Gombrich in commenting on *'the kind of complex problems that research shies away from',* quoted Professor Hearnshaw's presidential address at the British Psychological Society in 1956:

> *'Temporal integration cuts across faculty boundaries. It implies perception of the present, memory of the past, and expectations of the future – stimulus patterns, traces and symbolic processes – integrated into a common organisation.' (Hearnshaw, 1956)*

Gombrich, in moving the writing of art history and criticism into the Modern era, recognised not only the problem of working across disciplines but also the similarities in problems encountered by the disciplines themselves (Gombrich, 1964). The continuously advancing incursions of technology into daily life, brings these concerns into the domain of the contemporary interdisciplinary researcher.

Though working out the question to be asked and where to ask it, is the key to revealing useful knowledge, even in the most highly organised database or knowledge system, this is no small task where evidence is scarce. The process of negotiating resources from across the disciplines addressed during this research, in revealing what other researchers had pursued, highlighted the complexities faced by interdisciplinery researchers. The process of developing bodies of knowledge through practice includes advanced forms of gleaning, the purpose of which is to map connections between the resources of current information, thereby effecting entry to systems of knowledge. The Wikipedia has served usefully in this respect, but as Professor Charlie Gere recently observed:

> *… Wikipedia is also a brilliant exemplification and exploration of the idea of knowledge not as the representative of objective facts 'out there' but as a continuous process of negotiation, debate, dissensus and consensus, that is … far closer to how knowledge is actually made. (After all the word 'fact' comes from facere, to make, and facts are made not discovered.) (Gere, 2007)*

This research therefore emerges from critical perspectives of broadly speaking, time-based audio-visual media. From a scholarly distance, I seek to expand the basis of our understanding and hence usage of the many forms of time-based media, encountered in the contemporary world. These forms have barely advanced in the development of structures, language and syntax, beyond the narrative story-telling systems named as long ago as 1916 as '*photoplays*' (Münsterberg, 1970 (1916)).

Münsterberg was one of the first to adopt a critical position towards the *'cinema of narrative'* and the passive spectator, considering alternative syntactical formations able to foreground the agency of an active spectator. Since 1916, cinema and its myriad derivative forms have evolved forms of syntax that maintain a connectedness between one moment and the next. Supreme amongst these forms is 'classic film narrative', combining camera angles, action and dialogue into the seamless flow of a diegesis located in the viewer's mind. Meaning thereby becomes a product of the subject's emotional response to the cinematic experience.

The *'cinema of attractions'* later described by Gunning examines how narrative forms developed in the silent film era, then evolving with the introduction, first of sound in the 1930s, then colour in the 1940s, burgeoning into the entertainment factory of Hollywood today (Gunning, 1991). The illusion created with the mechanism of the film camera, the projector and the 'language system' of cinema, evolved inseparably into public consciousness, with meaning tied to a succession of narrative genres dominated by melodrama and spectacle.

> *The 1920s – the limits of the photoplay are reached – in Russia, Germany and France the constraints and demands of the Producer Showman are challenged – it is the artists who know what the audience want! (Leggett, 2003a)*

Flux describes the state of film culture in the 1920s as niches of experimentalists, visual artists and film-makers in Moscow, Berlin, London and Paris, sought to test the limits of the technology, or the audiences, either for their own amusement or to grander collective ends. Could the present state of 'digital culture' be described similarly now?

The time-based technologies employed throughout history to fix light to a time signature have been in constant flux, each component in the tool chain being constantly honed and eventually replaced. There are few parts of the wider culture that are not touched in some way by the ubiquitous microprocessor or silicon chip – from the personal computer and the cell phone to the washing machine, the car and the toothbrush. Delivered after a short gestation, the pixel, the byte, the digital video camera are seamlessly integrated into contemporary experience. The act of making an image has been wholly integrated within this evolution, with procedures and technology defining outcomes alongside the imagination and the skill of the artist. Such a blending of mind and machines in technology, Heidegger reminds us (Heidegger, c1977), is the root word TEKHNE (τεχνη) from the Greek word referring simultaneously to the activities and skills of the craftsperson, the arts of the mind, the arts of the senses.

At a point in time, about five and a half thousand years ago when the least visible technology, spoken language, was beginning to use the new technology of *graphe* or writing, the skills of memory, mnemonics, mnemonotechnics, became highly valued within oral cultures. *Tekhne* was to move Indo-European culture inexorably toward a state of empirical consciousness dominated by literacy and numeracy. The currently converging aspects of our technologies and systems of communication are inflected by de Kirckhove's (1995) consideration of language and literacy theory. The alphabet as software for the platform of Western culture is the paradigm maintained - literacy is the attendant who has strapped us into a straightjacket. He describes for instance, two modes of listening: *"...oral listening tends to be global and comprehensive whilst literate listening is specialised and selective........Greek tragedy is nothing but the literary and dramatic response to new sensory conditions introduced by alphabetic literacy."* (de Kerckhove, 1995) These conditions accompany every new technology and he tracks to the present day the consequences of developing worldwide telecomputers and other "psychotechnologies". The cultural shift that comes about with a new medium marks movement away from the (literate) *'private universe of mind to the public world of the cathode ray tube'*. It is here that for the first time a collective intelligence is being developed and tested. It is where modes of 'listening' are being re-defined, developing into the oral tradition he presciently described in the mid-1990s, later emerging with the advent of ‘social networking’ websites.

Ironically, the latest internet technologies to emerge have begun to create a potential path for a return to an oral culture, or at least a postmodern variation. Even Jean Baudrillard was moved to conclude recently *“..it is probable that all our technologies (fatal offsprings that they are) arise from the gradual extinction of reality.”* In such a context *“one may dream of a heroic age of photography when it was a black box (a camera obscura) and not the transparent and interactive space that it has become.”*(Baudrillard, 1999)

The fuzzy epistemology of the flux around the term 'new media' will move from 'interactive multimedia' towards anticipating an interactive cinema, or one reliant on reflex, cognition and agency within the architecture of the virtual and the actual. In *The Remembered Film*, Burgin places film as social phenomena into a contemporary context:

> *The arrival of the domestic videocassette recorder, and the distribution of industrially produced film on videotape, put the material substrate of the narrative into the hands of the audience. The order of the narrative could now be routinely countermanded. For example control of the film by means of a VCR allows such symptomatic freedoms as the repetition of a favourite sequence, or fixation upon an obsessional image. The subsequent arrival of digital video and 'entry level' personal computers exponentially expanded the range of possibilities for dismantling and reconfiguring the once inviolable objects offered by narrative cinema. (Burgin, 2004) 8.*

The re-ordering of motion pictures becomes possible in the contemporary technological context of the digital image. We are no longer bound by the rules of analogue illusionism, but can begin to imagine taxonomies of a different kind:

> *Taxonomy is the practice and science of classification. However, it has been taken over by artists as a mode of operation. It is a collection of something that is ordered systematically, which can be hierarchical or a network. It can be a collection of objects falling into one category, as simple as a list. In visualization the taxonomy would be a collection of images that give meaning to each other by being in the same context. (Ox, 2007)*

The context provided by our increasingly daily use of motion pictures requires that we discover new ways of organising and working with such documents. Clearly, traditions of organizing motion pictures into sequences and traditions of storing and retrieving them to make meaning using the technology of words and language, lie at the core of the problem addressed in this research.

1.1. The Problem

Storing and retrieving motion picture media files on computers systems using information and communication technologies employing text-based indexing systems is problematic. Structurally, the complexities of language as a semantic system do not serve well the complexities of the motion picture document, encountered in the contemporary setting.

The objective of this research therefore is to discover novel, effective and affecting design options for interactive storage and retrieval systems for motion picture media[1]. In so doing, we can advance our understanding of practical ways by which creators and audiences can creatively store and retrieve the motion picture files with which we work, communicate and entertain ourselves, increasingly each day.

1.2. The Method

The approach to this research is practice-based, being undertaken as an artist and designer of interactive video systems. It is an overlap between the philosopher's, the cognitive scientist's and the interactive designer's description of the knowledge creation process that guides the gathering of data and its evaluation in this research.

Acquiring evidence is by primary and secondary data collection involving analysis using experimental studies of interaction, in a series of models demonstrating design options. This is approached by investigating interactive agency over the order and duration of motion picture documents stored as a corpus, a specific collection. Navigation of the collection is based not on text or lists, but on visual cues, mnemonics[2], proposed at the outset of encountering a collection and also contained within the image frame of each file. In addition to the experimental studies, the models, artefacts, processes and events produced during the course of exploration of the topic and the conclusions drawn, are recorded with camera, audio and notebook. These observations are assessed through reflective analysis and recorded in the context of contemporary artefacts and systems developed by researchers, artists and designers. An evaluation process involving a group of participants interacting with test models later produces results which, following analysis, form the key findings.

1.3. The Outcomes

Primary data in the form of seven experimental models is assessed together with secondary data gathered during the development and later user evaluation of three test models. These are rated according to effectiveness of retrieval together with affectivity and quality of the interactive experience. Knowledge in the form of a series of design specifications for the storage and retrieval of motion picture media based on visual mnemonics leads toward approaches for further research to address the differing needs of ‘memory workers’. Memory workers – all of us – as not simply ‘users’ but creative minds interacting with documents (by definition) of the past, that require us increasingly in the contemporary context, to acquire, order and link collections of motion picture files.

Memory workers identified in this research have distinct needs. The individual artist, researcher or designer, who is creating systems to be deployed in contexts specific to their practice. The specialist community, that is enabled to define from within a toolset, (such as that used for building the experimental models used in the current research), the needs to be addressed by a system. The general audience, as memory worker without prior knowledge, have the need to know that interactive navigation is evident within a system encountered in a public place; there is the need to know the central theme or rule that govern the relationships created by author/designers within a collection of movies.

A feasible outcome from the findings is further research for creativity support tools to advance interaction design for memory workers who wish to make interactive motion picture file collections accessible as distinct systems both on and offline.

1.4. Significance

In June 2006, one of the handful of invited delegates to the Symposium on Supporting Creativity with Search Tools, Washington DC, affirmed the activity of searching a database or collection as *“…part of a creative process.”* (Kules, 2006). Less than a year later at the Creativity and Cognition Conference (2007) in the same city, other researchers identified the need for *'the configuration of indexicals'* (indexicality) where communities of expertise can collaboratively establish *'..shared meaningful objects…'* within a referential network (Sarmiento and Stahl, 2007).

The digital image can be used to document an object or the appearances of an occasion, but its meaning is also illusive. Having captured the likeness, the record, what subsequently happens to the artefact? Even in the field of still images, *"..there has been very little research attention given to how people organize and browse their photo collections, whether digital or non-digital."*[3] (Rodden, 2003)

The research seeks to advance our understanding relevant to the development of tools for storing and retrieving motion picture media. The design of such systems will need to accommodate the needs of the 'memory worker', whether as an individual, or part of a closed or open working group. Memory as a term, applied throughout this work, is a host of complexities, (addressed in Chapter Two), from short-term memory and the functional, to long term memory and the ruminative. Human Computer Interaction enables the personal memory of the interacting subject to mesh with machine memory, allowing 'work with' motion pictures, a dynamic quite different to the means of the past. The analogue machines that delivered the illusion of motion pictures by replacing frames sequentially are replaced by digital machines delivering frames that are in reality are only relational one to another, freed of the material constraints of acetate. It is this possibility in the digital domain that is here explored, whereby machine memory and human memory are able to conspire to make meaning, to derive significance from a motion picture collection as participants within a computer system, as an actively creative process.

In using practice-based research to investigate the precept of a taxonomy using visual mnemonics, we will advance our understanding of the most effective means by which different classes of users, from the industrial to the domestic, can be creatively enabled to store and retrieve motion picture files they have gathered together as collections.

The motion picture phenomena in the form of digital video is developing annually, both as a technology and as a communication form within ICT (Marques and

Furht, 2004), p1, (Woods, 2002). It is clearly evident that domestically and in areas of industry, motion picture images are becoming a document format where paper-based documents previously sufficed. Disseminated by cable, broadcast, the internet, (Viewcast, de Argaez, 2007), and more recently the mobile phone into the home and the workplace, motion picture media are ubiquitous[4]. It is in these contexts that the design of storage and retrieval systems for digital video must be re-evaluated. The distinctions between video and cinema as projected large-image phenomena become blurred as both digital production and exhibition technologies develop for publically shared and privately used purpose:

> Discussions of the effects of computer technology on cinema have tended to be dominated by questions of industrial production. … But we may also consider the ways in which individual personal uses of the computer may be producing mutations in narrative forms. As a delivery system, the Internet … has become the site of modes of telling that owe little to traditional narrative practices (Burgin, 2004) 13.

Glorianna Davenport anticipates:

> Rather than strictly mapping events to prototypical story action, we will evolve new story forms based on navigation of choice, constrained and guided by authorial will. (Davenport, 1998)

The means and ways, the ontologies and epistemologies of how this broader project will progress, whilst probed by some, has a long way to travel before the significance of the present contribution becomes evident. This thesis begins broadly and through the process of working from a practice-base, filters the probes and the experiments undertaken in its course towards outcomes of potential significance.

With the contemporary burgeoning usage of multimedia, (digital movies, photos, graphics, audio and text), distribution through networks both electronic and physical has been noted by many, (Hopper, 1998, Town and Sinclair, c.1998) and is considered in the context of a convergence of these media with personal and community history, and identity.

Projects with Australian Indigenous communities have produced websites and disc-based media functioning as both intra and extra-communication channels. (Tanami, 1998, Howard, 1999, Moorditj, 1998). These projects in particular, building on the traditions of an ancient oral culture within which locale and 'country' are central to identity, have extended the options for communities to become immersed in the re-discovery of their knowledge base through computational means (PYmedia, 2004). This research proposes to continue to develop our understanding and use of symbolic and other representational forms within Human Computer Interaction (HCI)[5] and the design options to *"..offload memory onto the world"* (Clark, 1997)

It is the dynamics of becoming, the flux and onward flow enriching the phenomena of motion pictures that is propelling this project. Organising the systems and materials to deny the stable ordering habits of sequential narrative, whilst acknowledging our necessary engagement with stories[6] as a form of dialogue, is a necessary part of the approach. Ideas applied as practice to the tools and materials readily accessible for creative use through the modern computer, sets out to modestly but with tractability, focus on the related set of key issues: agency, memory and the phenomena of the motion picture.

1.5. The Chapters

Our attraction to motion pictures follows a certain cinematic tradition, where the time and space of events can be manipulated to create the illusion of a seamless flow. We move from scene to scene – the bedroom, the bathroom, the kitchen, street, bus, office, canteen, toilet, desk, car, lounge, kitchen, lounge, bedroom – the daily round. When in control of this information flow, the transition from moment to moment fits in to a smooth continuum. But we also seek stimulation through disruptions and escape. Depending on our personalities, (the embodied knowledge we retain), we continue to seek encounters with the unexpected, the unplanned, even the shock of the unknown – Benjamin's flash of light.[7]

This enquiry is characterised through interdisciplinary reference to mind and memory, perception and cognition, presence and embodiment, media representation and creativeness, providing a context for this approach to investigating machine memory and HCI.

The discovery of contextual material both informing and framing this research has therefore been wide, reflected in the literature search in Chapter Two: Context. There is a ready availability of academic papers and articles about machine visualisation systems, segmentation techniques and automatic annotation methods for video in the service of industry and government. This is in stark contrast to being able to find experimental and prototype interactive systems, in particular those made by artists working in the loosely defined field of 'interactive cinema'.

Experimentalists and researchers in various fields of the arts and sciences, have developed the phenomena of motion pictures for a variety of purposes other than the mundane and these will be assessed in the opening chapters (Eisenstein, 1969, Gibson, 1979, Ballard and Brown, 1982, Burgin, 2004, Le Grice, 1977, Gidal, 1974, Davenport and al, 1994, Shneiderman, 1998, Petkovic and Jonker, 2001, Del Bimbo, 1999, Amir, 2000., Zhou, 2005, Courchesne, 1990, Courchesne, 2000, Welsby, 2004, Miles, 2004, Del Favero et al., 2004/5, Sommerer and Mignonneau, 1999, Hales, 1996, Davies, 2003, Shipman et al., 2005, Girgensohn et al., 2004, Tolva, 1998, Thalhofer and Velthoven, 2000-2006, Dorai and Venkatesh, 2001). All have sought to extend the potential of the motion picture media beyond the confines of what Gunning has called *'the cinema of attractions*' (Gunning, 1986, Gunning, 1989). In attenuating the hermeneutic and accentuating the heuristic, Dulic and Newby describe a *'cinema of braided processes'*, reminding us that:

> Technology as idea and *poesis* is made explicit in [Heidigger's] characterisation of the essence of technology as a mode of revealing or unconcealment of what is hidden – a coming to presence, a starting on its way to arrival, a responsible occasioning of this space-time.
> (Dulic and Newby, 2003).

The research methodology approach as an artist/designer of art systems, is described in Chapter Three. Practice-based research recognises complementary but distinct criteria for evaluation of outcomes during the process of research, drawing impetus from aspects of action research methods. The work of Donald Schön, Donald Norman and others informs these methods and it is Schön's discussion of repertoire in the context of practice-based research – *our knowing is in our action* - that will be core to the methodology. The motion picture phenomena, as tool, as semantic system, can be understood as emerging from several distinct areas of knowledge including systems theory, semiotics, cognitive science, film and video studies. Within and between these disciplines – 'culture as toolkit' - can also be found the methods and the elements of Schön's idea of repertoire useful to these studies.

Foundation work drawn from thirty years of professional practice, working as an artist and teacher with film and video and as a producer for television, is critically re-examined in Chapter Four and provides further context for this research. The reflexive and structural-material aesthetic, (a development of the formalist - modernist tradition), that together with others I pursued in the 1970s, describes the need for the re-alignment of the modalities between the artist and authorship, the audience and modes of reception. Migration of the audiences' reflexive response from time-based projected art (film and video) to the potential of interactive participation with an artwork, is therefore considered in this context. An interactive multimedia prototype (*Pathscape* 2000) developed with others is described and analysed as being a formative contribution to the current research project.

In the following Chapter Five (New Studies), the secondary data for a series of experimental and demonstration models (primary data) is gathered and described. The models are built using movie files encountered as full-screen motion-picture images and navigated with four-way gestural interactivity. The interactive schemas designed for each Model are analysed as a component of the visual elements associatively and semantically related mnemonically to the knowledge domain represented within several collections of movie files, gathered for the purpose.

The evaluation described in Chapter Six compares the designer's system image with that of the subject participant, in order to understand the effectiveness and the quality of the interactive engagement. Combining aspects of usability testing, field studies and predicative evaluation, the objective of each experiment with the creativity support tool - the Mnemovie engine – initially reveals the need to design interactive movie models specifically for each collection of movies. Subsequently, observational data both confirms and contradicts the precept, leading to the description by participants of their own navigational designs for their personal movie collections using the Mnemovie system.

In the final Chapter Seven, I re-appraise the project in the light of recent work on *'..shared meaningful objects…'* (Sarmiento and Stahl, 2007) and the activity of searching a database or collection as *"…part of a creative process."* (Kules 2006). Emerging from the conclusions, further research is outlined proposing specifications for a system, or series of systems, incorporating further development of the Mnemovie engine support tool; art and performance-based collaborative projects; generative systems, and opportunities for designing interactive sensing systems technology.

1.6. Notes

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[1] The term 'motion picture' will be employed as the generic term for visual images in movement via a computer-based system. This is in preference to the more specific terms like digital video, or film, or multimedia, or digital data for hosts of digital devices, from PDAs to mobile phones etc. all of which in the context of this research will be described with the generic term.

[2] *Mnemonic - a device to aid the memory; (in later use) spec. a pattern of letters, ideas, or associations which assists in remembering something. (OED)*

[3] Rodden and Wood's research came up with several interesting proposals for further research. In the conclusion they went on to cast doubt on the usefulness of text-based indexing and retrieval as being appropriate for providing the subject group with *"enough extra motivation to invest the effort in annotating their photographs."* (Rodden 2003)

[4] Broadband services enable, if not video quality, access to audio-visual digital media. Broadband subscribers have increased six fold from a base of 6.6 mil in 2000 to 35.8 mil in 2004 (Viewcast 2004; de Argaez 2007). By 2007, the worldwide broadband subscriber base had increased to 304 million.

[5] HCI: Human Computer Interaction is concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them. (Association for Computing Machinery, (ACM), Special Interest Group (SIG) Computer Human Interaction (CHI) 1992, p6.

[6] A cinema of interactivity can bring into form what Salman Rushdie describes in the *Ocean of the Stream of Stories* (1990), *'…the ability to change, to become new versions of themselves'.* As unlike the *'….storeroom of yarns. It was not dead but alive. "He looked into the water and saw that it was made up of a thousand thousand thousand and one different currents, each one a different colour, weaving in and out of one another like a liquid tapestry of breathtaking complexity; and Iff explained that these were the Streams of Story, that each coloured strand represented and contained a single tale. Different parts of the Ocean contained different sorts of stories, and as all the stories that had ever*

been told and many that were still in the process of being invented could be found here, the Ocean of the Streams of Story was in fact the biggest library in the universe. And because the stories were held here in fluid form, they retained the ability to change, to become new versions of themselves, to join up with other stories and so become yet other stories; so that unlike a library of books, the Ocean of the Streams of Story was much more than a storeroom of yarns. It was not dead but alive." RUSHDIE, S. (1990) *Haroun and the Sea of Stories,* London, Granta Books.

[7] *"Where the historical image, the dialectical image occurs, it announces itself in a flash of lights just as the shutter of the camera announces the arrival of an image to the photographic plate or negative on which it is recorded inversely: darkness as light, light as darkness."* (Benjamin 2006)

2. Context - a state of the art

2.1. Introduction

This chapter will draw on primary sources of verifiable facts and the broader discourse of knowledge within which they are situated. I will present a structured and critical review of these sources related to the field of study. The interdisciplinary scope of topics described in section 2.2, Interdisciplinary Expeditions – Mind, are concerned with the broader discourse within which section 2.3, Interdisciplinary Expeditions – Machines, is sited. The sections summarise knowledge gathered on methods, techniques and models of work by researchers developing machines for Content-based Image/Video Retrieval (CBIR and CBVR). Both sections draw upon theoretical, philosophical, positivist and practice-based models that in different ways engage with the notion of interaction with the motion picture. The subsequent two sections (2.4 and 2.5) describe and discuss models of interaction explored by artists working with a practice-based approach - the tools and devices of creative interaction are in different ways the central question faced by these researchers. The final sections (2.6 and 2.7) critically examine approaches being taken to organise and manage motion picture media in relational structures, rather than the sequential order with which we are accustomed.

Through the 1990s, I was able to access fresh approaches to the representation of what Norbert Wiener called *'contingencies of relationality'* (Wiener, 1997). This was through the potential apparent via the personal computer and the microprocessor. Chapter Four outlines the foundation work leading to this point and how it introduced me to thinking about the sociological and technological conditions which formed the basis of initial enquiries into published works - printed literature and exhibited artworks – to form a context for the research question in its initial framing. The focus has been to match possible connections across disciplines rather than accepting existing representations of the problem from within one discipline.

The literature review therefore has been wide, concentrating on interdisciplinary research into the closely related areas of mind and memory, (Heidegger, c1977, Yates, 1966, Sutton, 2004), perception and cognition, (Gibson, 1979, Clark, 1997), presence and embodiment, (Mantovani, 1999, Dourish, 2001) 'personalised representation' (Ballard, 1991), creativity and 'meta-design' (Fischer, 2003). The review will provide a context for the research and the evaluation of an HCI-related approach to investigating machine memory (Petkovic and Jonker, 2001) and motion picture digital media (Del Bimbo, 1999), employing practice-based research (Candy and Edmonds, 2002, Scrivener and Chapman, 2005).

2.2. Interdisciplinary Expeditions – Mind

The opening section scopes the literature dealing with theoretical, philosophical and practice-based models that engage with the phenomena of the motion picture, mind, memory, representation and examples of how some researchers have approached 'taxonomies of indexing'.

2.2.1. Motion Picture Mediums

The ordering of space in time, or the ordering of time in space, occurs during the act of making a recording with an audio-visual representational system. Motion picture media is the term that will be employed throughout this exposition, used with the purpose of neutralising meanings connoted by the more common terms like photography, film, movies, cinematic, video, audio, etc. Motion pictures, though an oxymoron,[1] will be the preferred term in describing the mediums with which we engage in everyday experience, from cinema to the mobile phone. In addition, that experience is one from which we are being weaned as passive consumers and into which we are increasingly being plunged as producers.

The cinematic cannot be avoided in this context as it is the representational system inherited over the past hundred years, inflecting at best, dominating at worst, our social experience of motion picture cultures overall. The construction of narrative space occurs within what we can call a virtual performance space, on the two-dimensional space of the cinema and television screen. Within this space multiplicities of melodrama are enacted, described and debated endlessly elsewhere. (Gunning, 1991, Gunning, 2000, Eisenstein, 1969, Burch, 1979, Barthes, 1972, Arnheim, 1969)

In applying the golden rule to the screen – 'don't cross the line' – generations of film-makers have triangulated the placement of the performers, (actors and other encountered subjects), into the two-dimensional frame (Konigsberg, 1997) 186. By crafted use of Wide Shot (WS), Mid-Shot (MS) and Close-Up (CU), the representation of movement in space and the articulation of performance within space has enabled information, often with great emotional effect, to be conveyed to the viewer, (Konigsberg, 1997) 359, passively observing the images on the screen, as in a state of reverie, inhabiting a representational space removed from material contexts and the reality of personal presence.

The representational system of motion pictures can be related to human perceptual psychology. As a camera-based recording system, it records sequentially presented individual images as a continuously present moving image stream. The complexity of this form of perception is summed up by the psychologist J.J. Gibson; *"Film-viewing … is both similar and dissimilar to natural observing"* (Gibson, 1979).

Gibson in the previous decade had challenged the 18th Century theory of point-projection of light, initially by using the figure of an array or sheaf of light rays. Later he modified this into the theory of pictorial information within which the light array is a hierarchy of nested units. These distinguish between stimulus energy – excitation – and stimulus information, the act of perception. Following a dispute over these claims with Professor Gombrich across several issues of *Leonardo*, (Gibson, 1971), he was later to summarise in his seminal *Ecological Approach to Perception* by reference to the film experience:

> "The composing of a film is not analogous to the composing of painting. The sequential nesting of subordinate events into super ordinate events is crucial. The transitions should be psychologically meaningful, and the sequential order of happenings should be intelligible. But the picture theory of vision and the stimulus sequence theory of perception are very poor guides to movie-making. The theory of ecological perception, of

perception while moving around and looking around the environment, is better." (Gibson, 1979), 302.

The progressive picture, by which he means motion picture film, he distinguishes from the arrested picture, by which he means a 'snapshot' photograph or painting. The movie camera by virtue of the fact that it moves within a space in time is able to convey *'something closer to natural perception'*. In terms of leading rationally from one proposition to the next, through ordinate and subordinate events, (a beginning, middle and an end), the sequential reproduction of a point in time and space is claimed to have verisimilitude with the visual experience. It is the nesting of events as a means of extending stimulus information into the holistic act of perception, that Gibson was concerned with describing, of relevance in the present context.

The two computer scientists, Ballard and Brown at about the same time discuss motion trajectories. Though their purpose is to understand computer vision, the analysis arrives at in part, tantalisingly related ideas:

> As one moves through a world of static objects, the visual world as projected on the retina seems to flow past. In fact, for a given direction of translatory motion and direction of gaze, the world seems to be flowing out of one particular retinal point, the Focus Of Expansion (FOE). Each direction of motion and gaze induces a unique FOE, which may be a point of infinity if the motion is parallel to the retinal (image) plane.
> (Ballard and Brown, 1982),199.

The FOE is a central component of the many calculations required in the development of computer vision systems (discussed in 2.3.2), suitable for recording movement. Unlike Gibson's interest, it is the stimulus energy these systems measure as a means for calculating change and therefore movement recorded as an image sequence.

But unlike the subject-orientated information gathered from the Point of View (POV) cinematographic image, these have specific objectives:

> An image sequence is an ordered set of images. The image sequences … are samplings of four-dimensional space-time. Commonly, as in a movie, the images are two-dimensional projections of a three-dimensional physical world, sequenced through time. …. Segments [describe] the

individual images. This process may be complex, yielding a relational structure or a segmentation into regions or edges.
(Ballard and Brown, 1982), 207.

The relational structure to which they refer is a description of each image specific to the task in hand – detecting change – which will be examined in more detail later, as it is central to Content-Based Video Retrieval (CBVR) systems – see more section 2.3.2. The distinction is between the detection of change relative to the recording device moving through space, and the static device recording the movement of objects through the space of the frame 'fixed' with an unchanging background.

This distinction is essential in moving towards an appreciation of how contemporary technologies can affect a redefinition of the motion picture. The ordered set of images are defined in video by the recording system – 25 frames per second (PAL) sequentially contiguous is the mechanical and electronic specifications of the motion picture recording. Each image is a record of change between frames, the data flow in either 'direction' updated by one twenty-fifth a second contiguously. Each frame thus has a unique electronic identifier – timecode, plus or minus 00.00.00.01 frame, (Hours.Minutes.Seconds.Frames) (Konigsberg, 1997).

Within the wholly electronic domain of the computer, the timecode identifing each frame becomes part of the data of the image itself as a hexadecimal equivalent within the binary environment. This can be described as a relational structure of frame-<u>and</u>-frame replacing the sequential structure of frame-<u>to</u>-frame, often regarded as defining the medium of video (Marques and Furht, 2004) 10. It is bound not by contiguousness but by an order based on software commands.

> 'Programming involves altering the linear flow of data through control structures, such as 'if/then' and 'repeat/while'; the loop is the most elementary of these control structures. Most computer programs are based on repetitions of a set number of steps; this repetition is controlled by the main loop of the program.'
> (Manovich, 2002) 65.

If the data comprising one frame of video is looped, a static image is seen. If the program instruction, having processed one frame, is to move to the data of a different image, then change is detectable. An interaction designer thus creates a system generating motion picture data from in essence, a collection of frames[2]. In practice, certainly in my research, sequences of frames (shots) are structured according to conditions determined by the system, which can include input from an interacting external agent. A sequence of visual events ensue, an order unique to the moment, a motion picture stream based on the retrieval of groups of frames, (rather than sequences of shots), that define a relational order or narrative. There remains a distinction however, between the functional seeking after specific motion picture experience – the selected shot – using all manner of indexing devices, (navigating menu tree structures of words, 'pull downs', keyboard 'short-cuts', etc.), and a poetic experience negotiated between designer and participant. This emphasises the heuristic as an important part of the experience.

In *The Remembered Film*, Burgin describes how this can operate as social phenomena in a contemporary context:

> …. A concatenation of images raises itself … above the instantly fading, then forgotten, desultory thoughts and impressions passing through my mind …. The 'concatenation' does not take a linear form. It might rather be compared to a rapidly arpeggiated musical chord, the individual notes of which, although sounded successively, vibrate together simultaneously. This is what led me to refer to my earliest memory of a film as a 'sequence-image' rather than an 'image sequence'. The elements that constitute the sequence-image, mainly perceptions and recollections, emerge successively but not teleologically. (Burgin, 2004), 21.

But physical interaction with a system, even using voice commands, all rely on aspects of memory. How does this function for the retrieval of aids to the mind, in the form of movies, to functional, historical and personal memory? What is the nature of the experience when short-term (functional) memory conjoins with the representation of long-term memory?

2.2.2. Mind

J.J.Gibson was foremost in developing the ideas of Heidegger and others in opposing the Cartesian formulations that sought to separate mind and body. He proposed taking an '*ecological approach'* to issues of perception. His approach, and for the many who followed, was to refute the mind/body separation, unsubstantiated by any form of scientific method and to go further in describing the human subject and its cognitive functioning (Gibson, 1979). Dourish also describes the world in which we move, affecting and being affected by our actions within it. By utilising the physical, material world through the invention and use of tools, we are able to extend our activity within the world. But not as passive receptors, because as our behaviour adapts our abilities are extended. This principle of adaptive behaviour and embodiment is essential to understanding how we as active agents devise and use technology (Dourish, 2001).

During the past 20 years we have witnessed the dramatic way by which many citizens in the 'industrially developed world' have adapted to using the microprocessor and more particularly the personal computer. Researchers in HCI have been foremost in grasping the importance of the shifts in cognitive adaptivity that has occurred. (Norman, 1999, Suchman, 1987, Dourish, 2001)

Other researchers, using practice-based methods and with far fewer resources, have in' the visual and fine arts been describing and building interactive systems that explore and demonstrate similar conclusions, (some of these are described later in Chapter 2.5). What these two viewpoints have in common, the cognitive scientist Andy Clark summarises as embodied action: *"..best understood as action-and-context-specific control structures rather than as passive recapitulations of external reality."* (Clark, 1997) 51. Theoretical positions and practice-based research by artists working with film over the last thirty-five years – to be discussed further in Chapter 4 - have advanced an approach to motion pictures that opposes the prescriptive cultural phenomena of Cinema and the 'passive recapitulations' delivered to paying audiences.

2.2.3. Representation and Mind

Emerging from the Modernist visual arts tradition, where primacy is given to material form and the existential presence of the viewer encountering film as phenomena, the experimental films of the 1960s and 70s were structured, temporally and thematically, to give primacy to processes of reception (Gidal, 1974, Le Grice, 1977, Rees, 1999, Curtis, 2006). Le Grice has described this as a phenomena which *"…couched the issues of structure primarily in term's of the* *spectator's act of structuring"* (33) with this approach as having *"… a priority for physical experience over interpretation."* (Le Grice, 2001), 293. [3]

This description draws a fundamental distinction away from Gibson's idea of film as being *'closer to natural perception'* as a form of representation of the world, but coincides with his *'ecological approach'* (Gibson, 1979), having a holistic understanding of perception, acknowledging that the motion picture image has a material presence within a physical context.

With the arrival of new technologies and tools, it becomes possible to advance from the research pioneered by the artist film-makers to another stage in the development of representational systems. These, both semantically and phenomenologically, are taking a form that seeks to provide agency to the beholder, proffering options that enable positive feedback, through interaction between human and computer-mediated systems. The experience is focused, the sense of presence amplified, the here and now made tangible.

"Personalised representations" is a term Ballard (1991) used to describe the means we use to facilitate everyday behaviour, such as correctly identifying our toothbrush in a bathroom shared by the household. Some residents may use colour differentiation whilst others, distrustful of their colour memory, prefer placing their toothbrush in a part of the bathroom different to the others. This is a good example of *"…the pervasive tendency of human agents to actively structure their environments in ways that will reduce subsequent computational loads."* (Clark 1997),150. Action-orientated representations of this *kind "…that simultaneously describe aspects of the world and prescribe possible actions, and are poised between pure control structures and passive representations of external reality"* (Clark 1997) 49, help describe ways in which memory can be aided.

This becomes central to establishing a relationship between temporal media, external reality and the computational mapping of 'aspects of the world', its objects, its associations. Cognitive scaffolding and the various devices we use as a part of Heidegger's *dasein* 'being-there' are many, (but lie tantalisingly to one side of the present research vector) (Heidegger, c1977). A brief survey of human memory is necessary, as it affects issues of interacting creatively with systems, personal identity and even consciousness itself.[4]

2.2.4. Memory

> "Memory is a label for a diverse set of cognitive capacities by which humans and perhaps other animals retain information and reconstruct past experiences, usually for present purposes." (Sutton, 2004)

The complexity of this area of knowledge must be emphasised. The following 'memory map' outlines the relationship between the many functions of human memory and is provided for the purposes of the discussion that follows. (Fig 2.1)

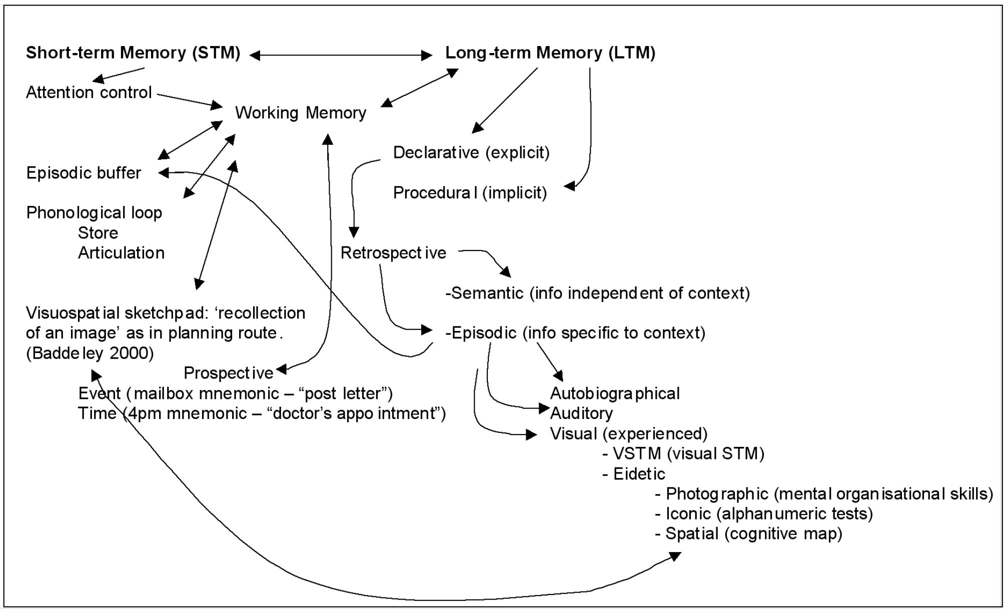

Fig. 2.1: Memory schema (based on sources referenced in the text)

Lansdale and Edmonds in a 1992 study investigated the design of document filing systems by developing a prototype, *Memoirs*, that treated *"…documents as a particular form of event memory".* Retrieving a document was based on two memory processes. The first, *recall-directed*, is centred on human memory for remembering the name or place of the object sought. The second, *recognition-based*, is mnemonic centred, relying on the system or machine to <u>prompt</u> the human memory, leading by association to the object (Lansdale, 1992).

The system relies on context specific episodic memory, which Sutton describes as *"..personal memory for past events and experiences accompanied … by a feeling of familiarity and a reflective awareness of having had the experiences in the personal past."* (Sutton, 2004) (In contrast, semantic memory delivers to us facts derived of the world – Freud died in London – knowledge by association).

The *Memoirs* prototype system *'…was designed to be flexible, providing the user with a range of ways of encoding documents mnemonically, including time-stamping, flagging, and attribution (eg colour, text, icon, sound or image).'* (Preece et al., 2002)

The project observed:

> "It is enough that the distinction between episodic and semantic memory throws into perspective an approach to the design of filing systems based upon event memory as opposed to the associative relations between items." (Lansdale, 1992)

With interest in and the relevance of the field increasing, interdisciplinary memory research is becoming increasingly recognised and valued (Hoerl and McCormack, 2001) As Sutton points out, *"It's no accident that memory is at the heart of recent work on dynamical cognition and the embodied, embedded and extended mind…"* and that the *"…brain and world are often engaged in an ongoing interactive dance through which adaptive action results."* (Sutton, 2004)

Baddeley has proposed a model of working memory (WM) useful in understanding such interaction. WM incorporates an episodic buffer storage system capable of integrating information from a variety of sources. Under the control of a conscious subject WM is then capable of retrieving information from the store in the form of conscious awareness, of reflecting on that information and, where necessary, manipulating and modifying it. The buffer is episodic in the sense that it holds episodes whereby information is integrated across space and potentially extended across time. He describes a Visuospatial Sketchpad as a sub-component within the model assuming *it "…to hold visuospatial information that is fractionable into separate visual, spatial and possibly kinaesthetic components…"*(Baddeley, 2000).

This proposes episodic memory, (particularly Visual Short Term Memory and prospective memory within WM), can produce outcomes useful to an interactive system. Furthermore it can be proposed that where technology has been used to augment human memory function, to *'off-load capacity into the machine'* (Clark, 2003.) the interactive process that follows mirrors the cognitive processes described.

Philosophers discuss ‘Episodic memory’ or personal memory at length. Like semantic memory, episodic memory is declarative memory which sets out to represent the world, usually with the aim of truthfulness (Sutton, 2004). (Epistemologies of representational systems debated between interdisciplinary researchers working in the fields of philosophy, cognition, perception, cultural theory and semiotics, are examined in the following Chapter 3.4).

The notion of ‘memory traces’ and representations for and of recall, while remaining contested ground, form the basis of memory storage and retrieval devices, from the dictionary to the encyclopaedia, from the diary to the snapshot. Autobiographical and personal memory can be prompted by what Tulving terms *‘synergistic ecphory’*, whereby the emotion or the memory is evoked or revived by means of a stimulus (Tulving, 1983).

Often aided by the context of the recall, a writer for instance, through placement of artefacts or words in spatial relationship can create the circumstances that connect with the narrative (of a memory trace, event, object etc). Like Mark Twain, we are not unfamiliar with the use of postcards and palm cards or scraps of paper placed around the room as a way of organising complex sources in the process of synthesising thoughts and events into fresh formulations.[5]

This echoes Barthes notion of the *‘proairetic sequence’* in film, (and Aristotle’s *proairesis*, the implied narrative sequence in history painting), separating the effects of narrative, with its implicit components reconfiguring in memory as something else.

> The more the film is distanced in memory, the more the binding effect of the narrative is loosened. The sequence breaks apart. The fragments go adrift and enter into new combinations, more or less transitory, in the eddies of memory: memories of other films, and memories of real events. (Burgin, 2004) 68.

Fragmentation, (specifically central to this research), offers the means of resolution whether by poetic or determinist approach. Interacting with external memory machines such as collections and libraries of knowledge located on computer servers around the globe are central to academic pursuit and increasingly, the education and edutainment of the population. The index has been central to deterministic retrieval of text-based data. Complex indexes have become subject to *"…classifying or arranging in classes, according to common characteristics or affinities;"* (OED)

2.2.5. Indexing Systems

Taxonomies of indexing[6] enables an overview of the structure of data, by reducing scale and quantity to proportions that can be comprehended, particularly by new or inexperienced users. The indexing approach is ideal for text-based data such as large Information and Communication Technology (ICT) parallel database systems (Taniar and Rahayu, 2002). But for audio-visual data based upon word interpretation this is constraining, useful only when specific words in documents need to be illustrated. The Arts and Humanities Data Service (AHDS) Visual Art image resources site is an example of this tradition, as are many photographic archives and stock-shot libraries that use keywords associated with location, subject, artist, colour, date, owner etc. Whilst a word index is admirable for locating traces within written language sources, *"..keyword searching is a crude and unsatisfactory method for sampling the information content of complex sources…."* such as media collections (Davenport, 1996). Likewise, seeking images on the web with a search engine is similarly hit and miss, when it is necessary to double guess a file name or location descriptor or other aspects of the meta-data, if present. How can the appearance of the images, their visual record of the material word, together with their connotations and semantics, be ordered relationally to one another?

Glorianna Davenport is one of a group of researchers who have developed approaches to storing and retrieving the complex nuances of the audio-visual artefact from dedicated database systems. One of these was developed by a research team in the Media Lab at MIT during the mid-90s*, 'Jerome B. Wiesner, 1915-1994: A Random Walk through the 20th Century',* an interactive documentary about the life and work of the notable MIT scientist, Jerome Wiesner. By monitoring the interacting participant's initial selection, subsequent options are reorganised to cluster related topics, using a combination of image and words, whilst re-shuffling their relative positioning on the screen. Each thumbnail image is able to operate as an iconographic link to display the archival media material. (Davenport and al, 1994)

Fig. 2.2: screen grab from Jerome B. Wiesner, 1915-1994.

Conducted as an on-line hypertextual project, the Wiesner project demonstrates the potency of replacing the table of contents approach to web page design, with an interaction design based on several mnemonic devices: thumbnail images of historical events with which the scientist was involved; single keyword boxes; a position on the area of the screen of initial topics with which to enter the database; colour in different areas of the screen; and as the system 'matured' over a search session, (using AI methods to learn the participant's perceived needs), anticipation of the participant's next requirements.

Visual mnemonics, in particular where related to spatial memory, has proved to be of value for many purposes over many hundreds of centuries. The Greek oracists and rhetoricians, before the alphabet had been handed down, developed an elaborate form of artificial memory, described so fully in Yates' *Art of Memory - Ars memoria*:

> "...a series of *loci* or places. The commonest, though not the only type of mnemonic place system was the architectural type ….. We have to think of the ancient orator as moving in imagination through his memory building whilst he is making his speech, drawing from the memorised places the images he has placed on them." (Yates, 1966)

It could be claimed the first movies were a conceptual model made by the Greek rhetoricians, complete with wide shots, tracking shots, panning, tilts, close-ups and flashbacks. Played in the cinema of the mind's eye, the first 'classic film narrative' guided the orator from theme to theme, detail to detail, by associating each element of the speech with the *loci* and the objects placed there and visible only to him within the chosen topography.[7]

A recent study included a range of tests carried out on people who were highly ranked in the World Memory Championships. Whilst their brain capacity and structure was determined to be average, it was found using functional magnetic resonance scanning (fMRI) that the regions associated with navigation and memory were more active than in a control group attempting the same memory tasks. The contestants confirmed that they used a strategy called the 'method of *loci*' in which the objects to be remembered were placed along an imaginary pathway that could be retraced when recalling the items in order. *"The longevity and success of the method of* loci *in particular may point to a natural human proclivity to use spatial context – and its instantiation in the right hippocampus – as one of the most effective means to learn and recall information"* (Maguire, 2002).

In this, the age of the rhizome (Deleuze, 1994), linearity need not structure thought within the confines of logic and rhetoric. The walk from home to the station may allow interventions of the everyday to structure the day itself, even enhanced by the imprecision of the visual cues that guide us during the walk. The invention or re-invention of a visual literacy based on digital video and 'machine memory' technologies would enable us (with the happenstance of chance encounter), to employ indexing and classification appropriate to the task in hand.

> Mental mapping resembles cognitive mapping insofar as the latter describes how individuals negotiate their lives in the places in which they move. It is a practice based on spatial choices, on going here or there in one way or mode of conveyance or another… (Conley, 2007).

The philosopher and writer, Italo Calvino also describes this:

> The man who knows how [the city of] Zora is made, if he is unable to sleep at night, can imagine he is walking along the streets and he remembers the order by which the copper clock follows the barber's striped awning, then the fountain with the nine jets, the astronomer's glass tower, the melon vendor's kiosk, the statue of the hermit and the lion, the Turkish bath, the café at the corner, the alley that leads to the harbour. This city which cannot be expunged from the mind is like an armature, a honeycomb in whose cells each of us can place the things he

wants to remember: the names of famous men, virtues, numbers, vegetable and mineral classifications, dates of battles, constellations, parts of speech. Between each idea and each point of the itinerary an affinity or a contrast can be established, serving as an immediate aid to memory. So the world's most learnéd men are those who have memorised Zora. (Calvino, 1979/72)

At about the time Calvino wrote these words, experiments at MIT in the late 1970s by Peter Clay in the Architectural Machine group, led to Michael Naimark's *'Aspen Walk',* that linked two videodisc players with a computer system. By interacting with a touch screen display, the viewer could navigate the image of a drive around the town of Aspen, Colorado, determining as each crossroad approached on the video screen whether to turn left or right or to proceed forward. With an appropriate touch, the video would be cued to change the image correspondingly (Naimark, 1998). Our familiarity with the visual cues of the urban landscape and of the principles of physical movement through linking streets, enable us in the machine version to navigate, cognitively, the visual system representing the physical layout of the town. (Fig 2.3)

Fig. 2.3: Aspen Walk, frame grabs.
Left, intersection view; right, touch-screen selection to effect navigation through the streets.

Criss-crossing a virtual town enables us to gradually instill in memory the main features of place and their relation to other features and the grid of the streets. Later as our familiarity increases, then the 'bird's eye view' is constructed in the mind at the moment it becomes necessary to reckon the most direct route between two points in the town. Such a process of conceptualising would be similar whether in front of the representational system or within the town itself.

This illustrates the complex way in which physiology, mind, agency and artefacts can interact to inform action, the outcomes of which can cause physical passage through a space as well as further updates from the system of representation[8].

A final example of memory systems based on *loci* is the ancient Exeter Cathedral ceiling and its contemporary website. Here the narrative of a learnéd treatise, a catalogue and a graphical map of the ceiling are each linked to pictorial details of the magnificently restored ceiling of the structure. However, the authors are quite upfront: *"There are two main routes into the material, Visual and Verbal ... The Verbal route is for those who are more at ease with text than images."* (Henry and Hulbert, 1998)

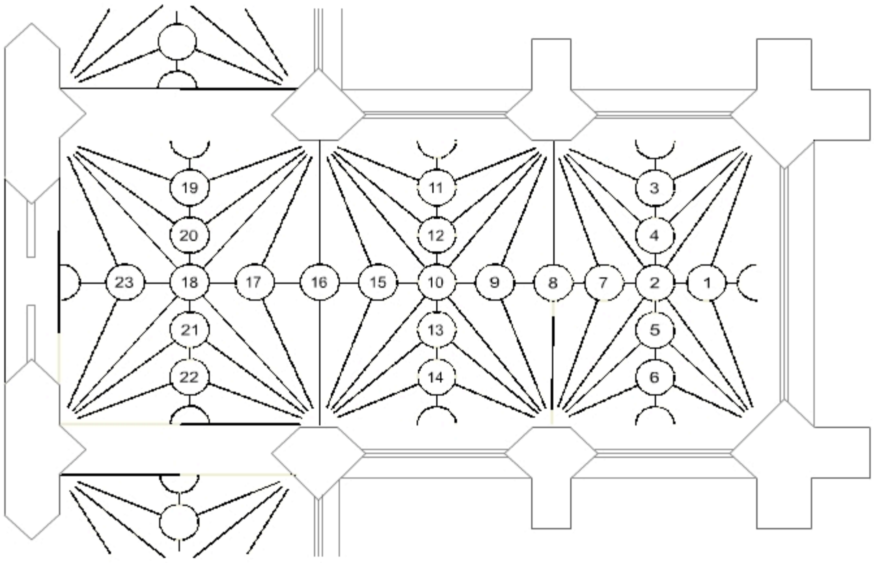

Fig. 2.4: Exeter Cathedral Lady Chapel, plan of vaulting and bosses.

By associating a contemporary on-line database design with a medieval equivalent - the vaulting and keystones in a 700-year-old cathedral - there is an elegance and appropriateness emphasising the visual component of both sites. There are pathways and nodes in both mnemonic systems giving access to 15th Century arcane and local knowledge. Six hundred years ago in the West of England few would have used the technology of literacy. It was down to the literate class of monks and priests, working with the carvers and stone-masons, to interpret the Gospels into a visual form thereby reminding the congregation of the teachings of the Church. Each keystone, incorporating images of flora, fauna and facial likenesses local to the population of farmers and labourers, encapsulated a verse or a lesson useful for the maintenance of spiritual and social order (Henry and Hulbert, 1998). Like the contemporary website counterpart, visual mnemonics and systematic method were woven together in the ceiling into a navigable environment of node-linkings and discovered associations. Through the simple action of the observer shifting their gaze, both directed and intuitively sensed knowledge was acquired.[9]

In so far as the memory diagram (Fig 2.1) is useful to the research question, it can be seen certain elements are central to interactive encounters with computer systems capable of accessing motion picture files. Working memory, in coordinating the functioning of short and long term memory and other brain activity, relies on the retrospective aspect of declarative memory. Information specific to context, episodic memory, draws on the visual experience encountered within the interactive system, adding to visual short-term memory. It will be seen later in Chapter Six that this capability enables the participant to interactively 'navigate' a succession of motion picture images. Within that experience, one of the sub-questions addressed is whether the participant conceptually constructs in the mind a spatial, cognitive map, similar to that used when moving through space to another point across some city streets.

Within the repositories of collected memory, in large public collections for instance, the stimulus relies on a common rather than private language of signs, most often expressed as the alphanumeric index, a form to which the computer has been historically well tuned.

2.3. Interdisciplinary Expeditions - Machines

Memory and remembering, the ability to recall data, is central to the function of the computer system. It is central to the functioning of the operating system and is the very basis of meaningful human interaction. The currency of exchange between machine and human for most of the modern era has been alphanumeric symbols arranged within the ubiquitous desktop metaphor. The metadata describing the visual objects in their digital form determines the taxonomical approach to indexing using alphanumeric, text-based keywords, thesauruses etc, and is central to the interface design for both storage and retrieval functions.

Shneiderman has observed

> "….the next generation of digital libraries will enable convenient exploration of growing information spaces by a wider range of users. User-interface designers are inventing more powerful search and visualisation methods, while offering smoother integration of technology with task." (Shneiderman, 1998)

He notes in the late 1990s that the machine memory industries specialising in servicing the demand for storing data and knowing how to retrieve it again, were moving away from notions of information retrieval and database management towards information gathering, seeking, filtering and visualisation (Shneiderman, 1998). In a recent survey by Bill Kules (2006, 53), the techniques for supporting creative searching of databases could embody four approaches: generative, for accumulating material as a means for initiating a project or artefact; cross-content, for the purpose of comparing the contents of say a literature database; explorative and iterative, when at a more advanced stage of project development, specific threads and information sources are identified and sourced; finally, and more pertinently, serendipitous findings *that provide valuable insight for the creative searcher*. Some examples of these approaches can be summarised.

The machine-memory systems in daily use for the retrieval of images such as photographs, graphics and video, range from the banal to the mundane. The copyright protection agencies under a series of international agreements, for example, have developed the *Vienna Agreement Establishing an International Classification of the Figurative Elements of Marks* facilitates the searching of design marks – logos, trademarks, etc - by classification of the figurative elements of the design (Vienna); the area of text / keyword-based multimedia file management applications (such as Extensis, Canto etc) for aided-retrieval. Hewlett Packard Labs in Palo Alto developed a prototype application for non-expert users – *Fotofile* – that *"..blends human and automatic annotation methods."* (Kuchinsky et al., 1999). A crude face recognition feature offered users 'matched faces' to confirm and name. The system then was able to use a 'hyperbolic tree' diagram (Fig 2.5) to link each face with its occurrence in other images.[10]

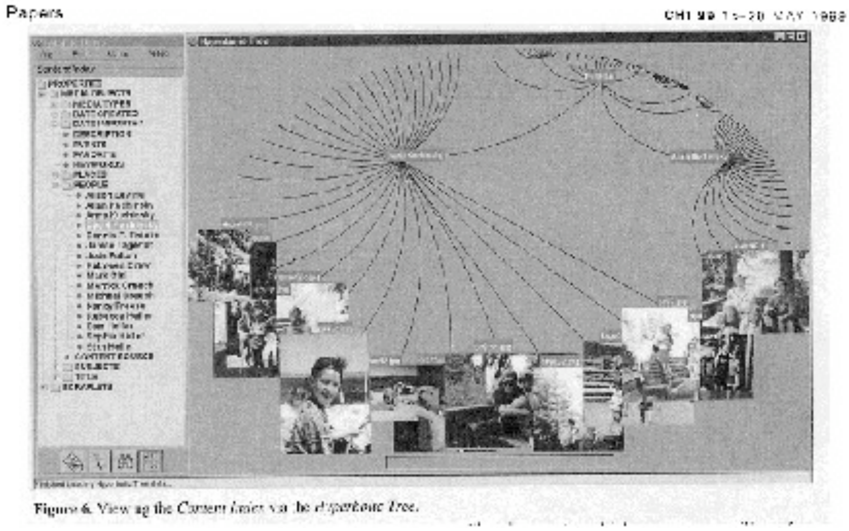

Fig. 2.5: Fotofile hyperbolic tree visual query interface

McDonald and Tait, developed visual query tools suggesting that colour-based visual searches might be a useful addition to personal image archive software. (McDonald and Tait, 2003) The means by which users match an image to memory or a perceived need has been aided by the work of Lim, Smith and Lu from Monash University, who designed i-Map an interactive system for visualising and navigating a large-scale image database that clusters images onscreen. It is distinct from other Content Based Image Retrieval (CBIR) systems by enabling the user to *"…explore areas which look more promising…"* (Fig 2.6)

Fig. 2.6: i-Map visual query interface

While still and graphic images present some problems for the rapid and efficient storage and retrieval of images, mechanical systems for interacting with motion pictures was present from the earliest days of cinema. Edison's kinetoscope, (see more in section 4.2.1), presented single scenes as pictures, the motion of which viewers were able to control using a hand crank. This peep-show aesthetic continued in amusement halls and the ends of piers into the 1960s when electronic machines such as the Scipitone[11] began to appear.

The 21st Century phenomena of the motion picture commonly known simply as 'video', presents for some researchers twenty-five times the problem of storage and retrieval every second[12]. It is the size of the database that determines the methods employed. A very large database connected to a TV station, iTV, video rentals (video-on-demand) or a web resource will require a different approach to a database that houses the collection of an individual or community. The projects described in Appendix 8.1 were all orientated towards the larger scale users of database storage for video, with outcomes of limited value to smaller scale users, the focus of my research.

In summary, Chua and Ruan described the segmentation, indexing, retrieval and sequencing of video data characterising the basic principles for Content-based Video Retrieval (CBVR) research (Chua and Ruan, 1995). Similar approaches were used to identify police mug shots in the construction of identikits (Brunelli and Mich, 1998). Content-based analysis and subsequent tracking or matching of objects within the frame has developed to an advanced level. (Sivic and Zisserman, 2003, Fan et al., 2001) Petkovic and Jonker (2000) provided a rough categorisation of video retrieval approaches in two classes: machine extracted visual features - colour, shapes, textures, or motion which characterise low-level visual content; and annotation-based features - free-text, attribute or keywords to represent the higher-level concepts of video content. They also suggest that HCI issues associated with their prototype could be improved with relevance feedback whereby:

> "..the system gathers information from the user about the relevance of features, image regions, etc. However, relevance feedback coupled with active learning is [a] relatively unexplored area in video retrieval. Video summarisation, query representation and a multimedia query language are much related problems worth to be explored."

(Petkovic and Jonker, 2004),148.

Clearly these researchers had not heard of Davenport's work at MIT described earlier. However, Del Bimbo develops the notion of higher level semantics with reference to semiotics (Del Bimbo, 1999). Interestingly he begins by quoting the philosopher Calvino:

> "We live amongst an unremitting downpour of images. Powerful media incessantly transform the real world into images and re-create it though game-like phantasmagoria: these are images which, for the most part are devoid of that inner soul which should nourish their character in terms of form, meaning, of capability to attract attention, or richness of possible meaning. Much of this cloud of images vanishes immediately, just like the dreams which leave no trace in memory." (Calvino, 1993)

Del Bimbo identifies several important research directions in visual information retrieval. He observes that while querying is used to precisely locate certain information, navigation and browsing offers the possibility of exploring information spaces. The domains he names as information spaces includes paintings, movies or advertising. Two distinct steps can be identified in the production of meaning: a narrative structure – such as is created with signs and signalling in classic film language; a discourse structure, whereby the apparatus of language constructs a story open to individual interpretation and thus meaning. (Del Bimbo, 1999), 28-29.

Other research projects seeking industrial objectives, (usually visual indexing systems for the television and cable industries), have included the IBM *CueVideo* research project. The project measured the productiveness of automated indexing, browsing and retrieval based on different means of summarising digital video. The conclusion the study reached, to which we will return in the final chapter, was that the system should not be optimised for the 'average' user but configured to allow individual choice to prevail.

The more recently demonstrated HyVAL system uses authoring visualisation of video objects, metadata and the overall hypermedia document as parts of an Editor tool. Shot detection and segmentation algorithms effect a semi-automatic function, giving it great potential for working quickly with large video file collections or through using search engine routines (Zhou, 2005) and was an advance on other MPEG7, [13] codec[14] embedded metadata projects. Metadata is a description of data – data about data. The keyboard-entered annotation processes described earlier are an example of the 'higher level' semantic descriptions stored as meta-data. A video file is not only data contained as sequential images, synchronised sound but also provision for meta-data (several standards), recognised for the purposes of efficient storage, transfer between computer systems and playback to the screen.

Several systems have recently emerged that facilitate the annotation tasks enabling human classifiers to key in, or interact with tick boxes, to describe the motion picture images in front of them. The common factor for all of the three applications outlined below, is the top-down approach to describing motion picture media, following accepted conventions of the sequential shot, retrieved using word-based searches.

In 2003 IBM announced the IBM *VideoAnnEx* Annotation Tool which assists in annotating video sequences with MPEG-7 metadata. (Appendix 8.1). The Ricoh *MovieTool* is another tool for creating video content descriptions conforming to MPEG-7 syntax interactively (Appendix 8.2). The Annodex format has recently emerged from the Commonwealth Science and Industry Research Organisation (CSIRO), built on the Ogg (media) encapsulation format to allow for internet servers and proxies to manage temporal subparts and reconstruct files from annodexed clips (details in Appendix 8.3). At the time of writing, this dynamic approach to accessing motion picture frames is, in common with the projects described above, at an early stage of highly technical development.

Whilst this brief overview of machine-based systems has diverted from the main thrust of my research, it serves to demonstrate that considerable resources are being deployed to address the common ground of storage and retrieval of video files. In the following sections we consider other approaches that are less concerned with servicing existing conventions of managing motion pictures and are focussed instead on the structural and relational connectedness of motion picture media.

2.4. Relational models

Relational theory was developed in the 1940s by E.F.Codd at IBM in response to demand for fast and efficient database systems. The theory broadly proposes that within a physical system the position and other properties of objects are meaningful only relative to other objects. Relational theory was applied rapidly into the designing and building of databases by breaking the functions down into a series of separate but linked files.[15] The process thereby reduced the amount of total storage space required for data by avoiding duplication of data, whilst speeding up access times (Codd, 1990).

Ballard and Brown described relational models in the early 1980s as turning away from *representing* models, to *matching* models from within a knowledge base. Thus proposition and inference became important aspects of interaction with the database. (Ballard and Brown, 1982)

The relational terms “more”, “same”, “less” - in database nomenclature called ‘operators’: ‘and’, ‘or’, ‘not’ - are of interest in this context as they express straightforward browsing options that enable either the refinement of searches or their expansion. Through a process of visual comparison or matching, the image collection can be rapidly assessed as to its usefulness, (as explored in the screen layout for *i-Map* in Fig. 2.6). The process of comparison is fundamental, employing visual memory learned as a child (Griffiths et al., c.1968).[16]

Much of the work made using multimedia tools in the 1990s developed this approach. Some researchers, whilst nominally connecting ‘place and knowledge’, took approaches that use the computer to link image symbols with specific narrative structures, such as the *Xi-Hu Historical Landscape* (Kiriyama and Chen, 2000), replacing in effect a book’s table of contents with the layered desktop e-book (Fig 2.7).

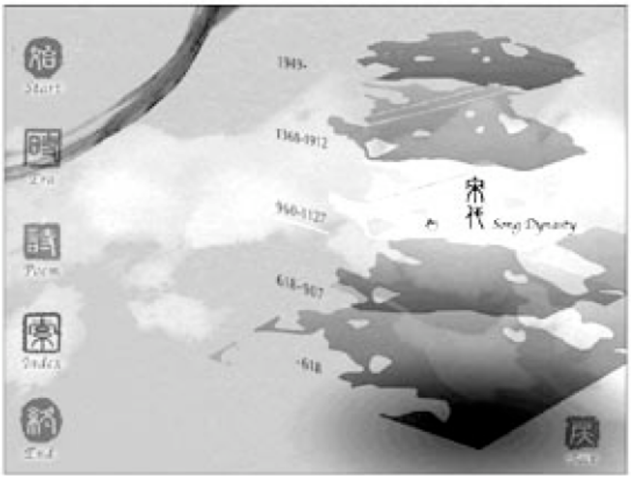

Fig. 2.7: Xi-Hu Historical Landscape interactive interface.

Brenda Laurel in concluding notes about some early virtual reality (VR) experiments:

> 'Working on this piece has demonstrated to me that the art of designing in VR is really the art of creating spaces with qualities that call forth active imagination. The VR artist does not bathe the participant in content; she invites the participant to produce content by constructing meanings, to experience the pleasure of embodied imagination.'
> (Laurel and Strickland, 1994).

The researcher seeking to establish a relationship between temporal media, external reality and the computational mapping of 'aspects of the world'[17], its objects, its associations, whether in a virtual or material setting, must now consider the elements of interaction with the machine.

The distinction between 'interaction' and 'interface' clearly affects not only the approach taken by researchers to human computer interactions but also reveals an attitude to that difference in terms of resultant outcomes. These distinctions can be characterized by summarizing some goals described by HCI researchers, as they developed over a 15-year period:

> '.. to develop and improve the safety, utility, effectiveness, efficiency and usability of systems that include computers.
> (Interacting with Computers 1989),3.

> '..concerned with understanding, designing, evaluating and implementing interactive computing systems for human use.' (Preece, 1994), 26.

> ‘..to develop a culture in which its creators became part of a complex and widely distributed system. It involves both human and artificial cognition and perception and is ‘an art that is emergent from a multiplicity of interactions in data space’ (Ascott, 2003),261.

The contemporary artist sets out to create systems for people, with conditions that stimulate thought and delight the senses through active engagement with the structural components of the encounter, both its form, content and conveyance. Many writers and researchers, from Herbert Read (1964) to Michael Joyce (1996) have described this in various ways. Intentions rather than goals help to guide rather than direct the process of encountering computer-mediated artworks and indicate directions toward an interactive cinema.

Interfaces defined as being 'designs' or 'layouts' for controlling a machine are largely at odds with conclusions to which artists and their commentators have arrived, where the notion of an interface has been collapsed with the intentions of interactivity. Interactivity involves not only feedback loops or communication cycles but also an active presence by the interacting subject, affecting the ecology of the location in which the encounter takes place. The design craft skills and guile of the artist in defining the interface has approached the issues tangentially, as Tofts has summarised:

> What, or more specifically when, is an interface? [The assumption is] that it only exists in the cybernetic domain, when someone sits in front of a computer and clicks a mouse.
>
> An interface, on the contrary, is any act of conjunction which results in a new or unexpected event. A door-handle, as [Brenda] Laurel reminds us, is an interface. So too is the ‘chance encounter, on an operating table, of a sewing machine and an umbrella’. [James] Joyce didn't write books. [Marcel] Duchamp didn't create works of art. [John] Cage didn't compose music. They created interfaces, instances into which someone, intervened to make choices and judgments that they were not willing to make. ... You are empowered, you are in control. Cough during a Cage recital and you are part of the performance. That's an interface (Tofts, 1995).

In the process of exploring relational models, various useful ‘crossover terms’ have been found that have currency within either research area - like ‘affordance’ and ‘ecological’ and ‘presence’. The term ‘presence’ introduces the need to understand the actual qualities of the interactive experience. (Appendix 8.

Gibson’s example of the image of a tree in the middle of a field on a summer’s day being only an *‘affordance’* to those who seek its cool shade being an illustration of *‘resources, which are only revealed to those who seek them’* (Gibson, 1979). Mantovani and Riva go on to amplify this distinction with the argument that presence is a social construction, mediated by both physical and conceptual tools that belong to a given culture, in which there is emphasis of ecological approach and the primacy of action on mere perception.

> “..action is not undertaken by isolated individuals but by members of a community. …. Ultimately, there are only two elements which guarantee presence: a cultural framework and the possibility of negotiation of both actions and their meaning”. (Mantovani, 1999).

For the artist, the presence of a viewer is assumed – the traditional painter makes adjustments, with decisions about colour, luminosity and mass, maybe also using representational devices like perspective, narrative content etc. to convey an idea, or expression or statement. However, in the words of Herbert Read: *“..the basis of the work of art was no longer Nature, but Ideas – something conceptual, geometric, architectural.”* (Read, 1964),76

Interaction between an artwork and the physical presence of the visitor is not an original technical innovation in the context of contemporary media art, but the way in which this element is introduced needs to have tacit consideration. It can make the act of viewing the surface a dynamic experience.

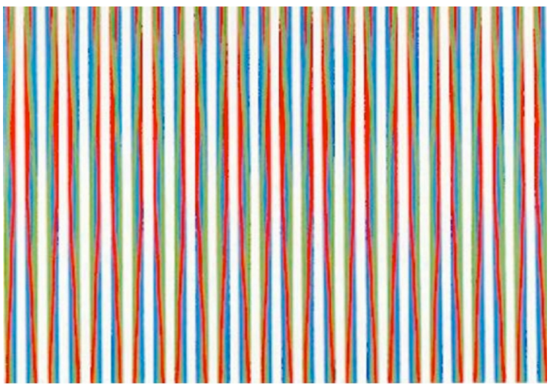

Fig. 2.8: Firebird (1971) Bridget Riley

Whilst visual artists like Bridget Riley (Riley, 1965) explore retinal response to optical patterning produced at different viewing distances (Fig 2.8), two-dimensional and three-dimensional artwork which actively responds to the viewer's changing physical position is a relatively recent phenomena emergent from electronic media. How does this affect our understanding, our feeling of presence, of proximity to and participation within, immersively, interactive encounters?

Presence implies at least two bodies in proximity to one another, (only one of which needs to be sensate), the presence of the other being detectable by operation of the senses or sensing devices. Cognition will determine an outcome – realising absence if the other has since departed initial detection, otherwise confirming a palpable presence.

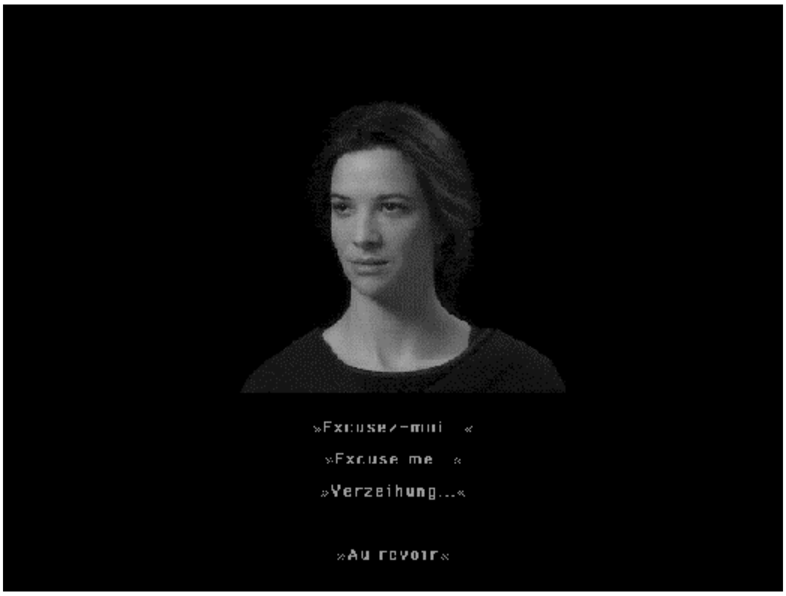

Fig. 2.9: Portrait One (1990)

Portrait One (Courchesne, 1990), proposes interaction, through sometimes risqué conversation with the on-screen persona of Marie, the simulacra, the cyborg (Fig 2.9). Using a touch screen with three alternative questions (in text form), the 'virtual relationship' is commenced with Marie, who replies in French (subtitled), before asking a question to which you, her correspondent, must select from three more alternative replies. And so on.

> [Marie]…forces us to think about the authenticity of our involvement or commitment to relationships in the larger scale of social life … the duty of

> reciprocity and response, which in this case is also the duty to play. Luc Courchesne raises the important issue of how we meet others in a telecommunications environment, and of how we meet ourselves, through others, in a virtual environment such as the CD-ROM or, more generally, in the context of digital media that will increasingly surround us. (Gagnon, 1995)

The term 'immersion' in this context is problematic, suggesting a disregard for the agency of the subject, somehow removing volition and substituting something manipulated 'remotely' by the artist or designer. Creating a functional interface that sets out to achieve a particular goal as suggested by the phrase, "..he was immersed in the gameplay.." or "..she was immersed in her work….", is distinct from a state acknowledging the world. The work of James Turrell amplifies this – though it is not mediated by computer - as being about our perceptions of the fundamental material manifestations of the world. (Appendix 8.5, James Turrell)

The language used, the descriptions of presence and the conclusions reached in these examples from telepresence researchers, by coinciding with debates amongst media arts researchers can be considered positive indications of grounds for collaborative work to occur. The common need is to create a context for interaction, an interface for measuring the quotient of meaningful presence in each of the models we are constructing, both physical[18] and virtual.

2.5. Models of Interaction

If the scientist seeks to solve problems associated with achieving effectiveness and efficiency of task completion within a system, the artist seeks to invite participation through a less certain interactive presence. This is likely to be different for each visitor, with the experience being structural, non-linear, and appealing to the emotional investment of the inquisitive and the exploratory gesture.

This approach may begin to address predictions voiced by Clark in the late 1990s concerning the role of computation and representation in cognitive science:

> "…progress with these issues … must await the generation and analysis of a wider range of practical demonstrations: dynamical systems models that target reasoning and action in ever more complex and abstract domains. As such research unfolds, I think we will see a rather delicate and cooperative co-evolution between multiple types of analysis and insight." (Clark, 1997),175.

Clark was evidently unaware that analysis and insight had for some time been progressing through discourses in film and media theory. Weinbren utilised Freud's interpretation of dreams - like Burgin (2004) et al - to draw comparisons between the atemporal experience of the dream state and the similar, non-sequential events that comprise the interactive encounter (Weinbren, 1995).

Ventilating some of the ideas and concerns being raised by cognitive scientists and the formal research methods they use are being addressed through practice-based research in the form of physical installations made by designers and artists. These amplify the visitor's sense of presence, or interact with the visitor's presence through the use of electronics technology. But developing interface models is dependent on the current state of the art in hardware and software technology and electronic devices and their availability to artists for the development of interactive systems. (This is appraised in Appendix 8.6: Sensing and Interactive Devices – a Survey, 2005). The following sections provides an overview of the ways in which these devices have been put to use in approaches to the construction of interactive models and interactivity with motion picture collections.

Thirty years ago Cornock and Edmonds described interactive 'art systems' as being: *'static, dynamic-passive, dynamic-interactive, dynamic-interactive (varying)'.* (Cornock and Edmonds, 1973). These categories were further developed more recently by Candy and Edmonds, with examples of work produced by Sid Fels, Jack Ox, Esther Rolinson, Mike Quantrill, Anthony Padgett and Ernest Edmonds (Candy and Edmonds, 2002). Whilst issues related to presence and interface continues to be explored, interaction within the multi-disciplinary domain of HCI and media arts continues at a pace. Several substantive published studies have documented artists working in these domains and a small industry devoted not to exhibiting but publishing about the work, has developed.

Descriptions of interactions with computer-mediated artworks have been numerous. In encyclopedic form there is *'Information Arts'* published in the USA and based on work exhibited at the annual ACM SIGGRAPH event (Wilson, 2002). *'New Screen Media'* published in Europe (Rieser, 2002) discusses manifestations rather than simply listing by description. More recently still, *Interzone* surveys the extent and engagement of Australian artists across a twenty year span (Tofts, 2005).

In Australia, specific articles and papers have included: interaction with CD-ROMs made by artists (Leggett and Michael, 1996, Tofts, 1996); 'mousing' through online interactive movies (VOGS) (Miles, 2004); artists' websites and the dynamics of net culture, (Rackham, 2004) in particular the concept of agency and infection, both as threat and subversive, such as Rackham's *Carrier* project (Rackham, 2003)[19]; and three-dimensional interactive installations (Leggett, 2004).

Tofts has observed that *"Interactivity is the refinement of a very specific kind of engagement with art that positioned the participant or visitor as an integral part of the creative process."* (Tofts, 2005) 13. Does the visitor arrive expecting to be creative? Do they regard their interaction with the installation as being creative? *"Such two-way communication, or feedback, meant that the participant or user could engage in a kind of dialogue with the work itself and affect outcomes that were not necessarily pre-determined. As well, the work was capable of …adjusting its actions accordingly…"* (Tofts, 2005) 15.

The model the artist develops focuses on the process of negotiation between a human in an actual space, together with a microprocessor-mediated feedback loop modifying the participant's perceptions of their presence within the system. The feedback may occur based only on data captured real-time in the installation space, or the same data combined with data from the computer's memory, the network to which it is connected or the peripheral machines it controls. Examples of these approaches, the means and the methods employed are extremely numerous and not often accessible or able to be experienced. The following artworks in different ways enable interaction with collections of images, some are still pictures, others are motion pictures.

Several installations, the first described here *Surface Browser* by Tim Plaisted (2004), address the vast collection of still images available on the world's internet servers using specially designed browsers. Others are for gallery spaces - *'Swarm'* by Alex Davies (2003) captures the images of visitors present at his installation, archives them, then represents them on the large screen that dominates the space. Another, in *'Changing Light'* by Chris Welsby (Welsby, 2004) the motion picture images are already collected and crafted into a database that the system accesses according to the presence and movement of visitors to the installation gallery space.

2.5.1. Plaisted

Tim Plaisted's approach is but one example of a whole genre that re-presents in a partially random, generative manner, the plethora of visual images deposited by people for a wide variety of reasons on servers around the world. Browser tools are coded to become the search engine and are downloaded by the user to the host computer. The interacting subject commences the search with a gesture, in the case of *Surface Browser* with keywords, the images retrieved, *objets trouve*, being delivered to the screen in an animated collage form (Fig 2.10).

Fig. 2.10: a moment from Surface Browser animation

> *Surface Browser* … gives volume and form to the evolving spaces of the Internet; its semi-random paths map out arcs of potential, pulling in the new, twisting and drawing in upon themselves, presenting an evolving representation of the internet and a way to explore its surfaces. (Plaisted and Irvine, 2006)

As a means of gaining a fresh perspective on the remarkable social network that is the internet, *Surface Browser* fascinates for a moment or two but has two drawbacks: agency is reduced to thinking in words in order to start the search engine process; and the participant is subjected to the visual detritus of millions of websites, like so much paper caught in a cyclone.[20]

Grander budgets have produced grander schemes based on similar principles. *T_Visionarium* (Del Favero et al., 2004/5) has moved through a development arc incorporating the search engine function into various display scenarios designed for spherical and 360˚ panoramas (Fig 2.11). Initially scanning the internet, in the most recent experimental manifestation (2007), some 40-50 motion picture images in the database are tiled in 3D onto the panorama and viewed with polarising specs. Using a 'magic' pointer, interaction with one image will trigger a selection process based on frame content and cause the frame and ones to which it is related, to move to the front. Within the system and therefore not seen, is a complex system of rules addressing word-based metadata describing the content of each shot, manually entered into the database.

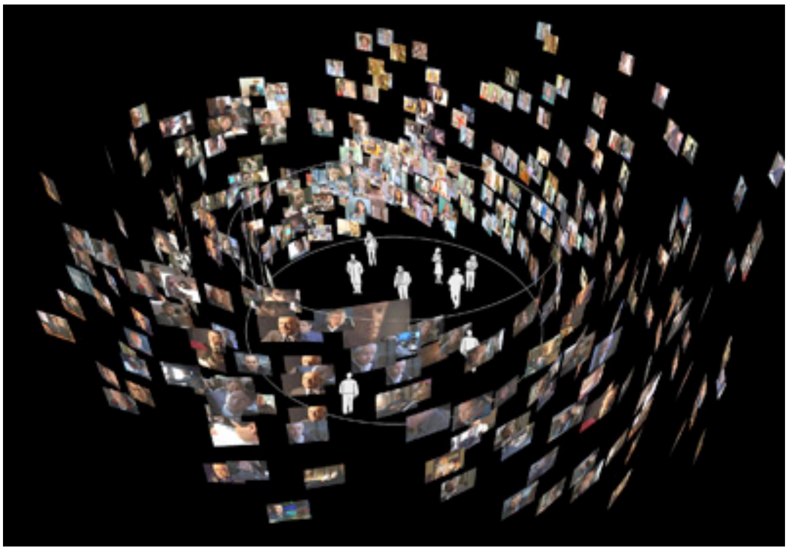

Fig. 2.11: T_Visionarium (2005)

Whilst an apparently stable spectacle for the dozen people who can fit into the circular screen, washed with the light from eight projectors controlled by a stack of machines and technicians, this industrial approach to a future cinema begs the question, why? It is not convincingly answered by Jeffrey Shaw's objective:

> The biggest challenge for the digitally-extended cinema is the conception and design of new narrative techniques that allow the interactive and emergent features of that medium to be fulfillingly embodied … perhaps the consummate challenge is the notion of a digitally-extended cinema that is actually inhabited by its audience, who then become agents of and protagonists in its narrative development. (Shaw, 2002),273.

The audience as agents and protagonists interacting with the output of database collections to large single screens have delighted audiences in far less technically ambitious environments. In an interactive work by George Legrady, *Pocket Full of Memories* (2001), the database was within a closed system and comprised scans of objects brought to the exhibit by visitors to be put on the server. Contributors were asked to attach keywords as metadata, with which the system's algorithms interacted to collage a visual output onto a large screen projection (Legrady, 2007).

Likewise, Zhang Ga's *Peoples' Portrait* browser, grabbed material from the collection of photographs scanned or transferred by spectators into the database, in several public squares around the world with large display screens, linked together over the internet. Interaction, though not dynamic for participants, has monumental screen proportions, the collection of images gathered from spectators being re-presented using generative system software.

Such databases are not always manipulated to produce projected images. Murray McKeich's on-going work with generative systems, *in Gathered Objects* (2006), renders overnight large quantities of two-dimensional images layered from components randomly selected from the database, for the most part, detritus gathered from the streets and scanned into the system (Fig 2.12).

Fig. 2.12: Murray McKeich generated photographic print.

Using a personalised fitness-function – his own eye and taste – the hundreds of variations are culled to leave individual combinations that are eventually incorporated into either fine art photographic prints, or following importation into an animation application, rendered out as motion picture files.

Fig. 2.13: Haze Express (1999)

Generative approaches are employed in the *Haze Express* (Sommerer and Mignonneau, 1999), though interaction with the system is effected by the participant stroking the train window through which projections can be seen. The speed and positioning of the hand movements influences the kind of image elements created by the system (Fig 2.13).

The touch-screen interaction in Chris Hales's early artwork, *Twelve of My Favourite Things*, a diaristic installation, is accessed using a touch screen over an image composite of three Quicktime movies (Fig 2.14). Through interaction with 'hot spots' based on visible colour zones, movies narrating the world of some young children recorded talking about their favourite colours, places and people are related. (Hales, 1996)

Fig. 2.14: *Twelve* (1995): five views (top to bottom) of interactive composite.

Contained in scope and size by the technology of the time, the work was an early model of how it could be possible to navigate a collection of movies using wholly visual means. Hale's overall project to develop an interactive cinema based on these indexing principles has currently reached fourteen iterations. Between 1995 and 2002 he delivered them as a package to venues together with a specially made A4 landscape-shaped screen and a stand for a touch screen-based version.

In the dimmed space of the touch-screen window 'railway compartment' set of *Haze Express*, the immersive, information denuded experience is in contrast to public spaces and the sites of contestation between images and our sense of self. The dimmed and quietened space of the art gallery is another place again…

2.5.2. Davies

In Alex Davies *Swarm*, (Davies, 2003), the collection of still images is not the indeterminate spaces of the internet but the specific space and material presence of the exhibition installation. The projection system unrolls across a wide screen format (6 : 1) a series of vertical frames that mix images of figures with images of space, a representation of the space in which you stand. They flicker as the vertical frames are replaced, as if from some scanning mechanism, replacing what was here with what is there, now – yourself, your companions, replaced again, in different frames, by strangers, whose images were probably captured and stored on some earlier visit (Fig 2.15).

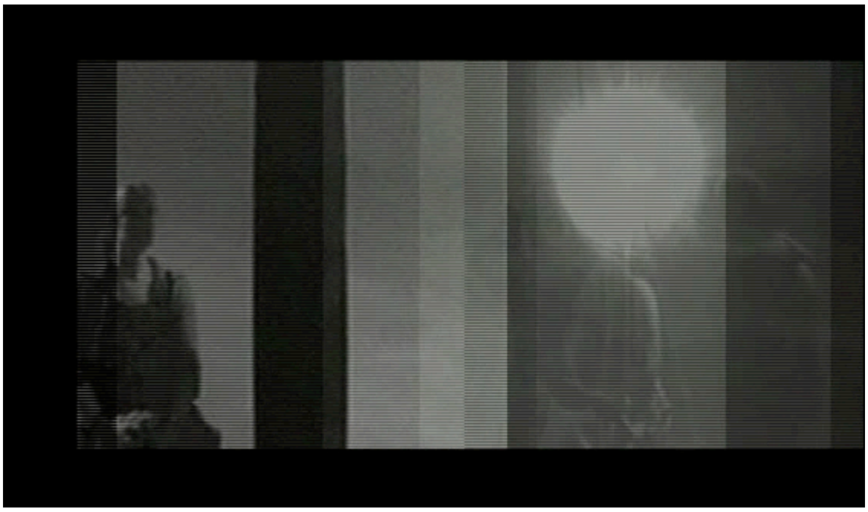

Fig. 2.15: *Swarm* (2003) movie frame

The visual rhythms are heard and change in pitch and volume as the greytone densities vary to the pulse of the picture as it sweeps across the wall from left to right. You, the visitor, move towards and away from the spectres on the wall, looking as you do, for the precise location of the tiny lens poking through the screen. This camera can form images where light is scarce, such as in the darkened space of this provisional cinema. They trade your image for your inclusion in the mystic writing pad of the palimpsest into which you have entered. The data space is constantly provisional, always in flux, your presence now absent, a previous presence now present. The database of captured images increases in size and number over the life of the installation. The space becomes charged with time. When the process is repeated during a subsequent installation in another gallery, additions to the database further append time and space.

Presence and proximity achieve for the visitor an interactive encounter that unsettles and disturbs as vividly as it may be brief. It is in contrast to the cinematic apparatus that delivers 'a sensorium', an immersive spectacle on the screen, whether flat, circular or spherical or optically virtual. That moment of frisson at the point of disturbance, signals incorporation of presence. It implies terms for extending that moment into an encounter that could in a moment of flux, allow the balance of power between artist and visitor to be comprehended and negotiated, if not reversed.

Does perception of the machine's response to the subject require a degree of amplification sufficient to register above the level of 'normality' in the environment? Is interaction with the system restricted to 'staging' ones presence, as in a session with a photo-booth? Like all installations in publicly shared spaces, the amplification brought by the system to our shared physical presence is the whole experience for each individual.

2.5.3. Welsby

Each individual viewing *'Changing Light'* by Chris Welsby at Artspace, Sydney in April 2004,[21] encountered a white screen 4 x 3 metres, horizontally mounted 40cm off the floor, reflecting a moving image from an overhead projector connected to a DVD player and computer. The image is of the surface of water in a lake surrounded by a rocky landscape with trees and vegetation. The image floats in the semi-darkened space of the large gallery floor (Fig 2.16).

Fig. 2.16: Changing Light (2004) installation at Artspace, Sydney.

Welsby describes the installation:

> As the viewer moves around the projected image, the spatial coherence will be disrupted as the reflection will remain stationery - the water will reflect only the image of the trees and rocks which surround it and not the image of the gallery. The interactive presence of the visitor will cause the apparatus to sample different aspects of the original recording made at the lake. These will sample the complex variation in the water surface caused by a mixture of wind and human intervention. ... this piece favours small numbers of people moving quietly around and looking carefully ... As the water surface becomes more agitated the illusion of pictorial space gives way to a complex dance of enlarged pixels, foregrounding the technology and shifting attention to the here and now of the gallery space. (Welsby, 2004)

Welsby's extensive oeuvre, starting with film in the 1970s, more recently video and now digital technology, follows within a long tradition of artists who stand before the physical world of botany and topography, climate and ecology. They present to us models that, like Turrell's work, negotiate a sequence comprising perception, action, cognition and effect that can be used to analyse the various stages of consciousness experienced whilst within the influence of the artwork. In *Changing Light,* the processes, technology and materials describing the artefact's making, our reception of them, and the synthesis, helps us define where nature, culture and self are in confluence.[22]

The technology inserted into the gallery installation is a camera, and image analysis software monitoring the comings and goings of visitors. Tracks are selected from the tracks of the DVD accordingly. Thus in the dynamics of the installation, two cameras function – one camera has recorded the surface of the lake, the other responds to the presence of the visitor and makes the work, in the present, of the past.

These examples of practice-based investigations by artists into the ordering of images for group and individual perusal, accentuate the circumstantial: the context in which they are experienced, perceptually and reflectively; and the aesthetic terms under which the images are gathered and ordered. In the next section attention is turned to taxonomies of indexing that move away from total reliance on conventions of word-based classification, seeking other forms of visual mnemonics to guide and stimulate interaction.

2.6. Linkages

Half a century after the invention of cinema, another vision-based machine was anticipated. *As We May Think* is an essay by Vannevar Bush, first published in The Atlantic Monthly in July 1945. No longer required en masse to build bigger and better machines of war, the scientific community were provided with a research departure. He described *'…a future device for individual use…'* that he called a memex.

> A memex is a device in which an individual stores all his books, records, and communications, and which is mechanized so that it may be consulted with exceeding speed and flexibility. It is an enlarged intimate supplement to his memory. (Bush, 1996 (1945))

This outline of the personal computer went further in detail. The system would be based on high-resolution microfilm reels, coupled by electromechanical controls to multiple screen viewers and cameras. It is only in recent years that the final stages of this vision, incorporating cameras and motion pictures have become apparent.

2.6.1. Image With Text

Human Computer Interaction (HCI) as a sub-disciplinary area of information technology research was recognised relatively late in the overall development of computer systems (Preece, 1994). That computers could be more than substitute typewriters, adding machines and advanced calculators was overlooked. Issues of functionality and usability become paramount as business interests began to fund research (Preece et al., 2002) 7. Sophisticated methodologies were invented to advance exhaustive evaluation with live subjects, so that painstaking and rigorous documentation and data gathering could arrive at some conclusions about interface design (Preece et al., 2002) 324.

Those who pay the pipers call the tune, and so today creativity tools are those defined by business and employers. We confront the image of a printed page, the surface of a desktop, a piece of graph paper, an electronic filing cabinet, a map, or other specialist interfaces such as that used for editing video and soundtrack. These two-dimensional spaces that have acquired the bevel edge, two, three and four pixels broad - embossed frames, windows, work areas, palettes, icons, trash cans and so on, remain in a pre-renaissance era as qualities of experience if not functionality. These contextual devices are more about achieving “the goals of performance” often associated with the interface and what can occur within the metaphor it sets out to establish. The kinds of interface that artists and other researchers currently construct are about interventions into all of this, presences as tangible as that of the live performer and the live audience.

2.6.2. Hypervideo

The development of microprocessor and computer technology has delivered for the motion picture phenomena, opportunities to explore the possibilities of relational ordering. Landow recognised this from practice-based experiments at an early stage in the development of hypertextual theory, ranking the relational as ‘Rule 2 ’ (from among nineteen Rules):

> ‘The emphasis upon linking materials in hypermedia stimulates and encourages habits of relational thinking in the reader. Such intrinsic hypermedia … provides a powerful means of teaching sophisticated critical thinking…’(Landow, 1994)

Hypermedia gives agency to the receiver, the audience, over text, image and sound, to determine the character and intensity of the interactive experience, within parameters determined by the builder of the system. Relational thinking is actively maintained as the material encountered is interrogated for possible significance within the linking scenario. Determining viewing duration and the order of the materials viewed is the substance of the interactive experience. The materials thereby encountered are experienced durationally as a unique continuum, the outcome of options taken.

Hypervideo moves the options into fresh territory, as the objects that the receiver will navigate are not static in time. By being able to access at different durational points of an individual video file in a motion picture collection, the time-base of the overall collection, as experienced by an exploring participant, is not fixed.

Primacy is given to agency, to affect duration and order as creative participation within the motion picture experience.

Grahame Weinbren, film-maker and video artist, had been making interactive narrative installations in analogue form, since the 1960s. In the mid-1990s, Weinbren was impatient with the rate of development in the implementation of video technology, the cinematic immersive experience being impossible with Quicktime movies comprising only 6,000 or so pixels. *'It is hard to imagine them carrying the power of the cinematic in their stopwatch-sized rectangles.'* (Weinbren, 1997). The real issue with which he grappled extensively was developing a narrative architecture that required "the viewer" to explore pathways through scenes depicting actors in locations. Derived in *Sonata*, from his fascination with the work of Freud, nonetheless did not detract from the essential qualities he explored in the realm of hypermedia – random access to data. Describing non-sequenced narrative as a tightly wound ball of data to be unwoven through interaction, preserved *'the sense of simultaneity'* (Weinbren, 1997), of the experience.

Cogniscent of Weinbren's work, the *MediaLoom* (1997) project was a Masters thesis supervised by the doyens of hypertext theory at Georgia Tech, Michael Joyce, Jay Boulter and Mathew Causey. The candidate, John Tolva observed:

> 'Hypervideo is a true computer-based media form, not only technologically but aesthetically. Rather than aspire to a quality of cinematic (or VR-like) immersion, hypervideo presents a field of video clips to be looked at and treated in relation to one another, not unlike the elements of the interface of the computer itself. These hypermediated, self-consciously digitalized video clips operate as a montage in the spatial, pictorial sense rather than in the temporal, Eisensteinian sense.' (Tolva, 1998)

Cinematic narrative has a convention of structure, learned from the novel and the fable, of cause and effect, temporally ordered, with a beginning, middle and end. Advanced editing techniques, pioneered by Eisenstein among others, bind shots together without distraction into a narrative structure. As Harpold had noted, early experiments in hypertextual narrative, though in one sense amplifing the narrative seams, encouraged the interacting subject to seek to bring the fragments together again. Tolva's project set out to probe how hypervideo could be distinct from hypertext, avoiding interactive ‘easy solutions’, whilst maintaining the spatial deployment of navigational options. *‘Based explicitly on a hypertextual link-node arrangement, hypervideo is a medium for computer-based narrative created by an interactive montage of text and video clips…’* (Tolva, 1998). Tolva’s experiments employed the first of the specifically designed hypervideo tools, the *Hypervideo Engine,* referred to by its builders as *‘a generalised content-independent implementation of the hypervideo framework*’ (Sawhney, 1996). One of the features incorporated in the Engine was the ability to generate an interaction log. *MediaLoom* advanced from this feature enabling ease of authoring to every aspect of the *Hypervideo Engine*’s runtime features.

The work of Tolva and Weinbren, and that of Manovich and other more recent projects like *Hyper-Hitchcock* and *HyVal*, have not only been important evaluation studies of closely related but distinct research projects, but were also assessed as potential tools for the building of models for the purposes of this research – see chapter 5.4.3/4. Though the issues associated with storage and retrieval for the purpose of authoring interactive video had not been pursued by ICT professionals, a useful research track by Girgensohn and Shipman developed the concept of *‘detail-on-demand’* video (Girgensohn et al., 2003).

Fig. 2.17: Hyper-Hitchcock player tool (Shipman et al., 2005)
The timeline on the bottom provides labels and keyframes for links.

The Hyper-Hitchcock project comprises a video editor tool with a player tool enabling a linear video to be prepared in the editor for an indexing system based on visual summaries of visual content (Fig 2.17).[23] The thumbnail summaries on-screen, are hyperlinked to complete sequences. The aim was to provide *'…a natural mechanism for authoring instructional videos that [then] allow viewers to quickly find the information they need.'*

They explained:

> We introduced detail-on-demand video as a simple type of hypervideo that allows users to watch short video segments and to follow hyperlinks to see additional detail. Such video lets users quickly access desired information without having to view the entire contents linearly. (Girgensohn et al., 2004)

This was measured in the case study stage of an instructional movie, *'Plumbing a Sink'*, and it was found that on average users correctly completed a set of questions about the content of the video in 9 minutes, compared with the time it took to watch the entire 27 minutes of video.

Though the quantitative results of the test subjects were task orientated, (foreshadowing the onset of YouTube bite-sized-video?), the project conclusions were useful to non-task orientated objectives in several ways:

- 'Hypervideo, like hypertext, derives its value by allowing users to express their own information needs via navigation. But navigation is only valuable when the viewer can anticipate the outcome of navigation or assess it very rapidly.'
- 'Rigorously following a particular design pattern so that the hypervideo structure is predictable may help.'
- 'The user interface needs to present users with an intuitive view of the hypervideo structure.' (Girgensohn et al., 2004)

By coincidence or inevitably, the *Hyper-Hitchcock* research team of scientists at Palo Alto came to a conclusion central to this investigation, that, *'….the work of film theorists can aid in considering how the navigational structure and cinematic structure interact.'* (Shipman et al., 2005).[24] The work of these researchers, in particular the detailed evaluations, has been valuable in shaping the new studies described in Chapter 5. However, designing interaction appropriate to particular collections of files was not a significant part of their considerations.

2.6.3. Authoring

The design of the video database hypervideo system will enable a user to comprehend and thus work intuitively with its underlying structure, being able to anticipate the outcome of decisions made whilst navigating the combined control and representational structures. Such an approach can be described as knowledge management, as distinct from asset management, predicating the need for an authoring approach that is definable within a non-sequential hypervideo environment.

Fischer and de Paula distinguish between two perspectives when considering knowledge management. The ‘commodity’ viewpoint is the classic corporate hierarchical set-piece that regards knowledge as an object, created by specialists, distributed to users, with access granted from the top downwards, enabling assignments to be set and with the system driving users to avoid making errors – the Non-Linear Video Editing (NLVE), tool is a good example[25]. The ‘design’ viewpoint on the other hand regards knowledge as something enacted, created by stakeholders, disseminated on-demand within a peer-to-peer network, enabling direct involvement with user-driven tasks that regard breakdowns as opportunities for further innovation. (de Paula and Fischer, 2003)

The ‘design’ approach Fischer and de Paula describe will be familiar to those who have experienced the benefits of working collaboratively across different fields, particularly in the industrial-based creative arts. Neither is it entirely strange to the cool corporate sector, I suggest, gathering synergies where they may - the new harvest. But the collaborative ventures familiar to many artists are less focused in their outcomes, expect little material reward, seeking primarily to enrich the culture of distinct communities. Fischer and Giaccardi describe this mechanism:

> The inherently social and situated nature of knowing invites us to consider a meaningful social structure in which knowledge is enacted, created, and shared among stakeholders. Such a structure should represent the social and historical contexts in which they are capable of acting, participating, and making appropriate and informed decisions. … Through practice, members of a sociocultural community develop a shared understanding of

what they do, how they do it, and how they are related to each other and to other communities and their practices (Fischer and Giaccardi, 2004).

In describing Communities of Practice (CoP) as stakeholders with the experience and sometimes the authority to work collaboratively, the Community of Interest (CoI) has the *"…common concern or interest, to solve a particular complex design problem."* (Fischer and Giaccardi, 2004) Meta-design gathers potential from these convergences and becomes *"…an emerging conceptual framework aimed at defining and creating social and technical infrastructures in which new forms of collaborative design can take place."* (Fischer and Giaccardi, 2004).

The *korsakow system* is a shareware application that enables authors to create narrative projects without programming knowledge. Like detail-on-demand, the designer has come up with the notion of 'smallest narrative units' (SNU) *'..each SNU should be able to identify its own partners, other stories with which it belongs.'* (Thalhofer, 2003)

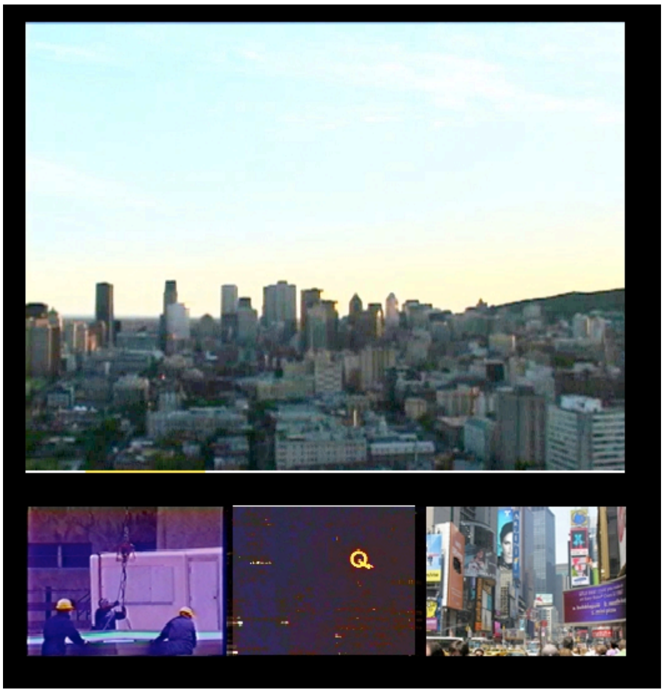

Fig. 2.18: *korsakow* online interactive movie system

An elegant Player has three small screens fitting neatly beneath a screen three time the size, on which the selected or 'active' movie plays (Fig 2.18). The three screens beneath show still images of linked scenes that when selected, fade out the picture and sound on the main screen, before starting up the one selected.

There is no clue as to where the options lead, so the interactivity with the movie determines the duration of the scene being viewed – not a good solution for those with a short attention span, but engaging for those who enjoy exploring and speculating on outcomes. Examples of completed projects are in the documentary idiom.[26]

Interaction with this system is by perceived relations between the visual elements of each model. Concealed however, is an authoring system based on words and the associations an author makes with the images visible. Navigation is thus based on chance, or at best anticipation of the author's use of words within the meta-design structuring principles.

'The materiality of softvideo' is how Adrian Miles describes such structuring. The architecture through which in the digital domain motion picture frames and frame rates are the subject of agency determined through software, characterises a fresh means for redefining the Vertov concept of montage:

> '..as a fundamental mode of time-based discourse … Montage as a principal of selection and organisation can now reside somewhere between the shooting or gathering of material, a dynamic combinatory system of construction (more or less automated), and a user who (more or less) knowingly controls and determines the particular montage event and sequence.' (Miles, 2008)

Though Miles's broad agenda for online, participatory, motion picture collage diverges from this research vector, the mode of time-based discourse in the contemporary digital video environment summarises the fundamental similarities between many projects and their protagonists.

2.7. Summary

The survey of the literature and the context for this research has engaged with the three areas central to this investigation:

- those developing the technical means to manipulate motion picture files;

- those conducting formal experimentation into alternative syntactical structures for creating connectedness between collections of video files;
- those experimenting with the physical and gestural means for interacting with video collections.

Traditional Human Computer Interaction relies heavily on metaphor derived from the mechanical age: the printed page, the desktop, the graph paper, the map, etc. Along with the process model of perception-cognition-intention, Clark has observed: *…perception itself is so tangled up with specific possibilities of action … that the job of central cognition often ceases to exist* (Clark, 1997),51. This could account for the tension then between the tools of the Enlightenment from where so many of our disciplinary patterns derive, and the tendencies within popular culture and post-modern interdisciplinary studies to, as it were, measure and compare less but experiment and juxtaposition more.

The embodiment of the visitor in the physical space and the mediated system through the acknowledgment of both their tactile and non-tactile presence, has since then become *a priori* the direction taken by those artists working in actual space (whilst sometimes annexing the virtual space of the internet). The scientists and artists discussed here have contributed significantly to the design parameters of hardware and software tools. For many, incorporating the participating visitor within the work has been central, their physical proximity to their work not only causing change within the work but often including the invasion of their physiognomy, the capturing of their appearance, the sampling of their presence.

What is it a person visiting an interactive art installation expects? Does this translate as 'needs'? The needs of some it seems can only exist within the text of the cinematic experience though for many in the post-narrative age, interactivity is confused with reflection and at very least a differentiated 'space' is acknowledged (Druckery, 2002).

> "To encourage audiences to be interactive is a potentially confronting gesture, since it disrupts the philosophical comfort zone that has traditionally assigned well-demarcated roles for audiences and art work alike. If media art is to transcend its label as an emerging set of practices,

> interaction needs to be as familiar and automatic as the experience of watching a film or reading a book." (Tofts, 2005),132

The narrative that I conclude here has discussed, if not imposed unity upon, the interdisciplinary background of the research that has arisen from an earlier research, to be discussed in Chapter 4. The scope of this literature survey has been wide and likewise arises from the rich set of circumstances created for deeper reflection and evaluation at a later stage. Thinking about ways in which the research may be further developed has unavoidably caused me to consider separated disciplines including the study of mind and memory, perception and cognition, presence and embodiment, media representation, creativeness and meaning. I am not forgetting the Machine and the interdisciplinarity of connecting with others engaged with computational complexity and its magnetic appeal.

2.8. Notes

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1 Film is projected at 24 frames per second, each frame being a static image. It is the complexity of human perception that renders this is as continuous movement ANDERSON, J. (1998) *The Reality of Illusion: an Ecological Approach to Cognitive Film Theory,* Carbondale, Southern Illinois University Press.. Video is more complex to describe as the image is composed from a continuous stream of electrons scanning the screen, constructing discrete but continuously modified images. The ubiquitous Liquid Crystal Display (LCD), used increasingly as the screen surface we will most likely encounter, renders the image as a binary stream within the digital domain of the microprocessor, affecting transistors to cause physical changes in the molecular structure of the liquid crystals contained within the screen structure. The Light Emitting Diode (LED) is similarly hard-wired into the micro-processor responsible for converting data captured by the Charge Coupled Device (CCD) back into the image focussed by the camera lens at many a sports stadium.

2 In section 4.3, we shall see single frames together with loops and generative systems were the basis for some of my earlier research with 16mm film.

3 The literature redefining the experience of cinema and its affect is considerable, references addressing two core periods of 'experimental' film-making, in the first and the second half of the 20th Century, outlined in chapter 4.

4 The plight of Alzheimer's sufferers dramatically demonstrates the way in which the cognitive scaffolding can be moved around to enable the person to adapt to his or her's changed circumstances. Labeling of objects and their significance, 'open-storage' of important items of daily life are all adaptive strategies with which the subject can avoid the total disruption that would result from

hospitalization. EDWARDS, D., BAUM, C. & MORROW-HOWELL, N. (1994) Home Environments of Inner City Elderly with Dementia. *Gerontologist,* 34. 1994) p64.

5 The author witnessed two professional script-writers working method, which involved them laying out palm cards and images around a studio, whilst working with a computer in the centre of the room to synthesis their content. Russell Crowe portrayal of the schizophrenic John Nash in the movie *'A Beautiful Mind'* provides an image of this process in its pathological state.

6 "Indexing is a way to increase retrieval precision and accuracy by consistent application of subject terms in their preferred forms. … A taxonomy is a controlled vocabulary presented in an outline view, also called a classified view or hierarchy. Terms are organized in categories reflecting general concepts (Top Terms), major groups (Broader Terms), and more specific concepts (Narrower Terms). The final terms at the end of a branch, often called nodes, can represent any specific instance of a Broader Term, including terms from an authority file of people, organizations, places, or things." DATAHARMONY (2000). Data Harmony Inc.

7 Yates's exhaustive study of ancient and medieval texts includes the 'memory theatre' of Guilio Camillo, which like many other visual memory systems, relies on the construction of elaborate tables and diagrams recorded as pictures. As "compressions" of medieval knowledge systems, they are useful in comparison with some of the tacit knowledge discussion in Chapter 5.2.3.

8 Well-established software tools related to topography, such as *ArcView*, recording time and place. They are widely used in industries related to environmental planning, water and land management, urban layout, national parks, mining and agriculture, etc. These are specialised tool sets based on data derived from various methods of measurement. GIS satellite data and a range of plug-ins to the system enable digital images, sound and text files to be attached to specific coordinates. This provides extensive profiles to be constructed and navigated in real-time from numerical data using graphical and map visualisations. Archaeologists and social scientists have adapted these tools. In the west of Sydney, the NSW Migrant Heritage Centre has commissioned a website, using a application called TimeMap that links a combination of text and map metaphors with personal oral histories and localities around the City of Fairfield in western Sydney.

The tools offer a plethora of styles and codes that incorporate maps, diagrams, graphical and typographic devices, each inflected with current tools and fashions in interface design. The Fairfield project takes an approach closely related to the archaeologist's inventory, making it possible to store and retrieve data about the past, but making the oral and written evidence useful for archaeologists and educationalists but uninvolving and distant as an experience for individuals in the community.

More recently the *Digital Songlines* project at the Australasian Centre for Interactive Design (ACID) in Queensland uses graphical representations familiar in game engines, to map the GIS data relevant to 'country' and cultural artefacts, related to an indigenous community LEAVY, B. (2007) *Digital Songlines - igitising* *the Arts, Culture and Heritage Landscape of Aboriginal Australia,* Hershey, Idea Books.

[9] A rebellion occurred in Exeter in the mid-16th Century, following the suppression of Catholic religious ritual in favour of expressed Protestant belief. The protest reflected the hold narrative, enacted through the ritual of the ceiling bosses, maintained over the congregation. In the current context, this 'situated action' of interactive story-telling using images can be compared to the more conceptual space of the printed page that replaced them.

[10] The paper provided no quantitative assessment though some compelling qualitative comments and concluding observations: 'Photography and home movies are activities that address deep human needs; the need for creative expression; the need to preserve memories, the need to build personal relationships with others. Digital photography and digital video can provide powerful and novel, ways for people to express, preserve and connect. However, the new technologies often raise new problems; the problems of multimedia organisation and retrieval…' (Kuchinsky et al., 1999)

11 Scopitone films are the predecessors of today's music videos. Distributed on color 16mm film with a magnetic soundtrack, they were specifically made for the Scopitone film jukebox, a mechanical database with a capacity of 36 films, which customers could select from a playlist. The first Scopitones were made in France around 1960, and the Scopitone craze spread throughout Europe (particularly in West Germany and England) before crossing the Atlantic to the United States in mid-1964. By the end of the 1960s, they were gone. The Cinebox was an Italian film jukebox that debuted in 1959 and entered the market in Europe almost simultaneously with the Scopitone. In late 1964 or early 1965, the Cinebox was renamed Colorama in the United States. The Color-Sonics film jukebox debuted in mid-1966 and used 8mm magnetic-sound film cartridges. Color-Sonics also made 16mm prints of at least some of its films so that they could be shown on a Scopitone jukebox. The 16mm prints have often faded miserably over the years though the authoritative Scopitone Archive is in the process of restoring them online. (http://scopitonearchive.com/)

[12] IBM researchers took an algorithmic approach to anticipating future media aesthetics: "In this new world of self-expression, there will soon be a desire to manipulate digital aesthetic elements to deliver messages in many different ways and a need to reverse engineer intent and meaning from available content. Computational media aesthetics takes us toward this goal. … we defined computational media aesthetics as the algorithmic study of a variety of image and aural elements in media (based on their use in film grammar)". (Dorai and Venkatesh, 2001)

13 The Motion Picture Experts Guild (MPEG) was formed in the late 1980s to establish international standards for the encoding of audio and video files, known collectively as codecs. MPEG-7 is a standard protocol for describing video files using embedded XML text-based annotations interleaved within the structure of the file. This enables specific moments to be found in a video MPEG file using hierarchical displays of text or icons. Originally the Motion Picture EDITORS Group before Experts emerged from the woodwork.

14 MPEG1 was the first standard and used in the production of VideoCDs (layer 3 becoming .mp3 audio files), MPEG2 in the production of DVDs and digital television. MPEG4 was an upgrade of 1, with MPEG4 version 10 becoming known as H264, a highly efficient Internet streaming standard. All of these standards required the user of the compressed video file to devise their own system for the naming, storage and retrieval of the file. Most used some form of database established as an application separate from the movie collection requiring manual keying of data about the data.

15 The author was responsible for building alphanumeric databases using relational design methods from the late 1980s onwards, for government departments and the National Association for the Visual Arts (NAVA), using applications such as Paradox and Filemaker Pro.

16 These words, more-same-less, were used by child development researchers GRIFFITHS, J., SHANTZ, C. & SIGEL, I. (c.1968) A Methodological problem in Conservation studies: the use of relational terms. Lafayette, Merrill-Palmer Institute. Continuing to develop Jean Piaget's Conservation Task, first defined in the 1940s in his studies of child development. The OED defines 'conservation' in this context as a branch of psychology: …faculty of conservation: memory proper, or the power of *retaining* knowledge, as distinguished from reproduction or reminiscence, the power of *recalling* it. (Author's emphasis). Derivation of the term conservation can be traced back to Aristotle. He distinguished between Memory, as the faculty of Conservation, from Reminiscence, the faculty of Reproduction. "Please assume ... that there is in our souls a block of wax, in one case larger, in another smaller, in one case the wax is purer, in another more impure and harder, in some cases softer, and in some of proper quality...Let us, then, say that this is the gift of Memory, the mother of the Muses, and that whenever we wish to remember anything we see or hear or think of in our own minds, we hold this wax under the perceptions and thoughts and imprint them upon it, just as we make impressions from seal rings; and whatever is imprinted we remember and know as long as its image lasts, but whatever is rubbed out or cannot be imprinted we forget and do not know." [Socrates to Theaetetus. Plato, *Theaetetus* 191d]

17 In the *Mapping Perception* project, the film maker Andrew Kotting worked with four main collaborators: Eden Kotting, his daughter, artist and performer; Giles Lane, curator and producer; Dr Mark Lythgoe, neurophysiologist based in Britain's premiere children's hospital; and Toby McMillan, sound designer. Eden was born in 1988 with a rare genetic disorder that led to impaired brain function, the focus point for the collaborators embarking on this *"experimental entanglement".* The project was multi-layered, crossing disciplines and led to material outcomes that included, from the artists, a 35mm film, an audio-visual installation, a CD-ROM together with the elegantly designed and printed book. The neurophysiologist Mark Lythgoe uses the metaphor of *The Castle of the Five Senses* in the film they made, where five narrow arrow windows restrict our ability to receive incoming stimulus. As an observation on the extent of the entanglement, he reveals: "The narrative for *Mapping Perception* was created not via a series of happenstance events, but was formed like a jigsaw – piece by piece, trial and error – until the story we had in our collective unconscious was realized. Those were the moments of revelation for me. … I cannot explain how

or why you suddenly get those moments of clarity, when that fuzzy fog inside your head finally lifts."

18 Such a concept extends to the spaces and scenic spots in traditional Chinese gardens which were composed to produce wonderful experiences for people to stroll through: "The wonders of a garden are revealed in carefully planned spatial sequences in which the visitor's aesthetic enjoyment is enhanced. In this sense, the garden should be seen as a system in which individual nodes are linked in meaningful ways to form dramatic relationship between the nodes." A research team reconstructed such an 18th Century gardens in virtual reality: "This study explores the multiple possibilities of spatial sequences that a visitor may take to obtain different aesthetic experiences, and this study discovers that the garden under study, as a complex experiential system, indeed supports alternative routes and provides varied aesthetic experience. FENG, J. (2003) The Traditional Chinese Garden as an Experiential System. *6th Annual Symposium of Systems Research in the Arts.* Baden-Baden.

19 Today, online, we are surrounded by many forms of Internet art. From streaming video, elegant interactive java works, electronic poetry, net.radio and tactical media, to the phenomenally successful genre of intimate video or panoramic blogs. We may interact within artist-created multi-user Virtual Reality and Game spaces, and watch new theatrical and cinematic forms like avatar performance and machinima. Flash animation has penetrated almost every corner of the Web; and the network itself becomes an artwork as software art and browser interventions reformat and recontextualise HTML code. Net.art creates a mixed reality when data captured from one space is transposed and revisualised in another location; or when the monitored interactions of both artists and users becomes the bio-input for an artwork. (Rackham 2004)

20 http://www.boxc.net/f_cwork.html. Other work in the field of browser interaction include: Browser Gestures, Mark Daggett, 2001 (Browser intervention); REWOB Screensaver, Hisayoshi Tohsaki, 2000 (More image montage from net traversals); Netomat, Maciej Wisniewski, 1999 (Experimental browser)

21 Changing Light was an exhibition of two installations curated by Mike Leggett, following Chris Welsby's residency at Artspace Studios, Sydney, LEGGETT, M. (2004) Changing Light - new work from Chris Welsby. IN POTTS, J. (Ed. *SCAN.* Sydney, Macquarie University..

22 A later work, installed at the Gwanju Biennale in Korea, captured weather data via the internet from four global locations, Gwanju, Sydney, Vancouver and London. The data was fed into a system designed to synthesis from previously captured images of a tree, a sense of the world environment. *"Only one channel will be projected at any given moment in time. If there is a wind shift to the left, footage shot from the left viewpoint will play on the left screen. If there is a wind shift to the right, the right viewpoint footage will play on the right screen and if the wind direction is constant and steady the centre viewpoint will play on the centre screen. In this way the wind will precipitate a visual dance about the central axis of the tree, mapping a three dimensional representation of space and time onto the three projection screens. In addition, the wind speed will cause the footage to speed up and slow down so that clouds, light and the movement of people will be seen in gusts, and if the wind stops blowing, the footage will hover back and forth*

over three or four frames; relatively still, but ready to move in either direction." (Email to author June 2006)

23 Members of the Hyper-Hitchcock project editing tool is distinct from the Visual Knowledge Builder (VKB), a second generation spatial hypertext system developed by Shipman et al, it also uses windows segregated according to function, using **text** as media builders. It is distinctive not because it uses familiar conventions such as windows segregated according to function, text, colour tabs, pull-down menus etc., but as a media builder. *'The alternative approach investigated in this project is one of "incremental formalization.'* This approach allows users to initially enter their understanding of their domain, task, and solutions in less formal representations and provides computer support for the gradual formalization of this knowledge". SHIPMAN, F., HSIEH, H., MOORE, J. M. & ZACCHI, A. (2004) Supporting Personal Collections across Digital Libraries in Spatial Hypertext. *JCDL '04.* Tucson, ACM.

24 Another related research team developed an interactive digital video system, *The Diver*, for being able to review archived footage using a 'virtual camera' to time/space crop and annotate (Pea et al. 2004). More advanced and resolved technically than the Hyper-Hitchcock project, it was concerned with the ability to build text-based discourse around the footage under review rather than building significance using the video medium itself, both as authoring tool and source.

25 Design of applications for common tasks, like Non-Linear Video Editing (NLVE), are straightforward tools for HCI designers to produce – it follows a study observing the analogue practice and processes, to developing a digital equivalent. Then incrementally, as the users get used to the new platform, the features of operation are improved and extended, inexorably moving practice into the digital domain. But as an authoring tool, NLVE remains firmly within the group of software applications for creating narrative and sequential experience.

26 Adrian Miles Vog approach using the scripting and linking features in Apple's Quicktime 7, similarly uses keywords as the (either visible or invisible) mechanism for joining nodes.

3 Methodology

3.1 Introduction

This chapter describes the toolbox with which and through which research has been conducted. Evidence is produced from a practice-base and used to develop interactive motion picture models. Data is gathered during the process of iterative development through analysis and reflection. This is based upon a repertoire of acquired knowledge including systems theory, semiotics, cognitive science and film and video studies. In the later stages of the research a modified user-testing evaluation is employed to arrive at conclusions useful for future development of the precept.

The advent of digital video and computer-based presentation systems has offered the prospect of expanding the use of audio-visual media in general and motion picture files in particular into an everyday communicative and expressive form. This requires fresh approaches to working with motion pictures in the digital environment, occasioned by the convergence of motion picture technologies with the computer. Breaking away from the constraining forms of narrative syntax on the one hand and avoiding the cumbersome interfaces developed for traditional video databases on the other, will be the main outcome of these approaches.

The research explores fresh approaches to demonstrating syntax options for creating meaningful linkages between individual video files. The building of experimental models proposes a range of interactive designs useful to the occasional user of motion picture files on the one hand and the advanced user who has already established a ‘system of connectedness’ on the other. This relational approach to working with motion pictures moves away from the pre-determined sequential tradition with which we are culturally familiar through the institutionalised forms of cinema and television discussed earlier.

3.2 Strategy

The approach to research will be practice-based, as an artist/designer of art systems exploring the precept of taxonomy based on visual mnemonics in motion picture files (digital video). Practice-based research recognises complementary but distinct criteria for evaluation of outcomes during the process, drawing impetus from aspects of action research methods.

> The methodology has been developed in order to facilitate the co-evolution of research studies and creative practice. The aim of the research is to acquire information that guides change in the existing situation and also to increase our understanding of creative practice and requirements of future digital technologies. The aim of the practice on the other hand is to create new forms of art and technology systems for exhibition in galleries and public places as ends in themselves.
> (Candy and Hori, 2003) 52.

The work of Donald Schön, Donald Norman and others informs these methods and it is Schön's discussion of repertoire in the context of practice-based research that will be core to the methodology applied (Schön, 1983). The principles of method, the methodology applied in this research, have been used to underlie, justify and inform the practice that has been completed to investigate and ventilate the problem as outlined in Chapter 1 and pursued in the previous Chapter 2. The approach adopted as method is directly related to the general framework of the methodology, the principles forming a repertoire, or toolbox of methods applied in the course of the investigation. (Checkland, 2000).

The motion picture phenomena, as tool, as semantic system, can be understood as emerging from several distinct areas of knowledge including systems theory, semiotics, cognitive science, film and video studies. Within and between these disciplines can also be found the methods and the elements of Schön's idea of repertoire, important to this approach.

The survey of the literature in the previous Chapter establishes a repertoire based on those areas of knowledge useful for exploring the work of researchers engaged in the three areas central to this investigation. Researchers who are: developing the technical means to manipulate motion picture files; who are conducting formal experimentation into alternative syntactical structures for creating connectedness between groupings of video files, (referred to here as 'a collection'); and who are experimenting with the gestural means for interacting with video collections stored within a computer system.

The experimental models developed during the course of research comprise the primary data gathered, the evidence gathered during the iterative development of the models being secondary data. The gathering of this data is described in Chapter 5. Additional secondary data is gathered during the development of four Models developed for evaluation purposes using a modified user testing approach, and are described in Chapter 6. The results discussed in Chapter 7 form the basis for further specifications of systems for interacting with movies, outlining proposals for implimentation and for further research directions.

3.2.1 Objectives

The objectives of this research are to:

- develop with a series of interactive models, taxonomies based on visual mnemonics for the creative storage and retrieval of digital video;
- demonstrate for the individual participant, methods by which this can be achieved as an encounter that:
    - enables agency over the motion picture (as a time-based medium) through interactivity, as a cognitive component of the encounter;
    - extends and enriches the motion picture experience.

3.2.2 Approach

The approach is informed by the investigations of Donald Schön (1930 – 1997) into the impact of technology within the creative professions of the 1970s (Schön, 1983). Through the 're-framing' of structural problems affecting these professionals, he along with others, (Wiener, 1961, McLuhan and Fiore, 1967), identified key points within the social formations actually and potentially frustrating beneficial outcomes for general and specialist users of technology.

Evidence will be gathered through the observation of experimentation as an investigative tool, followed by reflection on its significance as data, within an iterative process of investigation (Fig 3.1).

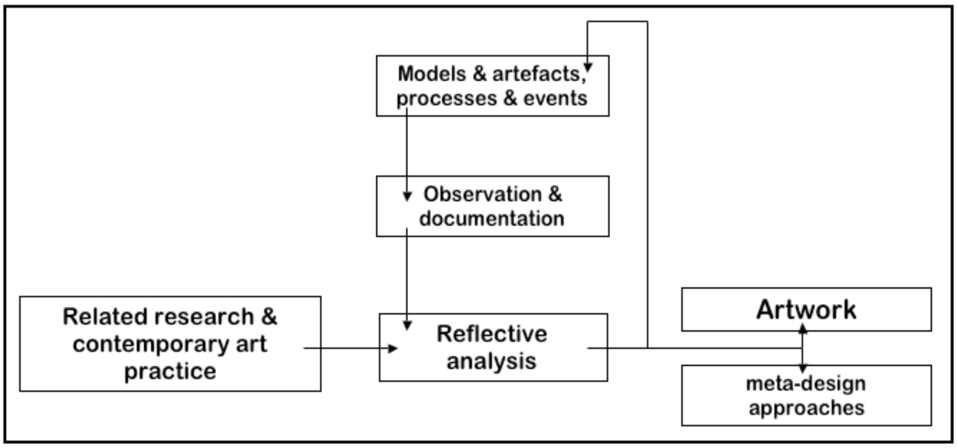

Fig. 3.1 summary of approach to iterative process of investigation

Primary data will be created with a series of models and artefacts, designed to explore a taxonomy based on visual mnemonics for storage and retrieval of motion picture files in general and in this research, digital video in particular. This evidence gathering will comprise the construction of an Application Program Interface (API) and the preparation of video files ('a collection') for each model. **Secondary data**, will be gathered from this practice-based approach, in several inter-related modes and formats:

- a record of the definitions, specifications and development of the software tool employed in the exploration and iterative process of building the experimental models, recorded with template notebook;
- assessment and evaluation of experimental models, through reflective analysis, of anticipated and actual outcomes, as a series of written reports;
- formal evaluation of participants interaction with test models derived from the experiments, followed by;
- further reflection and specifications for interactive motion pictures systems, interactive artwork and meta-design approaches to authoring, based on the accumulated data and conclusions.

Contemporary communities who specialise in, or use motion picture files on a regular basis, are the 'professionals' who could be added to Schön's list as a distinct group for the purposes of this research. The focus is on the specialist activity of this group, but the implications go far wider as, increasingly each day, the manipulation of video files by computer-enabled technology becomes necessary and commonplace.

The role of the 'professional' practitioner formed a specific study area for Schön including the work of the teacher, the designer and the architect. It is this work that forms the theoretical and practical basis of the still developing field of practice-based research:

> When we go about the spontaneous, intuitive performance of the actions of everyday life, we show ourselves to be knowledgeable in a special kind of way. …. Our knowing is ordinarily tacit, implicit in our patterns of action and in our feel for the stuff with which we are dealing. It seems right to say that our knowing is in our action (Schön, 1983) 49.

Many of his ideas show tantalising convergence with the experimental work conducted in the field of cognitive science, which will form another reference point in the approach being taken. Contemporary technology has enabled us to adopt an increasing number of (often mobile) devices to be able to aid and extend human cognition and reduce our cognitive load. Whilst augmenting human memory with machine memory is primary among these, it is novel approaches to the integration of technology with cognitive processes that remains the goal of this research. This includes extending and enriching the motion picture experience as a means of knowledge creation, and as an interactive encounter designed as a series of creative acts.

3.3 Practice-base

Practice-based research derives from action-orientated methodologies, which of themselves fall short of the current objectives.

> Research into human processes certainly influences the way those aspects of thinking and behaviour take place. Action research methods have been long developed in order to take account of this and to take the positive line of influencing practice in a positive way. However, whilst action research is good at encouraging reflection on practice, it is less clear that it can stimulate creative thought (Candy and Hori, 2003).

Creative thought, as part of the 'end-user' interactive experience, is echoed in no small way during the process of designing interactive systems. To begin, it hinges on cognitive behaviour.

The cognitive scientist Donald Norman describes two modes of cognitive behaviour: the experiential and the reflective. The experiential mode leads to a state in which we perceive and react to the events around us, efficiently and effortlessly. The reflective mode is that of comparison and contrast, of thought and decision making (Norman, 1993),16.

The reactive and the decisive are the product of the moment. Fortunately Norman avoids complete reliance on the convenience of such dualisms, qualifying the statement later by conceding that *"..it is dangerous to divide something as complex as human cognition into only two categories."* By further qualifying his two terms, he draws from cognitive psychology the distinction between 'controlled' and 'automatic' processes (p 256) that enables us *'to highlight and compare differing aspects of mental behaviour.'* These processes in the context of technology often fail in *'..providing reflective tools for experiential situations or experiential tools for reflective situations.'*

Jenny Preece qualifies the cognitive distinction further in the full context of interaction design by describing the experiential as:

> …reaching a certain level of expertise and engagement. … In contrast, reflective cognition is what leads to new ideas and creativity. Examples include designing, learning, and writing a book. (Preece et al., 2002) 74.

It is this overlap between the philosopher's, the cognitive scientist's and the interactive designer's description of the knowledge creation process that guides the gathering of data and its evaluation in this research.

3.3.1 Iterative Design

Both Norman and Schön elevate the reflective qualities of research. Norman applies reflection to produce an outcome that delivers supportive technology better suited to the needs of people rather than its designers. Schön uses reflection during the activity of research itself. He describes the process of investigating problems through creative research as an iterative cycle. In the investigation of mnemonics when applied to interaction with the motion picture, a diagram based on his ideas summarises the iterative process applied (Fig 3.2).

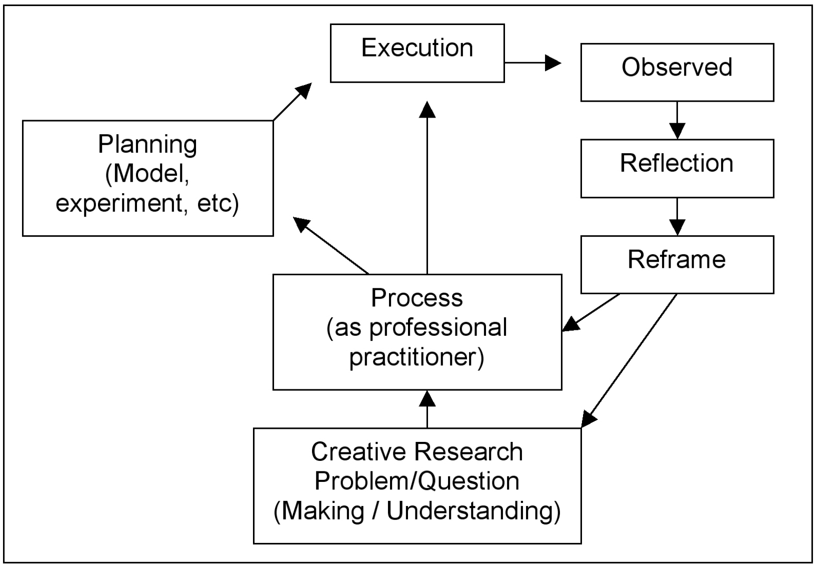

Fig. 3.2: Iterative Design Process, bottom up emergence (after Schön)

Schön's research is applied in the professional pursuit of solutions to problems encountered in architecture, sociology, engineering, town planning and, conceivably, interaction design, (though this is not one of his 'case studies').

Schön describes these research areas and others as situations of uncertainty, instability, uniqueness and value conflict. Many practitioners approach them with *'..an epistemology of practice implicit in the artistic, intuitive processes…'* , the knowing within their action. He uses the term 'phenomena' for the specialist knowledge each practitioner possesses, often ineffable and not accurately or completely described. It leads to *'..the idea that a kind of knowing is inherent in intelligent action.'* (p 50)

The state of knowing he corrals with the term repertoire (p138). The word is indicative of Schön's intent more than the closely related term repertory, associated with the artistry of the theatre, the musician and the dancer, (practitioners who tackle problems of a different kind). Constructing a list or index is the approach he critiques as Technical Rationality, an overarching term applying to Positivist traditions of research in the institutions, most notably the universities (p 32). Practice thereby is founded on problem solving served by well-tried and tested theory, aiming for clear and definable solutions. Schön's approach acknowledges the uncertainty of a situation, emphasising problem setting, the context and the means available to the practitioner; the aim is to produce outcomes that are tractable, possibly provisional. Ultimately the approach, we shall see, addresses the issues head on.

The figure of repertoire re-visits the Gestalt psychologists' categories of thinking as being either 'productive' or 'reproductive', the former with the use of insight, the latter using previous experience and tacit knowledge. Using a repertoire of knowing, as one would a toolbox, the practitioner retrieves the tool which through past experience, was found to be the most effective for loosening an impediment to the mind or the worktop: *'Seeing this situation as that one, one may also do in this situation as in that one.* (p139). The situation to be addressed is affected by the application of the (personal) knowledge retrieved, possibly even matched from the repertoire of examples and themes. The process advances the hypothesis further along the vector selected for the line of inquiry: *They make and test new models of the situation … to function as transforming moves and exploratory probes*. (Schön, 1983),166

Whilst exploration is a fundamental of empirical inquiry, creating conditions for transformation to occur, for emergent properties to be revealed, requires the addition of elements to the situation for the purposes of regeneration. Logic, even rationality may not be a part of this decision making, but in the doing and the recording of the doing and its outcomes, useful constructs and frameworks can become a part of the project:

> 'An overarching theory does not give a rule that can be applied to predict or control a particular event, but it supplies a language from which to construct particular descriptions and themes from which to develop particular interpretations.' (Schön, 1983), 273.

3.3.2 Reflective Research

In the context of this research, reflective practice as an iterative process commences with the identification of the problem or question, (as part of making something, an artefact), or understanding an issue or concern. It is followed by the application of the practitioner's 'professional' (tacit) process:

> Stimulated by surprise they turn thought back on action and on the knowing which is implicit in action [asking] for example, 'What features do I notice when I recognise this thing? What are the criteria by which I make this judgement? What procedures am I enacting when I perform this skill? How am I framing the problem that I am trying to solve? ….. It is this entire process of reflection-in-action which is central to the 'art' by which

practitioners sometimes deal well with situations of uncertainty, instability, uniqueness, and value conflict. (Schön, 1983), 50.

Such situations can use a planning process, based on theoretical approaches, where execution of the model or experiment produces an outcome (Fig.3.2). Or can move straight into the execution, (of the model or experiment), based on little more than a tacit 'gut feeling'. Either way, variance or the unexpected observation, is the core of reflective practice, where the repertoire of past experience, (either personal or gathered), forms the basis of determining, or hypothesising, the next course of action. By reframing the process of investigation, the problem/question itself is re-addressed as the iterative cycle re-commences (p268 - 271). This is augmented with the option to split off emergences that fall outside the objectives, for later or separate investigation (Fig 3.3).

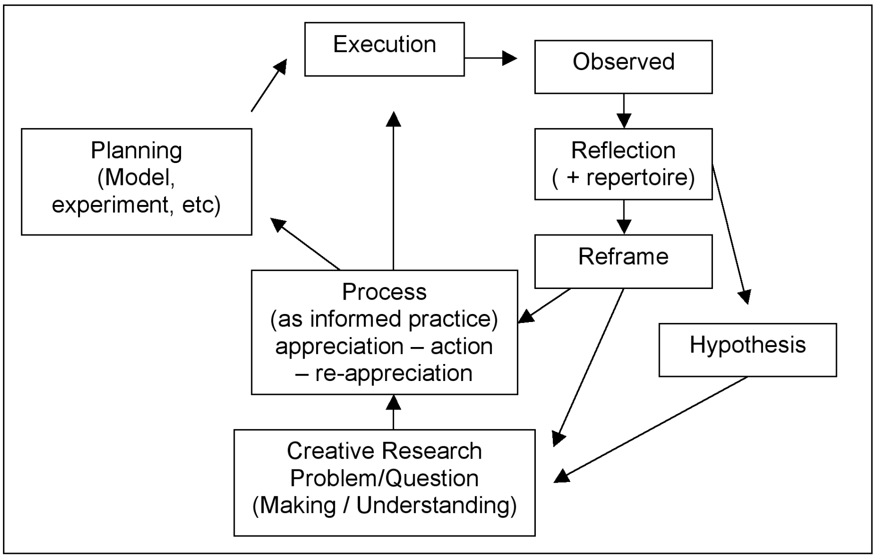

Fig. 3.3: Iterative Design Process (after Schön) augmented.

Schön lists four types of Reflective research *'which can be undertaken outside the immediate context of practice in order to enhance the practitioner's capacity for reflection-in-action'*:

1. Frame analysis;
2. Repertoire building research;
3. Research on fundamental methods of enquiry and overarching theories;
4. Research on the process of reflection-in-action.

Schön's concept of framing enables the practitioner to rationalise "strategies of attention" involved in demonstrating the concept. This meshes well with Preece's approach to evaluation *"…to determine the best metaphor for a conceptual design…."* (Preece et al, 2002) 348.

Metaphors are most often useful where the model being proposed can be recognised in relation to the framing effect given by a metaphor. The common HCI metaphor of 'a book' suggests layers of information, randomly accessible. It leads to the appearance of an office, or desktop, providing hotspots to access the files associated with the (ideally) logical operations and procedures of such places.

The 'strategy of attention' being investigated in my research has no readily available metaphor, so becomes a process of revising assumed values from related areas of research. Some areas have constancy with my experience (screen media and semiotics), other areas requiring background reading, (cognition, memory and systems), within an overarching theory of interaction design.

In a related field, the cognitive musicologist Otto Laske, like Schön, focuses on emergence and outcomes:

> We have transformed ourselves into a partner of communication between two species of knowledge, one that is alive in us, and another that embodies us in the form of an external knowledge-base (Laske, 1992).

The external knowledge base in this approach will be invested in the generation of Primary and Secondary Data from experimental Models and notations inflected by a framework of repertoire, now described.

3.4 Reflection as Practice

> …..the medium of reflection-in-action…. Media cannot really be separated in their influence from language and repertoire. Together they make up the 'stuff' of inquiry, in terms which practitioners' move, experiment and explore. Skills in the manipulation of media, languages and repertoires are essential to the practitioner's reflective conversation with the situation, just as skill in the manipulation of spoken language is essential to ordinary conversation (Schön, 1983), 271.

The framework around which reflection will occur can be described with the overlapping topics in a Venn diagram.

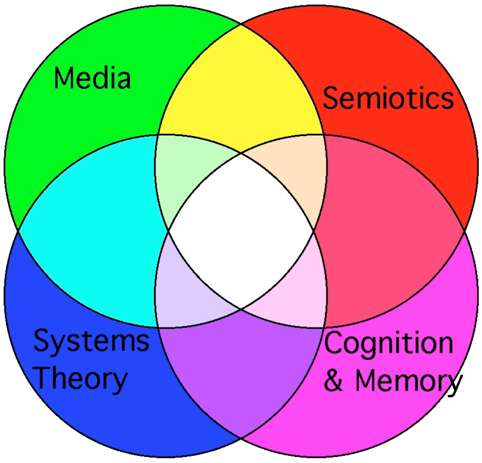

Fig. 3.4: Venn diagram – Media, Systems Theory, Semiotics, Cognition and memory.

The media to which Schön refers are not restricted to the metaphysical media of theory and criticism, proposition and argument, and a repertoire of based on the disciplines of semiotics, systems, cognition and memory. In the context of this research, overviews of the key elements useful to experimentation are outlined, as a means of articulating the foundations of the practical issues encountered. Whilst it is acknowledged each item in the repertoire is the subject of deep and continuing discussion, the media of motion pictures as <u>material</u> in analogue (film and video) or digital form are the substantial principles applied here, through which the repertoire will be referenced.

3.4.1 Systems

As experimentation with models proceeds, anticipation of emerging behaviours and states of uncertainty and instability is responded to positively. Opportunities for speculation and hypothesis leads to developing themes as scaffolding for further experimentation.

> Constancy of appreciative system is an essential condition for reflection-in-action … because of the constancy of the appreciative system, an inquirer engaged in on the spot experiment can tell when [the task] is finished, [bounded] by the appreciation of the changes wrought (Schön, 1983) 271-2.

Constancy of appreciative system is contingent upon the framework of the professional repertoire. Such a holistic approach is observed in other areas of research such as knowledge attuned to social and public policy, derived from Critical Systems Theory (CST) (Cooper, 2003). Addressing the 'hard' positivist quantative approach with a 'soft' systems constructionist approach such as Checkland's work on Soft Systems Methodology (SSM), the notion of repertoire is also described:

> And if the methodological principles are well thought out and clearly expressed, then a repertoire of regularly used methods which are found to work will emerge over time as experience is gained [1] (Checkland, 2000).

At the heart of General Systems Theory (GST) is the relationship between entities, denoting a connected or regular whole. *A system is not something presented to the observer, it is something to be recognized by him. Most often the word does not refer to existing things in the real world but rather to a way of organizing our thoughts about the real world.* (Skyttner, 2001) 52.

The development of this theoretical approach - lying outside the scope of this brief review - has been applied across a vast range of domains. In the Venn diagram above (Figure 3.4) the interlocking disciplines inform the present research topic and represents systems of knowledge overlapping with systems of practice. In moving away from the traditional reductionist approach taken in the natural sciences to methodology, a holistic approach incorporating context and its affect on a proposed activity, (interactivity), tends towards the considerations Schön has described in his definitions of professional and reflective practice.

This approach, whilst aware of component entities in a system, prefers to construct knowledge of the world through practice and outcomes, rather than 'simply' revealing knowledge. Max Wertheimer describes this distinction succinctly and in a way that urges research forward:

> Gestalt theory has to do with concrete research; it is not only an outcome but a device: not only a theory about results but a means toward further discoveries.(Wertheimer, 1924 (1938))

In refusing a reductionist approach to complexity he goes on to define the fundamental 'formula':

> There are wholes, the behaviour of which is not determined by that of their individual elements, but where the part-processes are themselves determined by the intrinsic nature of the whole. (Wertheimer 1924 (1938)

To illustrate the nature of such wholes he discusses von Ehrenfel's proposition concerning the transposition of six tones – a melody – with another six tones. The melody remains recognisable because:

> '…we are asked to assume not only elements but 'relations-between-elements' as additional components of the total complex.' (Wertheimer 1924 (1938)

With research grounded in this way, issues of gestalt (shape and form) emerge as a consequence of related 'material presences' within the system. These issues become useful when approaching motion picture technology, as a means of separating out elements determined by the specific technology of the cinema. The figure of the Maltese Cross can be used analogously in this context (Fig 3.5).

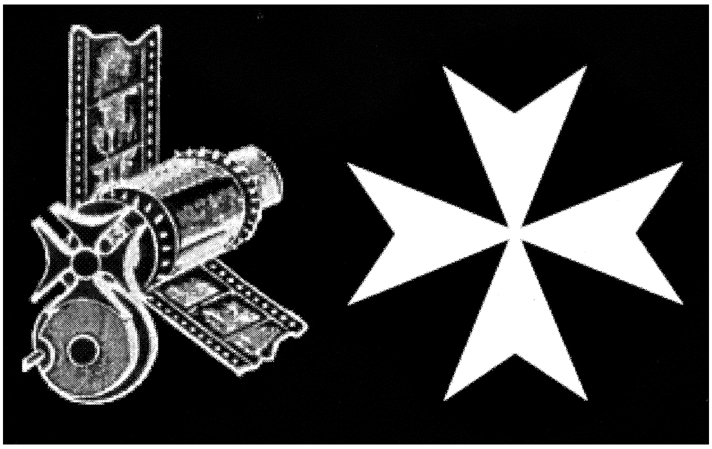

Fig. 3.5: the Maltese Cross, intermittent mechanism.

The Maltese Cross was an elegant mechanical solution to creating an intermittent mechanism for halting each frame of a film strip with sufficient duration for projection to the screen, before rapidly advancing the film strip to the next frame, repeatedly 16 (or 24) times a second[2]. Analogously, the hardware engineering of the projection technology meshing with the software program encoded in the film strip, enforced sequentiality, thus reproducing the fixed order of frame, of scene, of sequence. The mechanical elegance of the device defines the system, (as noted by Mulvey 2006, 27), as one creating relations-between-elements, a system of representation reliant for meaning on strict sequential ordering.

In the current technological circumstance when the motion picture experience is mediated as digital data within the digital domain, the reproduction of the motion picture image is no longer fixed but definable: as hardware system, as software system or both. Representation and making meaning is no longer reliant on strict sequential ordering but from the experience of interaction with the system. Based on the relations-between-elements, as in a computer software program, 'calling' each of the elements, even as individual frames in a video (movie) file, create conditions where shape and form become open to the emergence of meaning. The material presence of the viewer, (or user, or participant), seeking shape to what is encountered and interactively responding to the conditions of the system to create outcomes, thus becomes a variable within the system.

Soufi and Edmonds describe computational models supporting shapes emergent from primitives through two processes: *an interpretative, perceptual, process concerned with arriving at (alternative) entity descriptions of a pattern*, and, *a transformational process that uses the existing pattern as a prompt for generating new structures in a variety of ways* (Soufi and Edmonds, 1996)

Though the patterns referred to are concerned with computer support tools for two-dimensional designers, in a time-based (4D) context the transformational process will be shown to apply, where pattern is detectable as relations-between-durations. These need not be random elements but could have entirely regular proportions, such as encountered for instance in the Fibonacci series. Though a mathematical progression, it is in the natural physical world of biology and botany in particular, the affect of one genus on a neighbour can result in emergent properties constituting novel or unexpected outcomes (Maturana, 1993). It is the boundaries between entities and presences that, in taking a constructive rather than reductive approach, begin to assist in describing what has been built, which Critical Systems Theory specifically addresses. This can have great benefit for proposing further creative stages, through the adaptation of the methodologies used to conceptualise situations – such as the fixity of syntax inherited from motion picture media - or aid in the practice of designing alternative motion picture phenomena or indeed, making art works.

The questions addressed in this research with motion picture media takes paradigm approaches as an initial step to conceptualise possible avenues for further exploration using experimental models described later in Chapter 5, New Studies.

3.4.2 Cognition

Memory tools like text-based indexes, link words with things, stories and ideas. Can we shortcut this *'detour through signs'* (Derrida 1973) and use an object, 'the image on film' of the object, the story or the idea itself to refresh memory, or retrieve information related to that memory? Could the ordering or indexing function of mnemonitechnics be enhanced and extended through the linking of movies, in non-linear forms employing digital tools? Is this approach to acquiring information or refreshing knowledge by 'cutting out the middleman' - the text-based sign - applicable to all fields and domains?

Shneiderman reminds us that visual communications and visualisation methods are accelerating (Shneiderman, 1998) 510, and domains applicable or adaptable to this research have been described in the previous chapters. More specifically, are movies useful as aids to memory?

Tacit experience suggests they are used for this mnemonic purpose in different ways, principally for most people through documentation of family life and history with the snapshot camera and the handycam. We *'…reconstruct past experience, usually for present purposes.'* (Clark, 1997) This is a phenomenon of our cognitive selves and is also shaped by our culture.

Cognitive behaviour as a series of interlinked processes includes the facility of memory. The design of an interactive system therefore has to take account of the other key processes in this interdependency: perception and recognition; attention giving; listening; learning; problem solving through planning, reasoning and decision-making (Preece et al., 2002) 75.

The broad concept for the experimental models proposed is to stimulate memory and subsequent interactivity. Cognitive scientists such as Baddeley describe, (in the previous chapter 2.2.4), the complex functionings of memory, its elements and interdependencies. Clark, Hutchins and others, have argued that just as basic forms of real-world success turn on the interplay between neural, bodily and environmental factors, so advanced cognition turns – in crucial respects – upon the complex interplay between individual reason, artifact and culture. The external environment, actively structured by us, becomes a source of cognition enhancing 'wideware'. External items (devices, media, notations) that scaffold and complement (but typically do not replicate), biological modes of computation and processing, create extended cognitive systems. (Clark, 1997, Clark, 1998). Hutchins for example, gives a wonderful and detailed account of the way biological brains, combine with tools (such as sextants and alidades), and media (such as maps and charts) to make possible the act of ship navigation (Hutchins, 1995).

Lansdale, Scrivener and Woodcock have shown that *"useful theories of spatial memory can be developed of general utility in the design of pictorial databases"* but that *"…the specificity of task domain and visual material is more likely to dictate issues of design than is any generic theory of visual cognition."* (Lansdale, 1992)[3] Though setting out to be a storage system for movies and narratives rather than just pictures, the direction indicated by Lansdale, Scrivener and Woodcock's research into designing a system is in the same area as more recent thoughts by Clark about *"…the challenge of tractable search and recall given an extremely large database."* (Clark, 2002). Though an interactive system may ameliorate the apparent size of a digital media database, at some point the 'visitor' to such a system will need tools to enable a meaningful encounter.

In addressing the problems associated with other 'unknowable' database resources like the web, Clark describes Kleinberg's procedure, *"..which exploits information implicit in the links between pages so as to identify patterns of connectivity indicative of 'authoritative sources.'"* Recent work on this approach to *"…information-about-information (or second-order information) implicit in the link structures…"* may be of value in creating *"…a useful, low dimensional reflection of the high dimensional knowledge-space."* (Clark, 2002) A taxonomy based on making visible connections between locations of knowledge or evidence, provides the visitor to the system with some shapes, some vectors to move within at the outset. It also provides assurances to the participant of their presence as 'a central part' of the system.

The term embodiment has ventilated many of these concerns about presence. Dourish giving central place to Merleau-Ponty: *"…a sense of 'phenomenological presence', the way that a variety of interactive phenomena arise from a direct and engaged participation in the world [which] includes both physically realized and socially situated phenomena…"* Meaning and meaningfulness *"…is to be* *found in the way in which it reveals itself to us as being available for our actions. It is only through those actions, and the possibility for actions that the world affords us, that we can come to find the world, in both its physical and social manifestations, meaningful."* (Dourish, 2001) (Author's emphasis)

Revisiting these debates and the potential of responsiveness to the digital document through interaction with the motion picture, requires re-evaluation of the materiality of representation, some reconsideration of language, language forms and visual literacy.

3.4.3 Semiotics

Signs go back to an earlier data space. Ulmer describes (Ulmer, 2002) how Plato, at the cusp of the wider adoption of the technology of literacy, was concerned to protect the oral tradition of the School of Athens, developing an argument that questioned the real value of the new media of the time; reading and writing. In an oral culture, the presence of the creator of the work is important, for presence allows the pursuit of verification, disputation and debate.

In the *Phaedrus*, Plato used the new media, writing, to preserve the old technology, oratory and ars memoria, by reproducing the dialogues of Socrates in a hybrid form, 'the book', a hermeneutic space where an interrogation of the text by the reader could occur (Plato 1956). As with any new device, performing tests and trials, comparing the efficacy of its use with the familiarity and pervasiveness of the old methods was a part of a gradual adoption and continuing adaptation of literacy during the transition from the old to the new.

The new method of literacy however, remained suspect, as an interpretive space opened between sender and receiver of the text, thus diminishing the authority of the speaker. Less through the polemicists physical absence, more because of the sharing of the text with others, (fellow readers), who were inhabiting the shared data space (Ulmer, 2002). Literacy, then as now, is as much about remote networking as about coding.

As an 'early adopter' of the technology, in the *Phaedras* Plato lumps painting and the new technology of writing together, querying them with the observation: '*..but if you question them, they maintain a solemn silence.'* (Plato, 1956) 69.

The semiotician Saussure (1857-1913), argued that signs only make sense as part of a formal, generalized and abstract system, of which the recent discipline of linguistics was the best example and to which semiotics is often linked (Saussure, 1931 (1974). Saussure's conception of meaning was not therefore referential but structural and relational: primacy is given to relationships between things, signs in systematic relation to each other. The work of Saussure (the dyadic sign) and Peirce (the triadic sign), analyse processes by which objects as encoded entities (*representamen*) produce meaning following decoding (*an interpretant*) (Chandler, 2002, Peirce, 1934)

In the 1960s, Louis Hjelmslev suggested both expression and content have substance and form as four categories: substance of expression, form of expression, substance of content, form of content (Hjelmslev, 1961). Roland Barthes continued to define the elements of linguistic systems, (in the English language), using two terms useful in the present context. Syntagmatic and paradigmatic refer to the semantic function, the former explicit in its effect, the latter implicit. The paradigmatic sign operates at a less functional level, encouraging the perceiver to extemporise and associate with the power of imagination and creative association. Barthes describes; *"The plane of the signifiers constitutes the plane of expression and that of the signified, the plane of content."* (Barthes, 1973).

Aspects of semiotic theory and its methods are useful in the analysis of foundation artworks for this research, described in the next chapter. Peter Wollen in writing specifically about meaning in film, used the categories iconic, symbolic and indexical (Wollen, 1997 (1972)), useful for reflecting upon meaning construction within the interactive encounter, as it is explored through new studies described in Chapter 5.

Umberto Eco's assertion regarding the act of reading as a reconstructive activity, involving searches of reading material based on the relationships between the materials (Eco, 1976) characterises the activity of making meaning. Research scientists at Pala Alto - some twenty years later - in the 1990s, described semiotics as being useful for providing a basis for searching multimedia from an authoring perspective. They mirror Eco's point that synthesis is central to the act of writing, wherein the author is engaged in *'the hypothesising of relationships between the points' of the writer's attention*. They conclude that *'..a repository of video source material be indexed with respect to one or more abstractions of that content.'* (Smoliar et al., 1997) [4]

What is denoted and connoted from an encounter between objects and subject can begin to inform the human information-processing model, suggested by Preece (Preece et al., 2002) 96. In the wholly focussed environment of a task-orientated workplace, such models can aid in analysing a sequence of rational interactive processes:

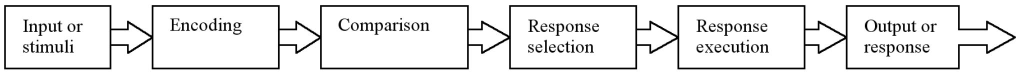

Fig. 3.6: Human information processing model (after Preece)

Needless to say this processing model would have been rejected by Gibson for the same reasons that Norman has observed (Norman, 1990) 5. Analysis in the laboratory falls short of delivering useful data where the context of the interactivity could be at variance with the objectives of the local system. Observing these processes in context, or 'in the wild' as suggested by Hutchins is more likely to produce useful outcomes (Hutchins, 1995), (echoed by Clark, 2.2.3), where the design encourages creative interaction with the system and its collection of files.

In the context of the data space of cyberculture, of telepresence (or even Ascott's *telenoia* or mind-at-large (Ascott, 2003) 259, does the computer-mediated artwork, (an installation in a gallery space), imply further opportunities for the expansion of dialogue between the artist/designer, the visitor and the artificial intelligence that lies potentially within the machine? Or is the form of the experiential contemporary hybrid artefact, multivalent? Where can it be found, who makes it and how it is experienced?

Within a creative iterative process, informed by evaluation of outcomes, it will be necessary to bear in mind what Jean-Jacques Nattiez, a musical semiologist proposed, that:

> a symbolic form...is not some 'intermediary' in a process of 'communication' that transmits the meaning intended by the author to the audience; it is instead the result of a complex process of creation (the *poietic* process) that has to do with the form as well as the content of the work; it is also the point of departure for a complex process of reception (the *esthesic* process that reconstructs a 'message') (Nattiez, 1990) 17.

Interaction that enables the subject to participate in the making of a work as experience, once only and always different, will involve the participant in the recognition and the subsequent operation of a system of surface structure, or syntax.

3.4.4 Media

'Syntax: Orderly or systematic arrangement of parts or elements, a connected order or system of things' (OED)

Contemporary media is characterised by traditions of connectedness specific to function – information and entertainment primarily – and the technological antecedents that give lead to the evolutionary process we term tradition. The system of things is a framework providing connection (or relationality) between things such as words, to stimulate or attract the (inter)active subject to engage or respond. Surface structure can also include the constructional uses of a word or words characteristic of a particular author, thus defining syntax as emerging from individual approaches to authoring an artefact. The context and circumstances of the connections being made between things is in order to be able to comprehend or intuit, the significance of the relations between them (Chomsky, 1965).

The motion picture traditions of connectedness – montage – are rooted in the Early Cinema experiments conducted in the first twenty-five years of the 20th Century. In Kuleshov's famous demonstration[5] the significance of the image of a well-known actor's face on the cinema screen affects the viewer of the image by the images that precede and follow it. In each instance, the emotions apparently visible are affected by the shot combinations, to produce intuitively in the viewer's mind significance based on the relations between them:

A + 1 = A(1);

A + 2 = A(2); etc

(where A is the same image of the actor looking into the camera lens in close-up viz, at the audience; 1, 2, etc, different images of sentimental or disturbing scenes)

Kuleshov's experiment demonstrates how we intuitively seek facial expression to be able to interpret meaning, using context to arrive at a conclusion[6]. In cinema this is achieved by groups of separate shots seamlessly linked. Classic cinema syntax has become adept at achieving emotional response by using such methods. It relies heavily on the immersive space of the cinematic experience and tacit knowledge of human relations.

Turning away from the deeply embedded cultural forms of Cinema, the connectedness being investigated commences from the fundamental operation within the cybernetic system that is the modern computer (discussed in 2.2.1), linking together files containing, specifically, motion picture data. By contrast, in linking together all manner of file types – graphic, text, image, sound – we construct a form called 'hypermedia'. The most developed and specialised of these linking procedures are software applications for the business and scientific worlds, producing outcomes such as economic forecasting, statistical analysis, molecular modelling etc. and general information needs such as news and current affairs (currently in the process of migrating from print and broadcast to become online services).

In the education domain, modestly funded and voluntary research included *Dynalinking*, a pedagogic research project that linked visual representations of natural systems, like pond-life, to diagrams of the food web, enabling interaction with images of frogs, snails and weed to alter plots on the abstract representation of the ecological process (Rogers and Scaife, 1998). These are examples of what Weinbren describes as a *'subjunctive relationship to the screen'* (Weinbren, 1995). The state of indeterminacy within the structure reinforces the knowledge that agency has its responsibilities as well as its consequences. Interaction design for motion pictures in this research recognises the essentially heuristic approach that will motivate interactivity with collections of movies.

The linking together of motion picture files – hypervideo - utilises the ability of computer systems to link together digital video files in many different possible ways:

- across domains / ontologies, (interdisciplinary),
- across networks (place) and
- across time.

Temporality is specific to the motion picture time-based encounter. The viewer of a moving image can experience either present time (passing) or 'the past'. The most immediate event, as captured by the camera, rapidly becomes the experience of observing a tool sitting in the past, conveying the present, that become images of the past. The captured images as retrievable documents and the plethora of motion picture images we currently gather, is the focus of the experimental and test models that are evaluated towards the end of this endeavour.

3.5 Evaluation

The evaluation stage of the research clarifies the outcomes of new studies described in Chapter 5. Interaction with the experimental models, separated from the rationales emergent from their iterative states, aids the researcher in identifying and defining subsequent stages or models for further investigation. This enables observations made during practical stages of model development to be ‘sidelined’ for later attention (see Fig. 3.2).

> “When a practitioner displays artistry, intuitive knowing is always richer in information than any description of it. Further, the internal strategy of representation, embodied in the practitioner's feel for artistic performance, is frequently incongruent with the strategies used to construct external description of it. Because of this incongruity, for example, people who do things well often give what appears to be good descriptions of their procedures which others cannot follow.” (Schön, 1983), 276.

Evaluation of an artwork or experimental model by the visitor to a test installation, will be cogniscent of Schön’s point four, taking *“..account of the interweaving of cognitive, affective and group dynamic effects.”* Preece defines evaluation as *“the process of systematically collecting data that informs us about what it is like for a particular user or group of users to use a product for a particular task in a certain type of environment.”* (p.317) The quixotic relationship between users and the system designer in understanding the conceptual model is summarised with the diagram:

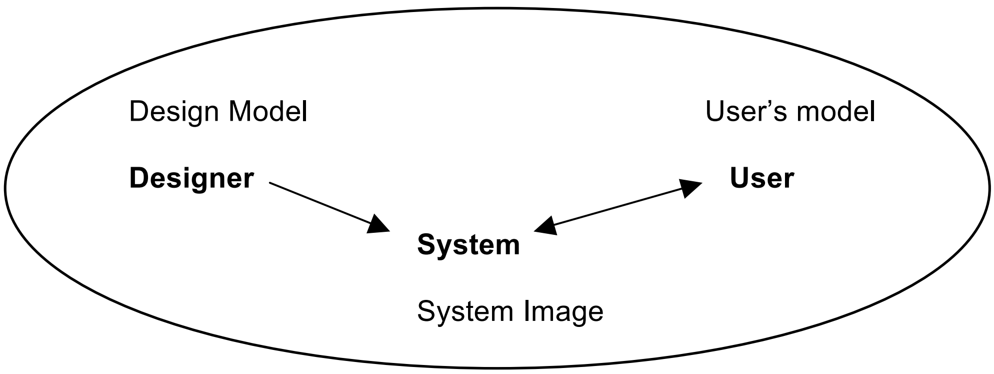

Fig. 3.7. : System image as concept

This approach proposes the researcher defines, as in a 'task-solving product', what is to be achieved by participation in the interaction design as a 'problem-setting' experience. It becomes possible using several evaluative approaches to assess not only the data gathered during interaction by the user-participants with the designer's model, but also the quality of the overall experiences represented by their reflections on the system.

As Candy has pointed out: *"In participatory research, there is explicit recognition of the inter-related roles of the personnel involved.."* where *"the research and design activities operate as an iterative cycle of investigation, analysis, results and feedback into design and development."* (Candy, 1995)

Putting visitors through task hoops is the least attractive option in evaluating interaction design that sets out to appeal to creative participation, with shades of authoritarian and manipulative engineering. The purpose remains to stimulate the mind with each of the Models within a framework that provokes or enables a critical and intelligent response [7].

The Mnemovie Test Models are evaluated using a combination of paradigms and techniques, under studio laboratory conditions, conducted as comparative experimental studies to gather assessable data. The user studies draw on a combination of the three paradigms: usability testing; field studies; predicative evaluation (Preece et al., 2002) 340.

Preece recommends the use of the DECIDE framework as a checklist for the approach:

- Determine goals;
- Explore questions to be asked;
- Choose evaluation paradigm and techniques to be used;
- Identify practical issues
- Decide about ethical issues;
- Evaluate, interpret and present data. (p.348)

The evaluation process therefore has several goals for producing data objects useful to the continuing formative development of the design concepts. Gathering qualitative and quantitative data from participants interacting with the Models at the outset provides data objects for analysis and the construction of hypotheses for verification at a later stage.

For the purposes of evaluating the precept of hyperlinked ‘mnemonic movies’, a modified User Studies approach employs evaluation paradigms adapted from accepted techniques (methods) appropriately. These include usability testing in a controlled environment and observation of user activity in the controlled environment followed by questionnaires and interviews. (Preece et al., 2002) 340.

The evaluation approach for experimental Models involves a combination of paradigms and techniques, initially in the studio.

Data objects	Paradigm
Modelling users tasks	comparative evaluation
User opinion - interview	predictive evaluation
Observational studies	in the field
Questionnaires	usability studies

Fig. 3.8: table of data objects and evaluation paradigms employed.

The evaluation plan has eight objectives (detailed later in section 6.3.1) arising from these goals addressing seven specific questions, (detailed in 6.2.2.) using a range of nine documents in the Evaluation Procedures (section 6.4). (A Pilot Study (6.3.3) proceeds the Participant Testing sessions).

Recruitment of participants is addressed at active users of motion picture files in the computing environment. A near equal gender balance is achieved across three kinds of participant profile (6.2.3), determined initially at recruitment, then in detail at the outset of the testing session using a questionnaire and point-awarding method of assessment. These distinguish between participants who have an occasional, non-expert encounter with motion pictures through to those with varying levels of expertise, from making simple movies through to working with complex multimedia systems.

The principles of the Mnemovie system are explained to each participant before a Practice Model is encountered, prior to moving onto the Test Models (sections 6.4.7 – 6.4.12). The sequences encountered by the participants – of each Model, and of the movie collections within each Model – are according to a pre-determined pattern not selected by participant or researcher (6.2.6). Observations are recorded in Log Sheets (6.4.16) together with video and audio recordings of testing and interview stages for later analysis.

Data collected in two questionnaires are recorded into a database for analysis. The second and final questionnaire collecting qualitative data, a matrix box being analysed quantatively and upon which tables and graphs are based. At this stage quantative data collected during observation is used to verify propositions advanced from initial conclusions drawn. As Preece has observed*: 'Most observational data is qualitative and analysis often involves interpreting what users were doing or saying by looking for patterns in the data.' (Preece et al., 2002) 379.* It will be seen that as the analysis developed (6.6.1) and as initial sets of findings emerged, the links observed between qualitative and quantative data raised doubts about the User Profile approach employed. A framework emerges based on the quantative data that leads to the development of 'persona' profiles. The profiles express different *styles of interaction* as revealed by the quantative results and analysis of responses gathered from the second questionnaire and the subsequent interview.

3.6 Summary

Norman's description of cognitive behaviour as based on the experiential and the reflective, and Schöen's reflective practice in action, serve well the development of a series of Models to advance through practice, the investigation of a fresh approach to the motion picture experience, responsive to the interaction of the movie viewer. Though there are certain limitations to the application of Schön's principles within the field of making artefacts – the repertoire is potentially unlimited – the framing and iterative principles apply well.

In adapting aspects of the task in hand to the methodology, this research will produce transferable knowledge emergent from:

- the stages of iterative investigation and the 'fallout' of boundary conditions, for later investigation;
- the evaluation of the experiences of participants interacting with several test Models;
- the specification of tools for the further development of experimental hypervideo systems as artworks.

In the next chapter the principles described above are the framework for critically examining Foundation works. These are related to current research and drawn from personal projects and artworks, some pursued collaboratively, during the previous thirty years.

3.7 Notes

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[1] Much work in the field of systems has focussed on the structure of organizations, in particular, industrial and commercial corporations. Soft Systems Methodology (SSM) has been employed as a 'bottom-up' approach within mainly social, administrative and managerial situations. In the same way as Schön and Norman emphasised developing means to respond to the unstable, the complex and the conflicted, Checkland in outlining the SSM approach, also emphasises knowledge creation as a learning process: "We had developed the idea of building models of concepts of purposeful activity … the best way to proceed would be to make an initial handful of models and — conscious of them as embodying only pure ideas of purposeful activity rather than being descriptions of parts of the real world — to use them as a source of questions to ask of the real situation. SSM was thus inevitably emerging as an organized learning system." CHECKLAND, P. (2000) Soft Systems Methodology: a Thirty Year Retrospective. *Systems Research and Behavioural Science,* 17**,** S11-S58.. Models in the SSM world are concepts, intellectual devices Checkland affirms, usually expressed through soft-edged diagrams, pure ideas of purposeful activity that contribute to a learning system asking questions of the situation. Another more recent development of GST is Chaos Theory, likewise applicable across fields, including the literary. Mackay (1999) investigates as system, the complex story of Leopold Bloom, the major character in James Joyce's novel Ulysses concluding: "The following four ideas apply as much to our lives as to the life of Bloom: (1) A trivial decision can wholly change a life. (2) A chance encounter can dramatically alter life's course. (3) A contingent nexus exists between consciousness and environment. (4) A way of thinking—what we might call a model or paradigm—helps us interpret life's chaos."MACKAY, P. (1999) Chaos Theory and James Joyce's Everyman. Gainsville, Fl, University of Florida Press.

[2] The shaft mounted into the rotating drive, bottom left, enters an arm of the Cross, instantly moving its spindle through 90˚ as its returns along the arm. The spindle links to a sprocket wheel engaged with the perforations cut into the acetate of the emulsion support. As the spindle rotates through 90˚, the wheel instantly advances the film by four sprockets, equal to one frame of 35mm wide film. The rotation is mechanically synchronised with a shutter, interrupting the light passing through the film just at the moment the film frame advances, for approximately one fortieth of a second. The shutter is then open for the period the shaft on the drive is rotating toward the next slot on the Maltese Cross. (The Maltese Cross also figures as a perceptual psychology example of ambiguous figure-ground when the (equal) spaces between the arms are hatched in opposite directions.)

3 The prototype of Pathscape is a specific model using the familiar figure of a landscape into which we walk and from which we can return as a paradigm with which to address this conclusion (discussed in more detail in the Foundation chapter). Like many of the aspects of contemporary interface design, the various

devices and indexing systems could become options at application launch, easily switched on or off by the user, helping the user to define for themselves, the interface with which they feel most comfortable and productive – more in the final chapter.

4 Though beginning in the promising area of semiotics, a science with a social and cultural foundation, the report falls short of exploring these rich areas of the use of signs and our visual culture, instead summarising the various machine-based approaches to the abstraction of content and the problems of *'…being able to formulate useful queries in terms of those features'* that only machines can generate.

5 In about 1918 in revolutionary Russia, Lev Kuleshov edited a short film in which shots of the face of Ivan Mozzhukhin (a Tsarist matinee idol) are alternated with various other shots (a plate of soup, a girl, a child's coffin). The film was shown to an audience who believed that the expression on Mozzhukhin's face was different each time he appeared, depending on whether he was `looking at' the plate of soup, the girl, or the child's coffin, showing an expression of hunger, desire or grief respectively. Actually the footage of Mozzhukhin was identical, and rather expressionless, every time it appeared. Vsevolod Pudovkin (who later claimed to have been the co-creator of the experiment) described in 1929 how the audience "raved about the acting.... the heavy pensiveness of his mood over the forgotten soup, were touched and moved by the deep sorrow with which he looked on the dead woman, and admired the light, happy smile with which he surveyed the girl at play. But we knew that in all three cases the face was exactly the same." PUDOVKIN, V. (1974) Naturshchik vmesto aktera. *Sobranie Sochinenii.* Moscow.

6 One of reasons why these experiments first occurred in Russia could be the linguistic structure of the Russian language. Without the existence of the definite article, 'the', meaning is guided by context. This experiment from Early Soviet cinema occurred at a time when the Bolshevik state needed to ideologically and materially link together the vast provinces of Russia. Cinema was employed as the new media with which this would be achieved by taking the projectors and the cameras on specially designed trains, out to the scattered populations to both record and disseminate the revolutionary message TSIVIAN, Y. (1994) *Early Cinema in Russia and its Cultural Reception,* London, NYC, Routledge..

7 A critical aspect of the proposed design approach is orientation within the information space, or navigation within the interactive cinematic space of the installations proposed. Visitor orientation within an installation is still as critical as when it was observed in 1993: *"Effective navigation through a hyper-system requires a sound navigational system closely tied to its underlying structure and content … What can I do here? Where can I go? How do I go there? What else is there for me to see?"* (McKerlie, D. et al 1993)

4 Foundation Work

4.1 Introduction

Foundations are evidence of past activity but determining the status of previous work in the current context can be quixotic - foundations can be both deep and related to current research, or of marginal relevance. This section will describe aspects of work drawn from 40 years of professional practice, illuminate the personal attitudes emergent from that social engagement and provide background to the impetus for this research. It is in three sections as an overview of practice:

- experimental artwork, stimulated by the phenomena of 'motion picture culture';
- film and video production in the analogue domain, a practice that both 'needed' and anticipated the digital;
- visual and motion picture arts in the digital domain, as a development, aesthetically and socially, from contemporary art practice.

This foundation represents a contribution to the development within the arts community of interdisciplinary media art practice, working with photography, film, video and digital media. Projects have followed formal and informal practice-based research methods and have encompassed outcomes as an artist, teacher, writer and curator. In the following sections I will describe some of these projects as a means of providing a context for the current research and the approaches it has taken.

I have amplified selected outcomes from these foundations that directly contribute to the reflective nature of the current research. In particular, pathways of thought and reflexivity in the mind of the viewer of film or video artworks in relation to non text-based forms of hypermedia linking.

The methodology described in the previous chapter, in particular Schön's descriptions of repertoire, will be employed in this chapter for providing structure to descriptions of earlier (for the most part informal) research activity, leading as it does to the accounts described in the following Chapter 5, New Studies.

The opening section will provide some background to the formative years, in an era when opportunities presented for graduates such as myself, to work in the film and television industries. The dissemination of information and entertainment which we crafted in these institutions and corporations, used a motion picture audio-visual language and syntax established in the cinema during an earlier part of the 20th Century. In the latter part of the century the electronic image was making its initial appearance, offering the counter-culture and 'alternative' approaches to making and presenting film and video to audiences, becoming a passionate pursuit for me throughout the 1970s. Selected analogue media projects from that period are analysed here, thereby in part illustrating the practice, theory and discourse around the issues of representation in motion picture media. Against the backdrop of late-Modernism, breaking away from accepted traditions of representation then, remains germane to the foundation of current research now.

The digital era as a set of creative possibilities for me began in the early 1980s, becoming more tangible in the latter part of the decade (and is covered later in section 4.4.1). Through experiments with early hypertext tools, encounters with exhibitions of electronic art, the research and curation of interactive art and the development of interactive multimedia prototypes, the ground was laid through the 1990s for creativeness in the field of interactive art. These activities have helped identify my current research direction.

4.2 Background

Film-making at the Regent Street Polytechnic and after my graduation, with the Rolls-Royce Aero Engines Film Unit, was based upon aesthetic and semiological approaches established by the earliest film pioneers: point the camera in the direction of where the action is and record what happens; then order the film in the editing stage to recreate the salient aspects of the action.

In my final year at "The Poly"[1] I elected to follow and graduate in cinematography and film. The idea of 'an aesthetic' was acknowledged but rarely discussed, as the comprehension and appreciation of film and television followed on 'naturally' from film language established in the 1930s. Hollywood and the narrative 'feature' film dominated the aesthetic even in non-fictional documentaries, being based on film-makers agreeing what 'flowed' within the narrative structure. This approach was also used as the basis of 'non-fiction' film-making. Documentary film aesthetics thereby developed, in my experience, to become rule-based and formulaic:

- point the camera in the direction to where the action is;
- change the camera-angle as the planned or unplanned action unfolds;
- edit the separate shots together, as a series of sequences;
- thereby fictionalise a space in the viewer's mind – the diegesis - around which meanings are produced.

I spent several years working in film and television production, servicing the delivery of information and entertainment to mass audiences using these approaches. The process was based on the fictions of illusionary forms and the suspension of disbelief within the individual viewer. The process was also one-way, from film-maker to audience, with no mechanisms for feedback during the experience and few opportunities for comment afterwards.

To that time - still largely true to the present day - the motion picture syntactical aesthetic was encountered in all genres: melodramas, spectaculars and comedies; the documentary film, its diversification into genres of news, current affairs, dramatised doco, re-constructed doco, mocumentary etc. The basic form, the aesthetic essence and its experience remained as a series of sequences, which authoritatively resisted intervention or participation by the audience.

4.2.1 Generations

The physiological / psychological illusion central to the film experience, (inaccurately but popularly described as the persistence of vision, or as Gombrich describes, *'the sluggishness of our perception'* (Gombrich, 1964)), relies on the repetitive replacement of an image on a frame of film by the film projector, at a rate which creates the appearance of continuous motion (Anderson, 1993). The illusion created centering on repetition within the machinery, and iteration of the film material, was recognized from a very early stage of the development of the cinematic spectacle and constitutes a central characteristic of the apparatus as a whole. The Edison kinetoscope appeared at the end of the 19th century, using loops of film material, which could repeat endlessly a simple scene played out under the control of each viewer. This simple interactive device was complemented by the projected film image in the tents of showman, who barked out the actors' lines and contended with the responses of the audience in the contested space of the early cinema experience.

But within a twenty-year period, what has become known as classic cinema narrative was aesthetically established, consolidating the illusionary basis of motion pictures and its attractions, preventing disruption within the narrative space by either the operations of the apparatus (Gunning, 1991) or the interventions of the audience.

Film-makers and artists in the 1920s and 30s, from Vertov[2] to Man Ray, from Richter to Ruttman returned to use the duplicated, repeated image for expressionist affect or decoration. These experiments employing temporal and iterative strategies set out to expand the material space of the cinematic experience.

Henry Clauser in his 1988 description of *'a dynamic, generative computer art'*, [3] (Clauser, 1988) also describes film-makers like Eggling, Fischinger and the Whitney brothers whose experiments with abstract form influenced and informed film-makers in England, Europe and the USA during the late 1960s and early 1970s (Le Grice, 1977, Curtis, 1970). Their work encouraged the development of discourse around representation and the techno-aesthetic apparatus of cinema as social and cultural phenomena (Gidal, 1976, 1989, Rees, 1999). At the London Film-makers Co-op (LFMC), a core of the films made from 1968 onwards, employed different iterative procedures. With the LFMC laboratory facilities under the control of the artists, film became a plastic art instead of an industrial tradition.

Many of the artists associated with the LFMC began working with film simply by having access to a film projector and some film. Most had developed skills in other art practice, often through tertiary study, painting, sculpture, photography and music most notably. An emerging practice, performance art ('happenings') very often involved multi-projection devices. Cinema became re-definable - the projection screen became any flat surface and the projected film became the play of light, its presence and absence. Such approachs extended the possibilities of intervention and became known as 'expanded cinema'. Invention included iterative methods using loops of film, often running through several projectors simultaneously, building-up moving collages or sculptural installations, thus placing the 'found footage' into a context for which it was not designed.

The ‘structural/materialist’ film-maker set out to make available to the audience the means, its form and materials, together with whatever else was visible and audible as a part of the filmic phenomena during a film screening. In an encounter with ‘film as phenomena’, as film ‘abstracted’, there existed an opening up of the spaces between its component parts. This was in contradistinction to the conventions of Cinema, intent on concealing the many joins that hold the illusion in place. The structural/materialist approach presupposed the audience engagement as moving far wider, exposing the conditional, revealing in the mind of the viewer an awareness of process in the production of experience and in the function of its reception.

These approaches challenged the impasse, on both the aesthetic and political fronts, by initially re-framing attention and reflexivity away from the entrenched principles of verisimilitude and Euclidian-based spatial representation, toward the abstract and the atemporal.

Frame analysis as one of Schön’s four principles of reflective research (see 3.3.2), applies to the practice pursued during this period of creative experimentalism with film and other motion picture media, setting out *‘..to change the situation, the values which will shape practice.”* (Schön, 1983) 309. The approaches described by Schön as part of his four principles - repertoire building, methods of enquiry and overarching theories, processes of reflection-in-action – played a part in the development of my work, a mix of formal and informal research in both the analogue and digital domains. This was also the case for many artists active internationally through the period into the 1980s.

4.3 Media Arts Practice - Analogue

Beginning in the late 1960s, artists and other experimentalists working with film, video, photography, performance and sound, covered a range of interdisciplinary practice. It necessarily involved collaborative relationships between artists, technicians and scientists using various channels and networks of communication.[4]

On a formal level the artefacts we made consistently questioned linear structure as an organising principle. We sought strategies, models and programs by which the viewer of television, the audience for cinema, the visitor to an exhibition could participate, be made more responsible for the making of meaning within the process of representation.

The core medium of my work as an artist during this time was 16mm film, effecting and controlling every part of the production process[5]. (Appendix 8.7 : Videotape and Filmography 1965-1986). Practice-based research was applied consistently to these endeavours, characterised (in hindsight), by the application of strategies supporting defined areas of focus:

- the camera as a tool of observation;
- procedures for editing and printing;
- iterative and generative procedures;
- performance and interaction practice;
- expanded and didactic performance.

This 'work on representation' redefined the tension between the figurative and the abstract, commencing during the early 19th Century in the landscape work of painters like Turner and Constable. Continuation of the Modernist project into the late 20th Century was to include the materials and the apparatus of film-making.

The process was characterised through varying levels of collaborative and cooperative working, by a practice based on conceptual foundations, developed through skilled and controlled experimentation, with perception and reflection informing each stage in the process. Cyclical movement forward, sometimes over extended time periods of several years, produced outcomes in film and video presentational formats, distributed and disseminated by a variety of means.

The documentation of this informal practice-based research was often recorded but rarely in publishable form. The explorations I conducted working with early non-broadcast video technology, both as a teacher and artist, were documented in a Poster form in 1973 and are rare examples of reflective recording from the period (Leggett, 2005d). Such a pedagogic development of critical practice and theory, and a general spirit of enquiry led me into tertiary teaching throughout the 1970s and into the 1980s, by which time 'media art' became an established and recognised phenomena within the art, museology and education industries.

Arising initially from expanded cinema aesthetics employing film loops in 16mm film projectors, the acquisition by the LFMC of a 16mm Debrie-Matipo ('the Debrie') step-printer advanced practice into areas normally reserved by commercial and industrial laboratories. The 'Debrie' was used in the film industry solely for the duplication of projection prints, but was also ideal for looping film. Instead of projecting light through acetate film in a projector onto a screen, the light in the Debrie affected unexposed film stock held in contact with an image-bearing loop. Exposure for colour balance and density initially was through trial-and-error as iteratively, experience produced a practice which became reliable and repeatable.

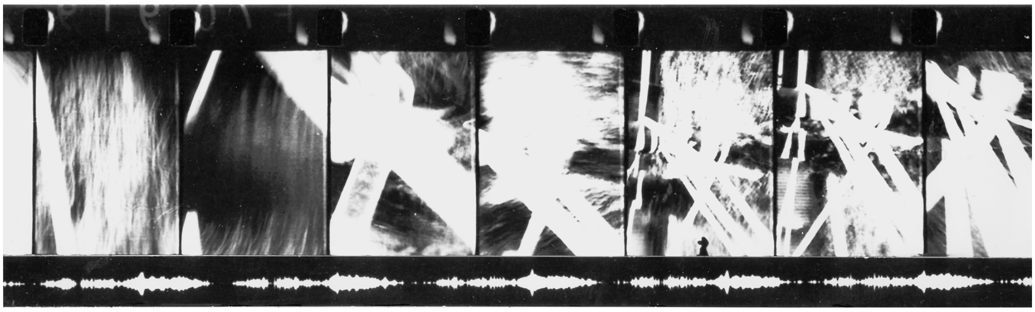


Fig. 4.1: Image strip from 16mm film *Shepherd's Bush*
(sound track at bottom of image)

Shepherd's Bush employed an eight-second looped black and white image of rapid pixilated[6] movement across grass and through trees, rendered from white transparency to dark opaqueness, over a 12-minute duration (Fig 4.1). The soundtrack was made from a longer sound image of a sine wave looped and processed electronically on an EMS VCS-3 synthesiser,[7] later transferred onto the film at the final print stage. The precept was to be further developed in a series of experimental films made between 1970 and 1976 under the collective title of *Sheepman & the Sheared*, (Leggett, 1970-76).

4.3.1 Discontinuity - *Sheepman & the Sheared*

The series *Sheepman & the Sheared*, was a practice-based project for exploring a range of approaches to redefining what constituted *'the cinematic experience and the problems associated with the cinema tradition at both social, political and aesthetic levels of practice'* [8]. It is a film in seven parts for continuous single screen projection with an approximate running time of 2 hours 15 minutes [9]. Two of the seven sections of the film are considered here in greater detail as bearing on current research: *Red+Green+Blue* and *Window*.

4.3.2 Generative Film – *Red + Green + Blue*

Red+Green+Blue, as part of *Sheepman & the Sheared*, extensively employed iterative sequences in the image and mask channels of the 'the Debrie' printer, a development from the use of the looped image in *Shepherd's Bush* (Leggett, 1971).

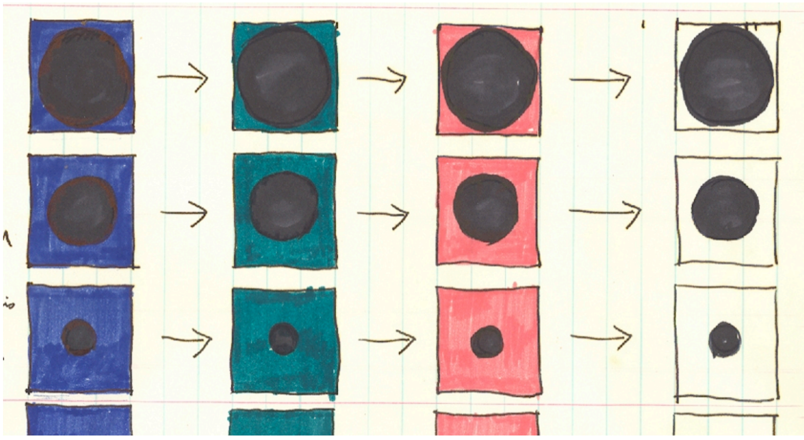


Fig. 4.2: *Red+Green+Blue* schematic.

Colour 'generated' from the sky, the grass and berries, a system of graphic loops synthesises in the printer, not only changing hues of complementary colours but white light itself. (Leggett, 1970-76)

Sketches on paper for *Red+Green+Blue* began in 1972 continuing on paper and acetate until the completion of the film in 1976. The concept for the film, fully within the exploratory scope of the project series, set out to articulate the physical and chemical properties in the motion picture colour reversal process [10]. This was to be achieved poetically and visually using images shot in the landscape, with a strategy planned for realisation on the 'the Debrie' printer.

The details of this project have been recorded elsewhere, (Leggett, 2007, Leggett, 2005a, Leggett, 2005b, Leggett, 2005c). It is useful to extract two reflections from the record: the planned signification of colour and shape, and the emergence of elements, behaviours that could not be entirely predicted. (Appendix 8.8: Red+Green+Blue summary)

The strategies went some way toward a creative procedure seeking to devolve if not abdicate a part of the image-making process, picture and sound, to circumstances or conditions determined by the system. *Sheepman & the Sheared* like other work at the time, by experimenting with recursive strategies revealed the emergence of behaviours that exceed the component parts of the process.

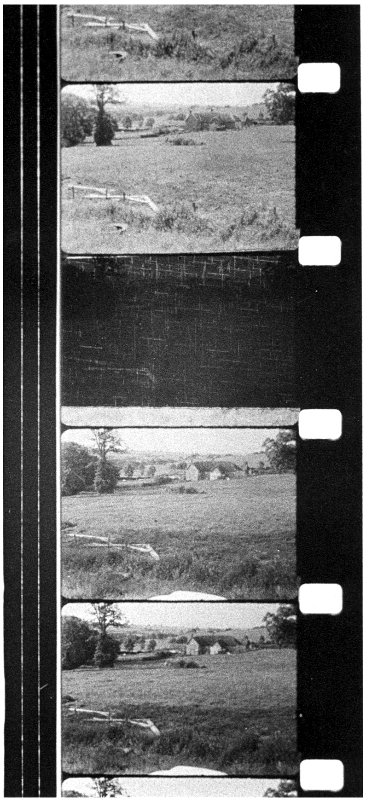
Gestalt theory was useful at this point for understanding the phenomena of motion picture film operating in this context: by de-emphasising emergence of meaning derived from sequential structure and emphasising the material relationships inherent in the design of the filmic experience, procedure and the paradigmatic eclipsed narrative as an ordering principle.

Although Gestalt theories of colour perception and dynamic figure-ground relationships were not pursued further at the time, (Albers, 1972, Chevreul, 1980), in the current research other aspects of Gestalt have been useful in describing emergent properties of proximity, similarity and continuity and will be addressed in the following chapter.

Generative art in the context of interactive systems questions the role of authorship and concepts of autonomy (Ward and Cox, 1999). The autonomy afforded the filmmaker as the designer of a system needs to be regarded in relation to the variables as observed during the iterative stages of the project. A public screening of a film made using generative methods proposes a level of autonomy for the audience. This condition is necessary for the participant physically interacting, through paradigmatic process, with a computer-based system.

4.3.3 Temporal Film - *Window*

Retrospectively applying semiotic analysis (see 3.4.3) to the film *Window* will assist in the second of Schön's reflective criteria (Schön, 1983). Repertoire building research will amplify the potential for developing the idea of an interlocking series of significations, enabling us to extend meaning beyond the appearance of landscape as a static entity locked into a fixed semantic relation. Motion picture images analysed in this way will assist in understanding the precept of the relational image rather than one sequestered by sequential order.



The initial analysis, (after Wollen et al 1969), is of the representation of temporal space in the 45 minute film, which records 52 filmed episodes of the landscape observed from the same position, across the period of a year. The view is from a first floor window, across a meadow to some houses with countryside off to the far horizon. The camera pans and zooms to details of the scene each week of the period, for an approximate one-minute duration. The physical join between one week's film material and the following week is marked with a series of blanked frames. (Appendix 8.9: Window Notes)

Fig. 4.3: *Window* (1974)

Detail from filmstrip at the 'cut' point, the join between two of the 52 sections. One of the blanked frames is visible; the soundtrack is on the left.

Within the structure (or system) of the film are a series of temporal markers (as image), classifiable as types of signifiers conveying meaning to the viewer. As the table below (Fig. 4.4) shows, the meanings available to the viewer are not restricted to photographic images of the scene recorded by the camera and its operator from the window, (the pro-filmic). The systems operating 'behind' the camera (the filmic) are also part of the system with which the viewer is engaged.

Sign No.	Temporal Marker	Type / Signifier	Signifies (description)	Signified (contemporary)
	Pro-filmic			
1	Landscape: - physical - organic	Iconic	Weather Plants	Four seasons
2	Landscape – human activity 1	Iconic / indexical	Planting Harvesting	Agriculture
3a	Landscape – human activity 2	Iconic / indexical	Playing Walking	Recreation

3b	Landscape – human activity 3	Iconic / indexical	Appearance	Historical: Clothing period Aging
	Filmic			
4	Camera	Indexical / symbolic	Framing of scene with pan and zoom	Control / making of image, presence of 'author' / film-maker
5	Editing	Indexical (Symbolic)	Weekly session start/finish	Projection duration
6	16mm colour	Indexical	Grain, scratches to emulsion, acetate base	Historical: Extinct media material
	Film Artefact			
7	'Window', made in 1973.	Icon, as corpus / concept	The view from a window, in NW Europe, looking south.	One year in 45 mins

Fig. 4.4: '*Window*' – temporal markers and signifiers.

Within the structure of the film can be found seven signs of temporality. A classification of these can be proposed:

- Historical – 3b; 6 & 7
- Filmic – 4 & 5
- Pro-filmic [11]– 1, 2, 3a.

These classifications will be returned to in the following chapter 5.2.7.

The film series *Sheepman & the Sheared*, (Leggett, 1970-76) was described later by Stoneman:

> The 'space' between the elements of the film can be said to produce a 'relational perspective' – shifting concern from the material or conceptual elements themselves to the relations between them. Individual elements cannot be considered in isolation from the network of relations in which

> they are held, and the way they are articulated together in specific instances. (Stoneman, 1979/80)

Stoneman theorises this in terms of spectator activity, characterised by consciousness of mental function being applied to the positioning of the subject within the flow of shifting relations:

> *Similarity / continuity : difference / discontinuity*
> (Stoneman, 1979/80).

This description of meaning construction can be found more recently in other disciplines. Similar configuration has been described occuring in embryology which:

> …has a set of visual preferences distinct from other forms of biology (Gilbert, 1996) and shares with film an aesthetic similarity. This aesthetic similarity comes, at least in part, from the formal principles (e.g.similarity and difference), that we use to identify patterns in nature and other systems of meaning (Harp, 2007).

In characterising the flux of the process of making meaning in this way, whilst being immersed in the filmic experience, (the cinematic phenomena), the contested ground of the 1970s in many ways anticipated the possibilities afforded by the arrival of the microprocessor and the integrated computer. We will return to further analysis and reflections with these two parts of *Sheepman & the Sheared* in the next chapter. But before that, further reflection will be applied to a performance-based work that anticipated further tenets of the digital media age: multiplicity of discourse, multi-media and interactivity.

4.3.4 Continuity - Image Con Text

During the early 1970s, I embraced the first generation of industrial video systems not only as an economical and convenient tool for rapidly visualising concepts and ideas, but also for its innate qualities and properties. Unlike film, video images can be characterised as potentially having a ‘real-time’ presence. The images as a signifying system based on the flow of electrons, with the camera recording what the observer sees on the screen at the same moment, foregrounds the immediacy of the framing functions of the device, whilst attentuating the significance of retrospective time. Similar to experiments with live performance – ‘happenings’ and performance art – when using a predetermined structure or system, the exigencies of spontaneous, chance and aleatoric detail is seen and heard throughout the duration of the performance. The audience for the performance is either present in 'real-time', or encounter the operation of the system at one remove, via the videotape recording played back through a monitor.[12] (For example, as described in Appendix 8.10: The Heart Cycle)

As Daniel Palmer has recently observed:

> "…video art is part of a broader shift from the representational tradition of visual art to one engaged in the more presentational modes of the 'theatrical', incorporating the sense of the here and now, of the viewer participating in the very space of the object, images and action."
> (Palmer, 2004)

Participation was at the core of *Image Con Text* (M. Leggett 1978), a research project that in early iterations as a lecture-performance utilised audio-visual material in a variety of formats: 16mm film, 8mm film, video, slide projection, audio via cassette player. Each of these elements, as program, as mediums, was about interaction of the analogue kind, between the artist and an audience gathered for a screening. It presented information, (or contextual material as it was then called), as a framing device to provide 'new' audiences with a way into the individual films and videos screened as artworks within the presentation. This was practice-based research, (as it is now called), being pursued with audiences as an evaluative component of the project, applying critical and analytical responses during the performance.

> 'This live presentation, outlines rather than reports, material factors which affect many film-makers working independently of commercial film-making, at this point in time, Spring 1978. … [To] examine these various activities and the relationship they have to the formulative process of arriving at a completed artefact, as a means of establishing points of similarity in methods of production, connections with other people and the way they are working at present, or the way they have worked in the past' (Leggett, 1978).

The presentation began by proposing a triangle diagram linking these concepts:

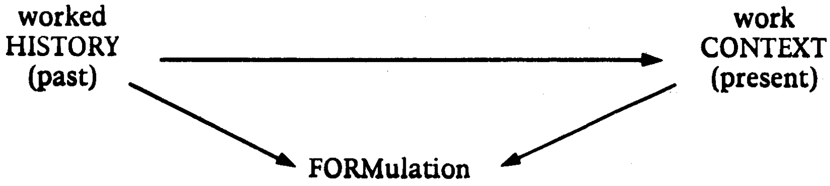


Fig. 4.5: diagram from *'Image Con Text'* (1978)

It reappeared as a titling or signposting device at the beginning of each section, seeking within the images and texts that followed, to provide a context for the range of activities and the resulting artefacts produced and the *"..conditions that have been involved in giving them the form they adopt".* Each main title was followed by several sub-titles as an aid to navigation by the audience through the related issues.

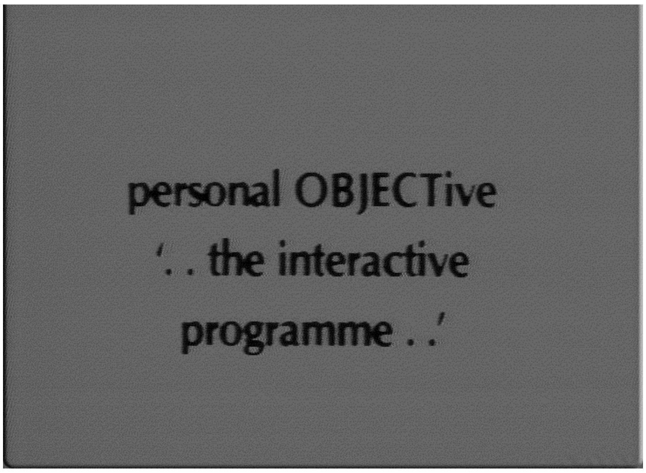


Fig. 4.6: Caption frame from *'Image Con Text : Two'* (1985) video

During presentation of *Image Con Text* the discourse advanced was open to extemporisation in response to the feedback from the live audience to its form and its content. Meaning was not given but developed (in the Socratic tradition), out of the needs and priorities of the audience engaging with the relations proposed. Between the means of presentation (signifier) and the issues and polemics (signified), much of the work of this period was informed by the theoretical formulations of semiotics and the work of the semioticians (discussed in 3.4.3).

Later, Stoneman in an article on film related practice and the avant-garde paraphrased Foucault in relation to the *Image Con Text* presentation:

> "A whole web of relations is woven between the text and context – they support and contradict one another, modify each other … The

> presentation is a site for the intersection of discourses which differ in origin, form, organisation and function. In their variety and totality they do not constitute an exemplary text or a composite work but rather a truncated description of a contestation, a confrontation indicating a series of power relations that take place in and through discourse.
> (Stoneman, 1979/80)

Later, *Image Con Text* was archived to videotape, the camera and recording apparatus 'becoming' a member of the audience. The work thereby shifted decidely to becoming a hermeneutic artefact, like a book, aiding debate but not debating with the maker of the work as had occurred in the live performances. The 'text' could not now be changed, because it became a source of represented knowledge rather than direct experience. The relationship to the artwork featured in each performance is now tangential, never causal. The relational link is echoed by the tenuous link between the elements within the performance (or video): the materials of sound and image, the technology of delivery, and the alignment of spoken or quoted sources within the overall order of the sections. (The overall project is described in Appendix 8.11: Image Con Text)

Artists' film and video migrated from cinemas and cinematheque to galleries and exhibition halls. *Film as Film* recreated a cinema within the Hayward Gallery (London, UK, 1979), hung images on walls, published a catalogue and produced an event celebrating the modern. In challenging the politics of connoisseurship and avoiding becoming part of a collector's holdings, the dynamic was outward, public and provocative. But constrained by the inexorable physicality of analogue mediums and a distribution model based on the commercial cinema industry.[13]

Television in Britain in the early eighties, through the impact of the arrival of Channel Four, offered some fresh opportunities, less through unsocial transmission times, more through an increased level of funding for production workshops of the organisational kind pioneered by the LFMC.[14]

One of the television projects secured for the Bristol Film Workshop, '*The Body on Three Floors'* (Leggett, 1985), was a commission for television with a budget of some £70,000 won following a formal competition between proposed projects and is worthy of mention on three counts related to issues of concern to this research:

- it set out to work openly with the audience through a series of public production and post-production meetings on the form and content of the televised work, and,
- worked extensively during the pre-production and production period with an inter-disciplinary team: an ethologist, a dancer, a clown, a playwright and an art historian;
- the form of the program was (like *Image Con Text* and the *Sheepman & the Sheared* series) as a series of blocks that could be rearranged according to context.

The latter was clearly not an option at the time of broadcast but in the context of a widening usage of video cassette recorders (VCR), a videotape copy of the broadcast enabled the program to become informally distributed in whatever way the owner of the tape determined.

Form and context, process and practice of this earlier work sought a dynamic means, both physically and polemically, by which systems of representation could be articulated across the stakeholders and participants. As the microprocessor and the personal computer began to arrive in the studios and workshops, so the work, its appearance and its administration began to change. But more fundamental was the implication for the physical relationship between the initiator of an artwork and its eventual recipient.

4.4 Media Arts Practice - Digital

Roy Ascott in the early 1990s described a culture developing in which its creators became part of a complex and widely distributed system. It involved both human and artificial cognition, and was *'an art that is emergent from a multiplicity of interactions in data space'* (Ascott, 2003).

The data space in which we move daily and with which we are most familiar is the media flow within which we have been raised. It is an accumulation of signifiers - what Derrida termed the absent present:

> Signs represent the present in its absence; they take the place of the present … when the present does not present itself, then we signify, we go through the detour of signs. (Derrida, 1973)

When these words were first published in English, (providing additional theoretical underpinning to the LFMC practice-based film art), the computer was an expensive device limited to ownership by rich corporations and specialist university departments. Computer networks were the domain of the military. Computer-based information technology was emerging but still distant for most people. Artists working with analogue information technology, film and video, were investigating how the tools in the factories of dissemination and entertainment, the institutions of cinema and television, could be redeployed. But also how the codes and languages, the signs and symbols needed to be reassessed and overhauled. It was the cusp of a move away from the analogue and linear modes of mediated social relations, towards the binary and relational, relying on network and distribution building for circulating ideas, whether these were expressed as text or other kinds of objects.

In reconsidering the work of the 1970s, the methods and approaches used by artists, we can interrogate whether relational changes were anticipated and fulfilled. Or whether the investigations, without an agreed program of work at the time - 'work on representation' would continue for ever - nonetheless encouraged a confidence amongst younger artists to embrace the *'multiplicity of interactions in data space'* as emerged more clearly through the 1990s.

4.4.1 Objects, Processes, Networks

Within a few months of acquiring a cheap personal computer in 1988 and learning how to use it, I was building a database for a government department. Another six months and I was made an Information Systems Manager and responsible for a public service Registry. Such was the speed of the new tools and their operators. In 1992 my experiments with early text-based hypertext tools and later that year, during attendance at the Third International Symposium of Electronic Art (TISEA) in Sydney, I encountered interactive multimedia; and the Internet entered the Australian art world consciousness.

The following year I began research on the potential for multimedia to be interactive with the art audience. At the College of Fine Art, University of New South Wales (COFA) Masters by Research program (Leggett, 2000a) the focus became concentrated on the uses to which artists were putting the interactive CD-ROM. Within 18 months, I had amassed data and a collection of works that were exhibited the following year in Sydney and four other Australian cities.

Burning the Interface <International Artists' CD-ROM>(Leggett and Michael, 1996) was, (like *The Video Show* in London in 1975), another pioneering survey show, a selected inventory that was both didactic and revelatory. The art arrived on 12 cm shiny discs or via telephone cables strung into the space and appeared on the face of modified office equipment – the computer. The discrete encounter with these early interactive multimedia works, while recreating the intimate space between book and reader, (and often mirroring the artist's working space when encountered by the visitor), was a restraining experience for many accustomed to the physical 'performance space' of the gallery and museum. In the words of one recalcitrant reviewer: *'Peering at a monitor is an impoverished aesthetic experience.'*[15]

As Natalie Daniel asked a little later:

> So where does multimedia art go from here? It poses problems for exhibitions in terms of both space and time. Unlike more traditional or conventional art forms, such as painting or sculpture, there is a precise limit, for instance, to how many people can 'view' the work at one time. A general gallery-going public may therefore find the nature of this type of exhibition limiting and frustrating. This raises the question of placing single-user works in a multi-user public space (Daniel, 1997).

The traditional role of the audience as an individual in solitary contemplation of the artwork would be questioned still further in exhibitions that followed. In *'Space Odysseys - sensation and immersion'* (Sydney, Australia, 2001), the premiere occurred of Luc Courchesne's *The Visitor – Living by Number* (Courchesne, 2000). It combined the nineteenth-century panopticon with the twentieth-century video camera and the twenty-first-century voice-controlled, computer-based image projector. Prototyping an immersion module in which the user/visitor, one at a time, navigated within a rural setting inhabited by spectre-like residents discovered in half-concealed bunkers.

Throughout the 1990s, the notion of audience as a participant or performer effecting the artwork and being affected as part of the experience, sometimes (like Couchesne's work), slight, nuanced, subtle, other times expansive and gestural, had become a feature of exhibition events organised during the ISEA bienniel events[16]. The artists attending these events were the individuals and small groups creating the conditions for 'things to happen' online, or offline in the studio or the gallery, for other groups and individuals to experience. Today they continue to make art and the many other things that a vibrant culture needs, the telematic culture identified by Roy Ascott 30 years previously (Ascott, 1990). They increasingly use not only words but also pictures and sounds to communicate and absorb. Fundamentally processes are non-linear, are greatly influenced by speed (of communications, and the actions and reactions that can then flow), and the texture, the feel of the images and sounds conveyed. This is a collective poetics, often made without accompanying commentary by critics or the rest of the art world, by the cohort of artists and practitioners engaged with the exigencies of digital media. It is the mileau through which the current research has proceeded [17].

4.4.2 PathScape

The conversations with colleagues that followed my curatorial research and exhibiting of *Burning the Interface*, the conclusions and lessons we drew from being able to survey so much interactive multimedia work to that point in time, led to a production project commenced in 1998 with the working title of *Strangers on the Land (SonTeL).* With a small research team and seed funding of $31,000 from the Australian Film Commission (AFI), this was the first prototype of an approach to what I now describe as visual or mnemonic indexing. The detail of this project are described in my thesis for the Master of Fine Art (MFA) at University of New South Wales (Leggett 2000a – copy on accompanying DVD-ROM, item 9).

> *Strangers on the Land* (SonTeL), examines Landscape as the mediated image, central to beliefs and identity within Australian culture both indigenous and non-indigenous. Through a dynamic and interactive process of presentation, intersections are made with interpretations and mediations about The Land, its many histories, its many appearances (Leggett, 2000a).

The prototype has an interface and navigation system giving access to 'narratives' through association with a specific place or location or series of locations. In the context of the AFI as a film-based organisation making prescient investments in the 'new media' area of the early 1990s, the project was described as exploring the notion of 'interactive documentary'.

Following completion of the prototype and the MFA, the project continued to develop and further funding in 2000 of $9,000 was achieved to produce a second prototype, *Pathscape*. The final section of this chapter will re-consider outcomes of that project as they impact upon the formulation and initial conduct of 'new studies', the contents of the following Chapter Five.

Each of the movies encountered in this interactive space employ, as part of the experiment, a range of genre approaches and / or narrative content, setting out to describe or make an association with, to tell a story about different sections of the Path. By linking movie files from a database with the image of a place during the authoring process, we were seeking to examine the layers of meanings that could emerge and co-exist within the present, future and past of place.[18]

Fig. 4.7: *Pathscape*, prototype interactive system (Leggett, 2000b)

The taxonomy of the database is represented with images of contiguous cinematic space. Individual photo images are pixilated to produce apparent motion – a movie - in a forward direction, perceived as a movement 'into' the space recorded of the bush track. The user controls this movement with gesture, using a mouse, to control the on-screen cursor.

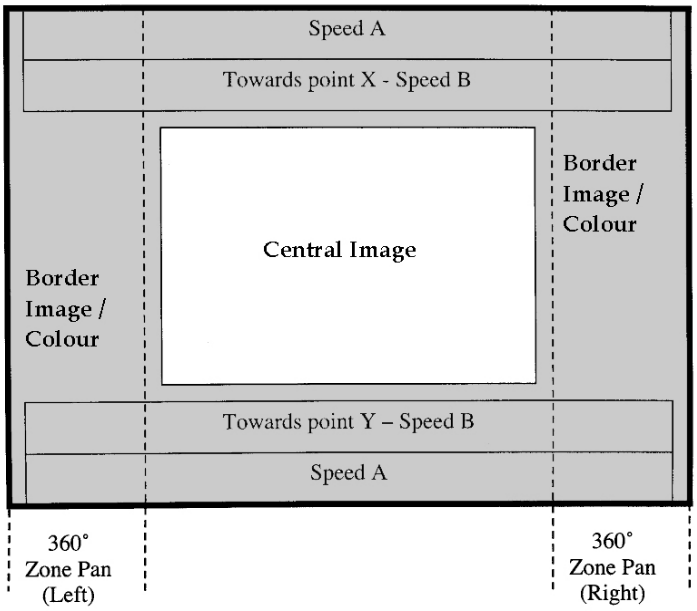


Fig. 4.8: Pathscape, screen Area Images and Cursor Gesture Outcomes

4.4.3 Interaction Design

A gesture with the cursor to the top of the screen (Figure 4.7 and 4.8) launches the movie of movement through the landscape, as in a cinema Point-of-View (POV) tracking or dolly shot. By gesturing with the mouse to return the cursor to the centre of the screen, the movie stops. By continuing the gesture to the bottom of the screen, the image on the screen will be replaced by the view in the landscape visible 180˚ from the initial view - in other words 'behind' the POV of the initial image. By gesturing to top and then to bottom, the view through 180˚ can be instantly changed. By continuing the gesture to the bottom of the screen, apparent movement into the landscape will recommence, re-tracing as it were, the earlier steps. By gesturing further to edges of the screen, top or bottom, the motion ‘into’ the represented space will speed up by a factor of two.

Thus in the prototype it becomes possible to traverse the full distance of 'the walk' through the Bush, (X – Y in Figure 4.9), commencing at the low-water mark on the beach and ending in the rainforest three kilometres away. This takes about 40 seconds at double speed (approximately 50kph 'real-time' Speed A in fig 4.8) and 80 seconds at the slower Speed B (25 kph). At any point the movement can be halted and a return made along 'the Path'.

The taxonomy of the Path is ordered with three indexical devices. Two are located in the border area that surrounds the central image. (Fig. 4.7) The **first** level of indexing is within this border and seen at particular points as fragments of images, visible for short durations. These indicate a nodal junction which, when 'captured' by using gesture to halt movement in the central image, will enable with a click, the launch of a movie and associated sound from a database, replacing the central image movie of movement along the bush path.

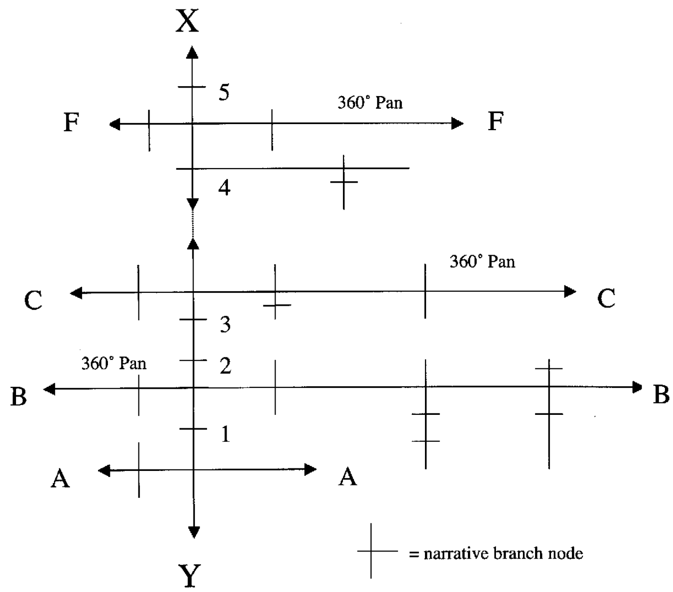


Fig. 4.9: *Pathscape*, schematic for accessing movie database

Thus along the X-Y axis (Fig. 4.9) are the 1, 2, 3, ... 4, 5 etc interactive options, or 'narrative branch nodes', groups of movie keyframes representing a *loci* or location linked to an associated movie file.

The **second** device uses changes in background colour in the border area and background sound to signify changes of zone. (In this prototype different colours represent different ecological zones through which the Path progresses). When a colour is visible in the border, gesturing to the left or right of the screen will launch the movie of a 360° panning movement of the landscape, a movie representation of the zone through which the user is currently 'passing'. Gesturing to the right will pan right, to the left will pan left : AA, BB, CC … FF (Fig 4.9). Within the pan will be 'found' further narrative branch nodes from where to launch movies set during the authoring process, associating each movie with the visible appearance of each locale.

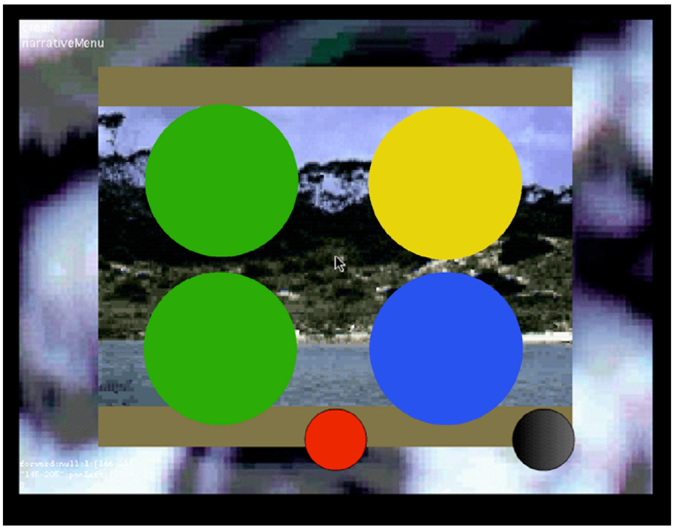


Fig. 4.10: *Pathscape*, screen grab : the end of a node movie, with colour-coded circles.

At the completion of a movie / narrative node, the **third** indexical device appears as a series of circle shapes over the final frame of the movie (Fig. 4.10/11). Blue, yellow, brown and green circles function as 'buttons' to linked topics colour coded to symbolically represent a narrowing indexical sort under the descriptors: Anecdotes, Historical Context, Commentary and Analysis. Each option extends and develops the background of what has gone before, functioning as a taxonomy and narrowing the index path to the specific, reducing from the broad. (A short 5-minute demonstration with commentary of the *Pathscape* prototype can be found on the DVD-ROM, Item 3.)

4.4.4 Consultations

The first prototype (*SonTel*) elicited a wide range of responses from participants who interacted with the system and most acknowledged the novelty of the interaction. One of the more detailed consultations was with the Aboriginal community local to the South Coast area of NSW in which much of the photographic and sound material was based. Their written response via a liaison consultant stated:

> The use of a walk through a landscape as a design tool to introduce an audience to historical and cultural material is particularly attractive. This provides local people with traditional affiliations an opportunity to express their connection with the land and their intimate knowledge about their country and its history. As they go for a walk through this landscape

people want to be able to engage in interactivity, choose their paths and stories while discovering new things. (Wells, 1999)

Of particular account during face-to-face consultations was the expressed need for ‘specificity’: who was that speaking? Where was she/he from? Where is that place?

Based on this qualitative and anecdotal evidence and with the limited resources left to the development project at the later stage of the second prototype *Pathscape*, it was decided to implement a text-based component. This would not compromise the initial intention of devising a visually based indexing system as the choice to use text would be clearly indicated and separated from the ‘visual’ path.

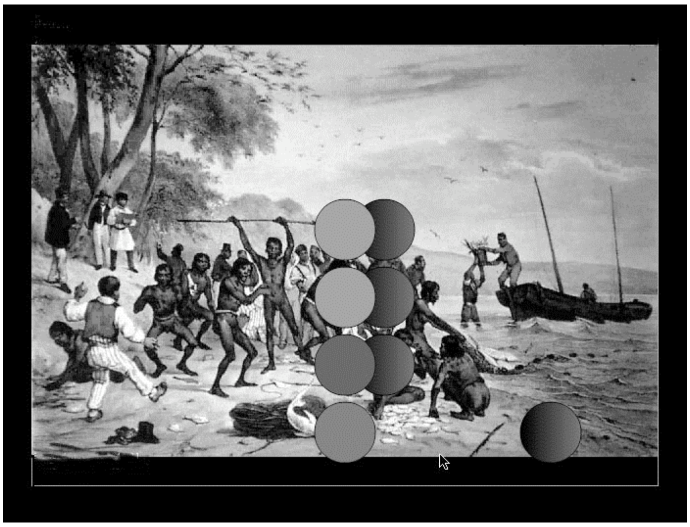


Fig. 4.11: *Pathscape*, screen grab within a narrative branch, with colour-coded circles.

The grey/black circles on the screen that sit behind each of the coloured circles is the **fourth** indexical device linked to a traditional text-based index. The text is organised sequentially as a series of ‘browser pages’ gathered, utilising XML protocols, from a Sources database of content.

Following each narrative the blue, yellow, green and brown buttons link to text specific for the narrative: Sound; Picture; Transcript of words spoken; Keywords; Web Search option (requiring computer connection to the internet); the red and black buttons access all the content of the prototype: More Stories (as a Table of Contents - the narratives - with the frame numbers of the Path movie listed against each item, from which the narratives could be launched); and a Keyword Index.

The user in the prototype therefore has a choice - to navigate the index by using images and sounds, or by using words, or a mixture of both. The probable usefulness of the feature in an educational context was also noted and this indexical convention was useful as a 'comparative' element during observation of participant's interaction.

The *Pathscape* project progressed from the final prototype into the planning of several stages and iterative forms:

> "It could be delivered on disc (CD or DVD) or via the internet or broadband cable or conceivably, as it uses XML protocols, via a PDA or mobile phone. The software framework is dynamic, rebuilding the database interface at each launch." (Leggett, 2002, Leggett, 2003)

A key-finding from the prototype indicated to us the need to develop an authoring tool that would enable individuals and groups to design their own system of linking the movies to a field of their interest. This was most evidenced in the local Aboriginal community's stated requirements for navigation. (Appendix 8.12: *SonTel* prototype Responses).

Initial responses from the community, affirming the aesthetic and organisational principles of the project itself, were pursued further in a move toward a larger collaborative project. However, research into the development of appropriate interfaces that would enable the authoring of specific spaces with personal and community narratives became a goal that failed to find further funding from the original investors.

Later, Tex Skuthorpe, the Indigenous cultural custodian of another Aboriginal community, asks the question:

> How did the Nhunggabarra keep the stories alive with such consistency over such a long time without written records? The answer is that they devised quite an elaborate sysem, which guarenteed survival even when disaster struck. A story was always linked to learning tracks, parts of the land itself and also to animals, none of which changed fast. The physical features of the land thus functioned as mnemonics. In some cases the story was accompanied by an illustration, a piece of rock art or a carved

tree. This supported the storyteller’s memory. (Sveiby and Skuthorpe, 2006)

As an academic undertaking, the proposal to explore the ontology and epistemology of personal and collective memory using the *Pathscape* paradigm, by examining models for placing and retrieving audio-visual digital media artefacts, was accepted as the present research project at the Creativity & Cognition Studios in the Faculty of Information Technology at University of Technology Sydney. Later within the Faculty, *Pathscape* would be re-examined as a potential tool for Indigenous communities, (see 5.3.5) but at this point in the research was analysed for its re-development as a generic tool.

4.4.5 Contemporary Evaluation

The *Pathscape* project passed through two iterative stages, which can be analysed with a table:

Prototype stage	Information	Interaction	Media
SonTel (1998-1999)	Landscape Stories History Ecology ‘quotes’	Gesture Mouse (spacial planned)	Photos (as movies) Sound
Pathscape (2000-2003)	As above + sources and citations	As above + hyperlinked to text sources as option; border image cues.	As above + dynamic XML-based database for sources; video; stereo sound

Fig. 4.12: **table analysis of *Pathscape* development**

The encounter in the prototypes is related to earlier and concurrent HCI research, and develops the concept of meaning derived from situated action (Suchman, 1987, Robertson, 2002). The emphasis here is not on goal-orientated outcomes but on interactivity where action takes precedence and outcomes emerge. It privileges the heuristic as an essential component of knowledge building, reflection and critical perception of the process.

Norman refers to this as reflexive cognition, where thinking, comparing and decision-making leads to 'responsive execution' (p96) as a component of an experiential cognitive process characterised by being effective, effortless, expert and engaged. (Norman, 1993)

The *Pathscape* prototype enables the user to orientate within a given topography in a way not dissimilar to a regular route followed in the country or the city. Interaction with the representation of the surroundings reveals hidden evidence, concealed information and comment, delivered as stories, as samples of discrete information, enabling the interacting subject to put together knowledge of the place gathered from movies of its individuals and communities. Less as query terms addressed to a database, more as embodying gestures, using the relational terms, "more, same, less" within the interactive progression. The experience constructs meaning as part of the gathering process, adding to the interacting subject's knowledge base. Under these conditions, meaning emerges as a constantly shifting series of conclusions, the consequences of which flow on from the individual decision-making process about subsequent action.

In the context of traditional cinematic experience, where reflexivity is rarely a component, the interactive experience for the audience of *Pathscape*, as explorers of a representation of that place, anecdotally revealed four main areas of response: participants who wholly embraced the immersive visual and navigational experience together <u>with</u> the knowledge building process; those who wholly embraced the experience <u>without</u> much concern for the documentary and informational aspects; participants for whom the knowledge acquired was unacceptable and without authority or specificity; participants who resisted the responsibilities of interactive engagement altogether.

4.5 Conclusion: Questions, Repertoires and Framings

Does the *Pathscape* prototype enable the user to orientate within a given topography in a way not dissimilar to a regular route followed in the country or the city? Through interaction with the representation of the surroundings, does hidden evidence, concealed information and comment, delivered as stories, as samples of discrete information, enable the interacting subject to put together knowledge of the place expressed through movies of its individuals and communities?

The *Pathscape* prototype elicited a wide range of anecdotal responses from users, most acknowledging the novelty of the interaction and potential applicability of the approach to a field of their interest. This indicated to us the need to develop an authoring tool that would enable individuals and groups to design their own system of linking the narratives contained in each of the movies. *Pathscape* had been made by a small group of professionals, one of whom was responsible for the highly technical manipulation of the authoring software. The kind of creativity support tool envisaged to progress the research, would need to be founded on basic technical knowledge and experience with computers and not programming skills. This would maximise the attention able to be given to building collections and exploring relational linking stategies experimentally for later evaluation by a participant group.

The subject of much of the HCI research surveyed in Chapter Two is concerned with accessing databases containing discrete and specific video durations for the purposes of knowledge building. Preece and others have identified manipulation and navigation together with exploration and browsing as conceptual models based on accessing activity, as opposed to objects like the spreadsheet or the desktop. They describe metaphors of this kind as able to *'..combine familiar knowledge with new concepts.'* (Preece et al., 2002) The metaphor predominant in *Pathscape* is that of the 'walk through space', communicated through our familiarity with Euclidian space as represented with a motion picture camera. Giving new meaning to this paradigm with a concept based on relationality between moments within the pathway movie and linked narrative sequences, proposes a representational form for the concept of 'situated action'.

Using novel means to avoid the technology of text-based indexing requires careful and incremental movement in the design process. Accessing a database is reliant on levels of agreement between those storing data and those needing to retrieve it. The design of a 'visual' index is either determined by convention, or agreement between accessing parties, or according to other protocols, idiosyncratic or otherwise. It is not unusual for the individual to design a system that is highly productive for their needs only. It is more usual for specialised groups, (like the stone masons and cathedral builders of the 14th Century discussed in Chapter Two), to develop specialised and highly efficient systems, meaningful to their group but incomprehensible to others.

The proximity of authoring and user functions for situating action is key to the design process. Metadesign as a research approach arising from such issues becomes of interest to the researcher where the tool needs to accommodate diverse systems of representation amongst potential users.

We will return to these issues in the following chapters. The projects described and the issues raised in this chapter provide further material for Norman's repertoire and Schön's reframing process that will be applied during the development of New Studies.

4.6 Notes

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[1] The Polytechnic (later Regent Street Polytechnic and now the University of Westminster), was the first institution in the late 19th Century to establish a link between the arts and sciences by offering classes and public exhibitions in the 'technoarts'. This extended to the illusionist visual effects of Dr John Pepper. In 1896 the Lumiere brothers demonstrated the cinematograph for the first time at The Poly.

[2] *Kino Eye* (Dziga Vertov 1924): from the market to the farm – experimental didacticism for the urban proletariat, about food origins; for the rural proletariat, about city markets; and agit-prop trains – 'all education is political' – the kinoscope. This was anti-melodrama, anti-escapism, free-form Constructivism with industry and technology as the heroes. The meat sequence is presented in its entirety, in reversed (backwards) motion (an instance of Kierkegaard's maxim on memory: *'Life is lived forward, but it is understood backwards.'*) A filmic process, as the projector handle is cranked, that returns the meat (and the propaganda) from the proletariat to the peasants – city/country, collective/cooperative, hand/mind, film material/narrative nutrition. (In another place at a similar time, Henry Ford had visited a Chicago stockyard and observed the packed meat coming out of the slaughterhouse in cuts – he reversed in his mind's eye the process and established in 1913 the first moving production-line assembly of the model T.) Later in *Man with the Movie Camera* (Dziga Vertov 1925) explores the system of film by demonstration, the ending dealing with the future and the other 'new media' of the day, about to affect the lives of the new nation. In the Workers' Club the radio with a loudspeaker, the Radio Ear, linked with the Kino Eye (objects) – as the workers read (ephemera) whilst in the cinema, sound is made visible (process), anticipating the expansion of sound, film, telephone and radio to the nation (networks).
Here is technology at work and the worker is the icon, the hero, the masses who are the audience of individuals. Visual indexing and symbols of distance, time,

speed and acceleration – cutting bench rewinds – speeding frames, speeding trains. Speed – blur – flux. (Leggett 2003a).

[3] Clauser described the making of acrylic paintings employing procedures controlled by computation. A *'structural* system' was employed, and the term *'epiphany'* was used to describe*: 'the creation of a form differing, often radically, from the main compositional format of the picture's elements …. not a creation by the artist but rather the product of the generative process – a self-precipitating structure.'*

[4] In the film and television industries collaboration was organised on a heirarchical basis. My collaboration with the librarian Ivor Davies and visual artist Ian Breakwell introduced me to the notion of collaborative frameworks within which each participant had a role to play defined by watching, listening and thinking imaginatively. This approach was applied with Breakwell in films and performances including *Sheet* (1969); *Unword* (1969-71); *Unsculpt* (1971); and *One* (1972).

[5] With the exception of working with colour film. The 16mm Houston-Fearless film processor operated by the LFMC was for black & white negative and print processing. Though the Debrie printer could be used for printing colour film, processing could only be completed by one of London's several commercial colour film laboratories. As each new print needed to be checked for colour balance and density, making a print could therefore take several days.

[6] Pixilation is an 'animation' film term, whereby each frame is exposed individually instead of 25 per second, commonly used to give movement to inanimate objects. Not to be confused with pixelation, a computer display term refering to the picture elements forming the image.

[7] The New London Arts Lab was set up in the Euston area of central London during 1969 under the title, Institute for Research in Art and Technology (IRAT). It brought together for the first time in Britain, film, video, sound, electronics, engineering and science based projects and practitioners. The engineer John Lifton had a VCS-3, which he set to generate the soundtrack for the film, transferred initially to a quarter-inch tape for later transfer as an optical track negative.

[8] In 1977, as part of reassessment of work plans for writing and further production, a comprehensive written reflective process produced fifty pages of Notes. (Leggett 1977/8) that lead on to the Image Con Text series – see 4.3.3.

9 "The film takes Landscape as Object in front of the filmmaker and the Medium; it is not about rural life or the mythology of The Land, neither does it seek to present a personalised impression visual or otherwise of the state of residing in a rural district of the South West of England. The coincidence of flora, fauna and man-made object, processes and activities, with the film frame are in no way paramount to an inspection of the total film process by which an observation of this kind is made possible - specific conditions to do with both Nature and men's activity with Nature are recorded with the camera but is essentially a subject to the observation and reaction to its operator." (Leggett, 1970-76)

[10] The colour reversal process was used in the making of direct positive images – Kodachrome slides were the most commonly encountered use of this technology – and used three layers of light sensitive silver halide emulsion separated by

three filter layers: Cyan, Magenta and Yellow. During chemical processing the emulsion layers would reproduce the values of light for each of the colours and in a colour coupling stage, be rendered as Red, Green and Blue. (Konigsberg 1997) 333.

[11] Pro-filmic is the term used to refer to the scene and its activity as depicted, with animate and inanimate objects etc, in front of the camera.

[12] Early video systems did not enable satisfactory editing and post-production processes and like Super 8mm film, an aesthetic developed in response to this reality. Dominated by quantities of duration and the poor visual quality of the black and white image compared to that of film, early video art is memorable for its reliance on the human figure in dynamic (or static) action.

[13] The LFMC workshop was even re-created as a *tableau vivant* in the Museum of the Moving Image during its existence in the early-90s, next to the Hayward Gallery on the South Bank, London. The design romanticised the workshop as a domestic space, with the squalor and chaos of a Bohemian attic, quite apart from the functional semi-industrial feel the four different London locations actually possessed.

[14] The Workshops, were set up under the ACTT Workshop Declaration, negotiated by a national committee of the ACTT. I was a member of the committee (1979-81), and as a member of the Bristol Film Workshop, several individual and collaborative projects were managed under the Declaration.

[15] John MacDonald, *Sydney Morning Herald*, May 1996.

[16] The author attended ISEA in Montreal 1995, Rotterdam 1996 and Sao Paulo 1999.

[17] Code, the ephemera of Human Computer Interaction, links Intention with Outcome, Input with Output (I/O), the new age of scribes, cutting and assembling code 'objects' which could be shots hanging in the vast trim bin of internet code 'libraries'. Code features in an article that commences "Tools affects outcomes" (Leggett 2003c). It recounts the history of the development of two photo-manipulation applications, one pixel-based (Photoshop™), the other vector based (LivePicture™). Though the latter was clearly a superior creative tool, (like the Betamax VCR system that fell to the VHS standard), eagerly sought after by artists, the former prevailed due to successful marketing to the print and publishing industries. The article concludes by noting the importance in the future of open source software and the acquisition of programming techniques by artists and collaborators.

[18] It was later that Yate's work on The Art of Memory, discussed in Chapter 2.2.5, came to the author's attention. It served as a spur to continuing the research, commenced in the fine and visual arts, in the context of engineering and IT.

5 New Studies

5.1 Introduction

This chapter describes the production of **primary** evidence in the form of models and artefacts, the specifications, processes and outcomes of which produce **secondary** evidence in the form of recorded analysis and reflection upon what is observed during and following its production.

The chapter commences (5.2) by examining a range of concepts key to the interactive paradigms explored using experimental models described later (in 5.6.) The concepts re-frame references to hypermedia and hypervideo encountered in the earlier section 2.6.2 as a means for providing a speculative, possibly idiosyncratic foundation for the themes to be explored through the building of models and artefacts. The themes develop foundations described in the previous chapter, of the image of landscape as a tacit (or syntactical) schema for knowledge structure (5.2.6). In mapping out a ground with which to approach hypervideo, the rubric 'mnemonic movies' is used to describe a practice-base applied to interrogate the paradigms proposed. The themes are expanded into spatial and temporal paradigms for the navigation of a specific collection of video files, using experimental Models with an interaction design based on 4-way gesture (5.3).

An analysis of the software tools (5.4) used by the hypervideo researchers described in 2.6.2, concludes the toolsets they developed as unsuitable for the production of primary evidence in the current research. This leads onto a provisional description of: the Mnemovie[1] interactive engine, the toolset specifications, the production processes envisaged and the outcomes expected (5.5). Secondary evidence gathered during the iterative building of the Mnemovie experimental Models (5.6) include the development of the toolset through three iterations. Summaries and reflections addressing both primary and secondary evidence complete the chapter prior to evaluation by participants external to the experiments, described in the following chapter.

5.2 Hypermedia and Motion Picture Files

In a text-based environment, turning the pages of a book, magazine or newspaper, even the modern website, is determined by a variety of interaction design factors meshing with our levels of attention. Based around the concept of flat sheets of paper bound together, the structure contains both constraints - Beginning, Middle and an End (BME) and affordances - More, Same and Less (MSL).

> '….readers developed a repertoire of aids to textual management … within a single volume and the relations between volumes …. such internal hypertextual functions as tables of contents, page-numbers, chapters, verses, rubrications, footnotes and indexes.' (Landow and Delany, 1994) 4.

Not only are we confronted in Landow and Delany's words with *'the stubborn materiality of the text'* on the physical page, but we are also restrained by the limits of language across cultures and literacy within a culture. In the age of media technology, the oral literacy of a blog enables us potentially to return to a Socratic field of discourse, where each statement is disputed (or supported) by simply adding a Comment. As de Kirckhove observed with one of his pithy aphorisms: "*Our neglect of the ear may be one of the prices we have paid for literacy*" (de Kerckhove, 1995) and could also be applied to our neglect of fully utilising the contemporary phenomena of motion picture platforms as a way of extending our means for sharing knowledge and experience. Hypervideo and the theoretical means for creating meaningful linkage between 'moments' of significance in motion picture files are the objective of the next section.

5.2.1 Hypermedia

Conventions of hyperlinking diagrams are units of information – such as pages on the Web – given spatial and linking variability. One of the first tools to explore hypertextuality was Storyspace,[2] *'…a mapping function that represents the structure of the hypertext as a series of boxes and lines (nodes and links) lying in a plane*:' (Moulthrop, 1994)

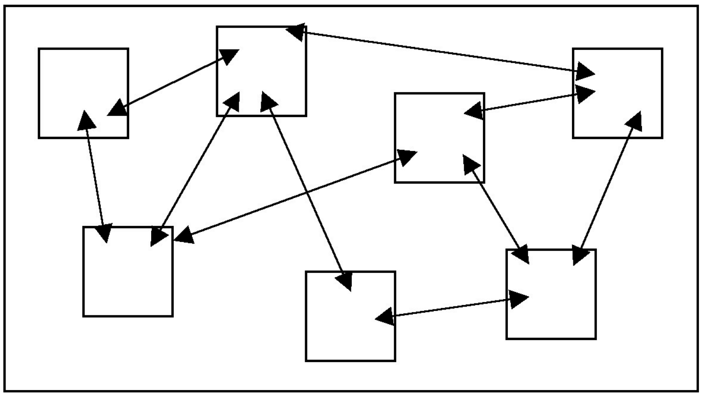

Fig. 5.1: Hypertext schema of Storyspace

In 'standard' hypertext (Fig 5.1), the media (text and graphics) are static objects, without durational value. Time is not a given for the object, measured as a time-base, with a beginning, middle and end, but is determined by the interacting user. Contrarily, motion picture objects have a time-base within which both explicit and implicit moments occur, revealed as observation proceeds, moments and conjunctions that become the basis for interaction. Video linking thereby can be based on patterns of connectedness, protocols developed within a hypervideo environment.

5.2.2 Hypervideo

In the hypervideo schema (Fig 5.2), the points of departure from the Parent afforded as interaction links to the Child, are matched by a return to the Parent, either to the point of departure, or to an equivalent point on the Parent time-base. (This horizontal layout, is not to be confused with the conventions of the non-linear video editing applications timeline).

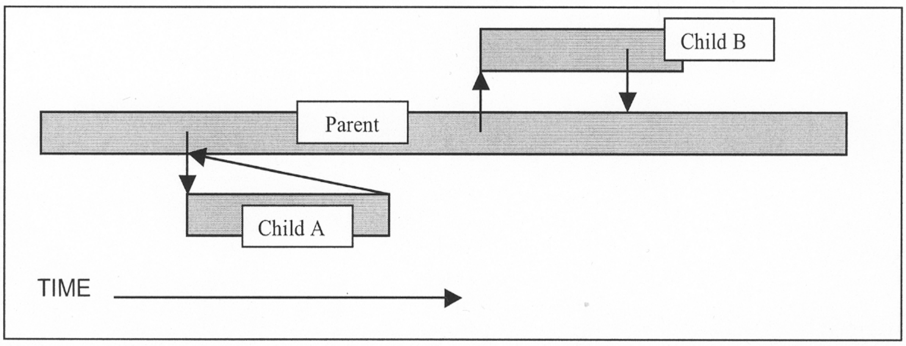

Fig. 5.2: Hypervideo schema

Child A: linked video returns at end to point of departure from Parent. Child B: linked video returns to equivalent time base of Parent.

A time-based object has a finite duration – from a twenty-fifth of a second to many hours – with a beginning, middle and end points, but it's duration can be made infinite, both perceptibly in the analogue realm, and imperceptibly in the digital domain by looping (Manovich, 2001, Manovich, 2002) (and as discussed in 2.2.1).

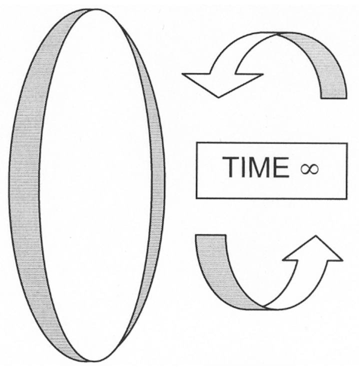

Fig. 5.3: Motion picture film / file, as looped infinite duration.

Linking between loops becomes similar to linking between non-time-based objects such as pages of text, each frame of video being the equivalent of the word on the page (Fig:5.4).

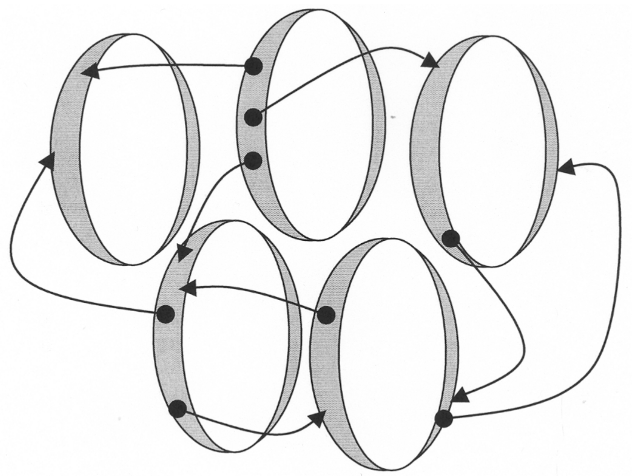

Fig. 5.4: Hypervideo schematic - motion picture files and linking paths

5.2.3 The relational semantic schema

In the previous chapter in which the *PathScape* system was described and evaluated, acquiring knowledge through interaction relied on memory. The mnemonics are implicit as the interacting subject becomes familiar with the pathway and its associations of place and knowledge, imparted using a variety of narrative techniques. As interaction progresses, the knowledge contained shifts in different ways for each interacting participant, from the implicit to the explicit. Explicit knowledge resides as a result of learning, the product of observation and recall. The process is meme-like, the information pattern held in the memory of one encounter, capable of being copied or anticipated into the memory of a later one (Heylingen, 1998). Bartlett's (1932) studies of memory led him to formulate the schema or mental framework. Extended by Rumelhart (1980), as a way of characterising our organisation of knowledge concerned with people, situations and events, he and Donald Norman further defined the variables that could be introduced into otherwise stable information structures {Rumelhart & Norman, 1984).

The principle of the schema as mental scaffolding, intuitively developed in the *Pathscape* project, now became central to the research trajectory. In the time elapsed since the earlier experiments, hardware and software capacities now made it possible to consider working with a full-screen motion picture image. With the screen thereby completely uncluttered by the paraphernalia of player frames and bevelled edges, buttons, arrows and various on-screen interactive devices, further ideas about schemas as systems of affordance have been determined to advance the research. In the following five sections, these ideas are developed based on visual themes of knowledge organisation, the knowledge base around which interaction will occur.

5.2.4 Neutral Time

We have knowledge of the tree, say a gum tree, standing in the Bush. We know from observation over many years that our knowledge of the tree is ordered, the order being reinforced each time we re-examine a tree. The Tree grows from the ground as a trunk and as our gaze follows its line, it becomes a bough, then a branch, then a twig, then a leaf, then a bud, and then into the various components visible only with a microscope.

We are moving between known zones in that specific order, a 'natural' classification, of the natural physical world. This is an area of individual tacit knowledge. We have learned and remembered the words for the parts of the tree, understanding and confirming the order through being active in the world.

If we were to record each of these zones as still images, capturing the essence of each zone, we would know in which way to order the pictures left to right on a tabletop. The still image as an object like a computer file, is time neutral. On a computer display, by organising the images into an interactive system, the viewer is enabled to determine how long each image is viewed before moving to the next. Arriving at the image of the 'bough', chances are the 'natural' progression will be recognised – observation as stimulation of memory leading to anticipation of the next image to be seen. These decisions can be plotted against time (Fig 5.5).

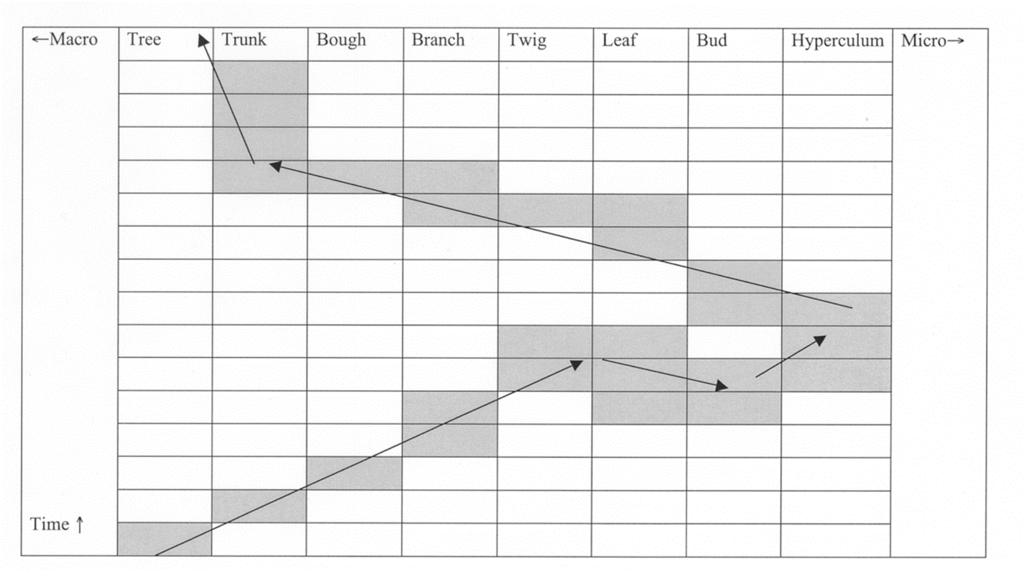

Fig. 5.5: Gum tree Interactive Schema (tacit) of a hypothetical interactive progression.
Each row is a unit of time – say two seconds – each column is the Image of that part of the tree.

5.2.5 Durational Time

The tacit principle of order described above can be applied to another example. If we were to walk beside a body of water, beginning as a spring of water emerging from the ground, continuing beside a ditch along the river to the estuary and then the sea, we would be anticipating the order, the 'natural' classification, experienced, or taught previously. This is not a walk many of us have completed, but we know it is implicitly true.

Each stage of the walk, each zone that we pass through is recorded to capture the essence of that place as a series of still images – a neutral time object – or as a series of durational time motion pictures: a 360˚ pan for instance, showing the full setting, or a static camera framing the water passing through the picture frame, like time itself, in full flow.

But as a representation of time as well as place, as a temporal object, captured as a manipulable video file, time can be made infinite. The motion picture collection of at least eleven shots, presented as looped images, can now be accessed in the order of which we are explicitly aware: spring, rivulet, ditch, creek, rapids, reaches, estuary, inlet, bay, sea, ocean.

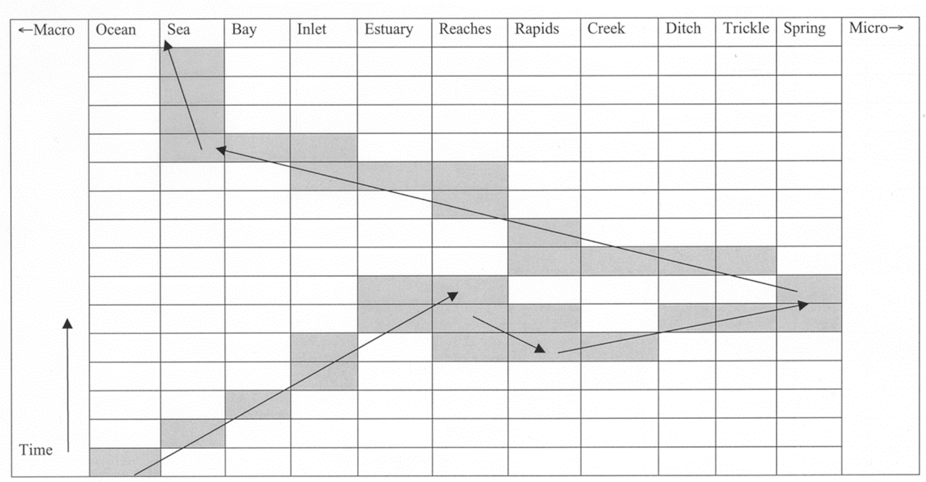

Fig. 5.6: Ocean to Water-spring to Sea Interactive schema (tacit / implicit) hypothetical interactive progression.
Each row is a unit of time – say five seconds – each column is the looped Image of that part of the watercourse – say, seventy-five seconds.

Encountered as a series of looped images, as interacting subjects we are able to anticipate the outcome of a decision made to advance or retreat alongside the watercourse. In this example, we begin at the ocean, advance to the spring, before retracing our steps back to the sea.

Though these are temporal objects, (looping every seventy-five seconds in the Fig 5.6), reproducing the flow of water across the field of view, they contain the traces of another durational element, worthy of semiological analysis, a parallel taxonomy layered into a relational system. As examples of motion picture images functioning within linking pathways (Fig. 5.7), they can be aligned with Preece's classifications of interactive conceptual models. (Preece et al., 2002), 249-256.

Conceptual Model (after Preece)	Motion picture object	Knowledge base
Instructional	*Plumbing a Sink* (Chapter 2.6.3)	Explicit
Conversational	*Pathscape* (Chapter 4.4.2)	Tacit / Explicit
Navigational	Gum Tree (schema) (Fig. 5.5)	Tacit
Navigational	Ocean to Spring (schema) (Fig. 5.6)	Implicit
Explorational	*Aspen Walk: (*Chapter 2.2.5) *Lanes Model* *(later in section 5.6.1)*	Intuitive
Experimental	Live vision	Innate

Fig. 5.7: table of conceptual models (after Preece)

5.2.6 Landscape as Knowledge Structure

'Landscape' is for many city dwellers, a place with plants and few buildings. Outside the urban centres of population, it is often a source of anxiety at best, or fear at worst. It is in many ways a *tabla rasa* into which we enter with a mixture of trepidation but also aggressiveness – fear produces an innate defence response. The experience, particularly at first arrival, is hesitant, like that of encountering any strange and unfamiliar environment. We navigate into the space using a mix of observation and tacit knowledge. For the city dweller, entering a landscape is like entering an installation artwork in the city museum!

As a syntactical system, a landscape links together the known and the unknown, creating relations between them that we seek to resolve in order to quell our anxiety. We achieve this by using the known as the basis for addressing the unknown. From the security of what we recognise and assume to be the known, we examine critically that which we do not recognise. Initially, from a distance, using the senses of sight, hearing and smell (possibly also taste and touch), then through physical movement, we move into the proximity of the unknown. In so doing, our anxieties are addressed and quelled. This place becomes part of our known world. Together with what we assimilate from other sources within our culture - books, movies etc, - the landscape of which we gain knowledge becomes Nature, natural to us, no longer unnatural to our knowing.

But unlike our cultural artefacts, the landscape is the subject of moment-to-moment change. So when we return to the place we knew, or may have known, we discover that it will have changed. This may require careful observation.[3]

5.2.7 Temporal Spaces: **'Window'**

In the previous chapter, (4.3.3) I applied retrospectively semiotic analysis to the film *'Window'* (1973), inflected by the second of Schön's reflective criteria - repertoire building. Research of this kind will amplify the potential for developing the idea of an interlocking series of significations, enabling us to extend meaning beyond the appearance of landscape, for example, as a static entity.

Within the structure of the film can be found seven signs of temporality (Fig 4.4): three Historical, two Filmic and three pro-Filmic. From the evidence presented by the filmic process, we are encouraged to become aware, as a perceiving subject, of each of the distinct processes, in front of the camera and 'behind' the camera.

The film as artefact establishes the domain of this knowledge structure, within which there are two sub-domains, the pro-filmic and the filmic. The pro-filmic identifies the iconic and the indexical signs through our tacit recognition as viewers, of the physical and organic natural world, with human activity occasionally visible. The filmic establishes similar types of sign, implicit within the experience of viewing the film. As visual evidence, these operate as mnemonics throughout the duration of the 45-minute film: the framing of the scene during each recording session; the join between one weekly session and the next (emphasised with the blanked frames); the material of acetate, scratches and image-bearing emulsion, read as evidence in the contemporary setting, of a 'historical' and obsolete imaging process.

Each of these temporal objects – 12 metres in length - following the durational tempo of the film and reproducing the temporal markers, are later assembled in sequence into a new temporal object, the completed film record of the passing year.

This temporal object, the film, and its temporal component parts, can be described within a matrix (Fig. 5.8):

Temporal Object	Era	Year	Season	Week	Narra-tive	Hyperlink
Occurrences	Many	1	4	52	52+	Many (68,000 frames)
Visual Represent-ation	First frame Thumb nail	First frame Thumb nail	Leafs on trees; Snow on ground etc	Camera movement; movement in frame; join mark between 'takes'	Formal incident; pro-filmic incident	Relational to incident
Alphanumeric Represent-ation (Example)	Numbers (1970-6)	Number (1973)	Name ('Spring')	Number (Week 28)	Title ('Plough-ing')	

Fig. 5.8: Temporal Object matrix analysis – *Window*

The classification of duration and image in Fig 5.8, aids in identifying moments critical to orientating within the overall entity of the filmed record. Each moment, whether occurring as a product of the representational system, or as a pro-filmic event, are incidents that are potential hyperlinks, relational to the 'content' of either. This notion can be developed using film (or video) material.

It is within the dynamics of the filmed time period of a year projected in 45 minutes that the potential for mnemonic linking occurs. For example, each of the temporal objects can be represented within a one-minute loop (Fig.5.9):

Temporal Object	Year	Season	Week	Narrative	Hyperlink
Occurrences	1	4	52	52+	Many
One minute Loop Representation	52:1 compression, complete film	4 X 15 second samples	52 X 1 second extracts, zoomed out	52 X 1 second extracts, zoomed in	

Fig. 5.9: Temporal Object matrix analysis *Window* compressions, by Object.

The *Window* model contains a classification system branching out from the film as artefact that establishes the domain, an area of knowledge accessed through temporal metaphor. There are three areas of sub-domain, (1, 2, 3a in Fig 4.4), through recognition of season or activity in the field of view. And two areas of sub-domain (4 & 5 in Fig 4.4) based on 'shapes' within the material of the film.

Barthes ideas of 'proairetic sequence', (based on Aristotle's proairesis, on implied narrative sequence in history painting), describes how we reconstruct situations, narratives for instance, based on flimsy or partial evidence – the paradigmatic is incorporated into the syntagmatic. Burgin likens this to the way in which an archeologist might envisage the form of an ancient dwelling, and a whole way of life associated with it, from the indication of some pottery shards. He reflects on the experience, not only in terms of the 'already read' determinate content, but how that experience is affected by the retention (in memory) of its fragmentary nature. (Burgin, 2004) 26.

This proposes that we are good at matching things and their place in the topographical sense, better than we are at retrieving the narrative sequence of events that lead to the present moment. We have all retraced our steps in order to relocate the lost bunch of keys, in preference to sitting in a chair to recall the order of events that led up to us putting them down. The physical act of sighting the shards of objects as we retrace our steps is the means of reinforcing the sequence of moves, bringing the fragments together and the resolution – or not – of the loss.

5.2.8 Drawers

The metropolitan landscape is one where objects have been invented and built by humans for a variety of purposes. Some of these objects, a set or collection of drawers, help us manage knowledge using similarly tacit methods. The growth of trading and business necessitated devising systems for not only storing paper documents, but also being able to find them again. Initial solutions included furniture-makers approaches, such as the patented Wooton desk.

Fig. 5.10: Wooton patent desk
Advertising slogan, "A place for everything and everything in its place".

The Wooton, whilst useful for keeping a working surface clear, did not provide mnemonics linkable to bits of paper other than aiding the 'lost keys' approach of rummaging. The later technology, the filing cabinet, maintained the vertical grid shape, then altered the mnemonic base to include horizontal lines (dividers), colours for categories of document, and finally words attached to individual hangers and the folders contained (Lansdale & Edmonds, 1992).

Reeves and Fischer's study of McGuckin's Hardware Store in Colorado, where each of the salespeople have an area of special responsibility within the massive stock, arrive at the concept of the 'intelligent agent', whereby each agent is also able to direct inquiries to the part of the store able to help the customer (Fischer and Reeves, 1992). As Norman has observed:

> McGuckin's… shows to what we might aspire: efficient, intelligent agents, coupled with a functional arrangement that makes browsing a pleasure and a source of unexpected finds." (Norman, 1993)174.

Intelligence and agency (as anticipated by Vanevar Bush and his Memex – see Chapter 2.6), pursued by computer corporations in the development of interface metaphors – from desktops to windows – does not compare with personal choice when it comes to the design of storage spaces. Combining the concepts contained by both examples of the Wooton desk and McGuckin's Store can be extended to the familiar object of a chest of drawers, not quite a filing cabinet, but certainly a store. As the basis for a complex knowledge management system (KMS), each individual drawer contains the objects that are implicitly significant to the drawer's owner.

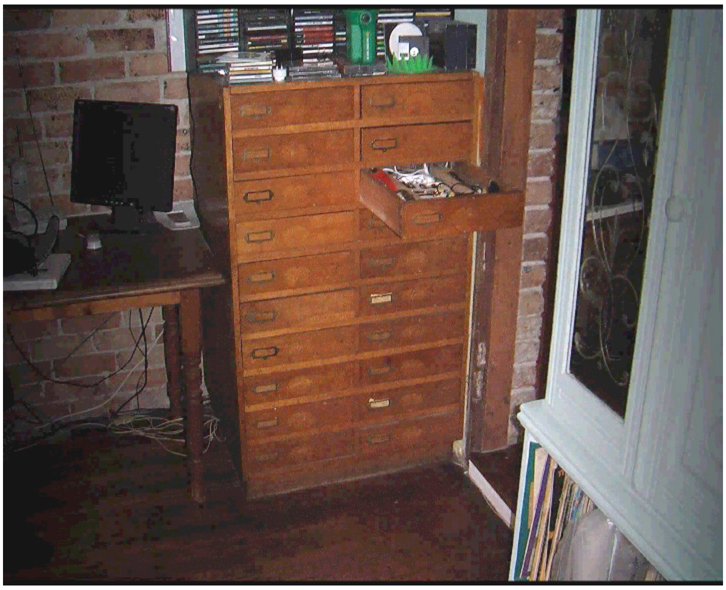

Fig. 5.11: Interactive object (tacit) – the Chest of drawers

Interaction therefore with the object we call a chest of drawers is based on tacit knowledge – if we pull out a drawer, we will find objects contained. The objects, whether two or three-dimensional, are each a domain of knowledge.

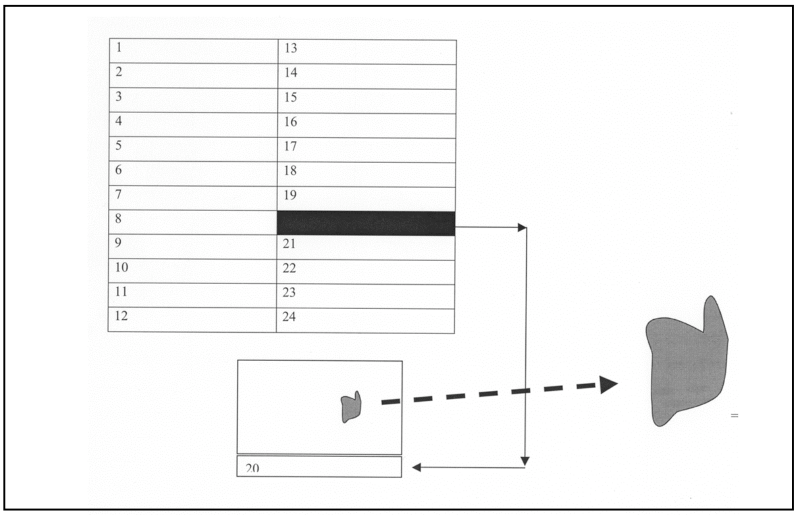

Fig. 5.12: Interactive schema (tacit) for Chest of drawers

The classification system providing structure to the domain of knowledge in the chest of drawers is not explicit. Through interaction with each drawer the structure, an implied classification (or lack thereof) is learned. The mnemonics then operate in different ways: spatially through position of drawer – left or right, high or low; associatively through contents of drawer – position in draw, colour, shape. Text-based notation may also play a part in this mnemonic memory system.

5.3 Mnemonic Movie Paradigms

How is the scenario described above afforded as an interaction design? Rokeby provides the clearest statement of how interaction within an interface, the classic HCI dilemma, should be approached:

> *The interface becomes a zone of experience, of multi-dimensional encounter. The language of encounter is initially unclear, but evolves as one explores and experiences (Rokeby, 1986-2000).*

The *Pathscape* quick-and-dirty evaluation in the previous chapter (4.4.4) revealed that participants were intrigued by the approach taken to interacting with a multimedia system. They highlighted the experiential aspects of 'movement through a landscape' using physical gesture. Under observation, the relation between place and knowledge was not clearly established as a part of the experience, and the cross-modalities of narrative were found by many to be confusing.

The new research, whilst maintaining the gestural basis of physical interaction in the *Pathscape* system, builds experimental Models to investigate extending the syntaxical basis for linking within not a multimedia, but specifically a video environment.

5.3.1 Video

Interactivity and navigation principles for managing video files based on gesture rather than keyboard control, when combined with data models using concepts such as entities, attributes, and relationships (Marques and Furht, 2004), can be described as combining the shape of gesture with the shape of the information space. (Fig. 5.13)

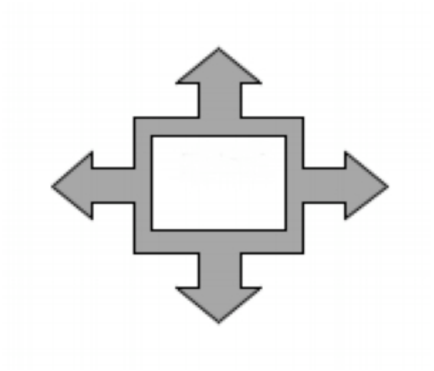

Fig. 5.13: Shape of gesture, shape of information space

The information space is the two-dimensional (2D) surface on which the computer-mediated digital video image is displayed. Whilst the space can be enhanced with techniques and devices to give an illusion of this 2D space having three dimensions, the video stream additionally operating in the forth dimension (4D) of time provides more than enough information - or screen-space - with which to work.

The essential objective of this approach to interaction with the system is to minimise 'clutter' on the screen and as far as possible, retain the video image as a 'responsive presence', able to run motion pictures in forward and backward modes. The four sides only of the screen space are the vectors to which gesture is directed to achieve interactivity. Simplicity and directness are important attributes in this regard.

In the *Pathscape* prototype, the 'core' video from which other videos linked, was a representation of Point of View (POV), looking down a path, with forward movement 'into' the space on the screen. Gesture with the mouse produced a mix of computer-based and cognitive outcomes: using the mouse position toward the top of the screen caused the movie to run forward, away from the beach and toward the forest. With a mouse position toward the bottom of the screen the POV would change through 180˚ and then run forward in that direction. Though the motion in the picture was still 'into' the space, cognitively we were returning back along the path.

The collision of culturally induced perceptions and cognitive meanings like these would remain constant boundaries in the construction and evaluation of the Models. But the principle of effecting 'forward and backward' of the movie, (whether this was running the movie file backwards, or retracing the path recorded by the movie from a different POV), would be retained using Up and Down gesture effected with the mouse or some other interactive device (see more in Appendix 8.6: Sensing Devices – a survey).

Gesture to Left or Right in the *Pathscape* prototype caused the essential hypermedia characteristic of the system to be demonstrated. The image of movement through the space of the landscape is terminated and replaced with a movie 'related' to the place represented on the screen at that moment of interaction.

New work on experimental Models set out to explore the precept more fully – mnemonics embedded within the motion picture document (as so far discussed earlier in this Chapter), as prompts to link between movie files, with the physical gestural means for doing so.

A initial list was prepared of hypervideo 'relational scenarios', space/time representations containing mnemonics familiar on a daily basis, having temporal, narrative and graphical characteristics (Appendix 8.13: Mnemonic Paradigms). Each moment in the 'parent' movie contain mnemonics with which a linked 'child' movie is associated.

5.3.2 Interaction Concept Summary

Interactivity will control Forward motion and Backward motion in the Parent; be able to link to, and be linked from the Child; linking procedures would avoid the rules of narrative sequence, instead seeking relational sequential orders, guided by mnemonic aids for navigational options through association.

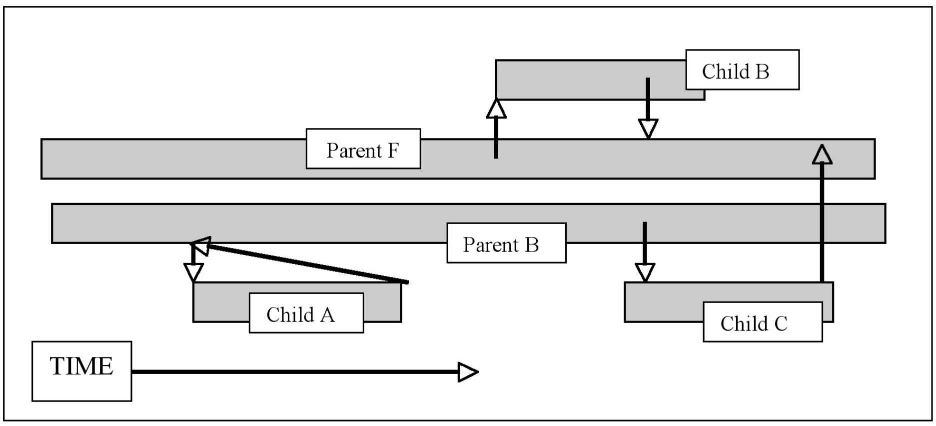

Fig. 5.14: Hypervideo, Parent and Child.
Child A and Child B are linked from the parents but return differently; Child C links from Parent Backward and returns to Parent Forward.

The new specification, a considerable simplification from the *Pathscape* prototype, affirmed the four-way principle:

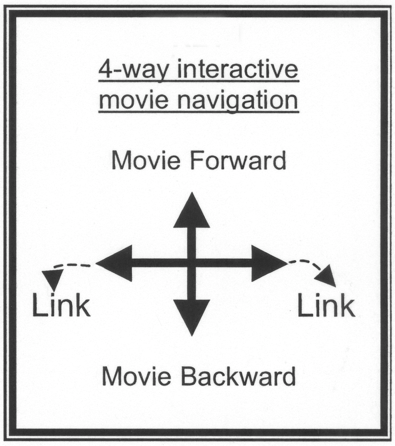

Fig. 5.15: 4-way interactive movie navigation.

The ↑-gesture runs the movie Forwards, the ↓-gesture runs the movie Backwards. Using the ←-gesture will activate the Left, or the →-gesture the Right linking.

The principles are applied across a range of experimental scenarios, extending the principle of a 'central' movie containing 'potent' mnemonics, from and to which movies are linked. The mnemonic paradigms serve as the basis for defining the kind of tool(s) for playing and authoring hypervideo (Appendix 8.13: Mnemonic Paradigms). This was to be approached in three ways:

- identifying 'real-life concept' applications to which a player and toolset specification could be assigned – see following two sections;
- locating existing hypermedia authoring tools via internet searches that potentially could be utilised for the experimental paradigms – see more in Section 5.4.2-7;
- specifying a simple player and authoring tool, to be built for conducting the experiments.

In addition, the process of accumulating video material for possible use in the Models was commenced, both as recordings gathered on tape and later, as requirements became specific, captured as files to the hard disc.

5.3.3 The Mnemonic iPod

The first of the ‘real-life concept’ applications was the mnemonic iPod research proposal (with Dr Shigeki Amitani), for a Java-based emulation and an application based on these principles:

- The emulation would be of the iPod operating and control system (McFedries 2005, Hayes, 2005). It would demonstrate one movie file linked directly to another movie file, with successive markers on the movie linking to different movie files.
- The application would demonstrate the way in which a Java-based framework will enable developers to create links between each of the movie files using a video editing application.
- Exported to iTunes (McCombs 2006), the movie files containing the additional metadata, could then be imported into the iPod simulation where, in the Movies section of the Menu, an additional Mnemonic Movies option would be found with the iPod firmware. (Appendix 8.14: Apple Universities Development Fund, Mnemonic iPod research proposal).

This was more than a novel application of the precept that moved away for a moment from ‘pure research’. It addressed the potential public context as a technology, but more importantly, as an approach to considering the design aspects of such an intervention. As discussed in Chapter 2, meta-design as a framework for user authoring became considered as an approach. How this might work in practice as applied to Personal Video Players was the subject of a paper (Leggett and Amitani, 2006). These principles later became part of parallel research in another related project, the *Indigitrax* proposal.

5.3.4 Indigitrax Toolset

A group of Faculty researchers came together at the beginning of 2006 to further develop the *Pathscape* precept as a meta-design project together with Australian indigenous stake-holders. A proposal (unsuccessful) was delivered to the Australian Research Council (ARC) Discovery round mid-2006 (Appendix 8.15: Indigitrax ARC proposal description). The specification for a video Player/Viewer designed for gestural interaction was pertinent to developing a definition of the type of tools for the building of experimental models in an ideal research scenario. This would provide the tools for authoring the system from scratch, including the appearance and interactive functioning of a Viewer and an authoring Toolset. The definition for the tools arising from the initiative included three specifications: the Viewer functions; the authoring Toolset; and the Timelines for development (Appendix 8.16: Indigitrax tools specification).

5.4 Tools

The time estimated for software development in the *Indigitrax* project – some five months - provides some idea of the complexity and expense of engineering a hypervideo customised player and authoring toolset for purely experimental purposes. Subsequent research concentrated on seeking out existing hypervideo tools that had already been developed, that could be adapted under license in order to build experimental Models[4] necessary to advance the research. This included further investigation of adapting the *Pathscape* framework as a creativity support tool to this end.

5.4.1 **Pathscape** *as tool*

In the search for a tool for building experimental models, the *Pathscape* framework, (based on an engine built with Macromedia Director application [5]), was considered as a possible contender by using a process of 'file substitution'. In the funded production of *Pathscape*, the authoring process had been divided into quasi-industrial functions between the production team: principal artist, programmer, media preparator, researcher and sound designer. Each team member passed their contribution to a neighbour for further 'value-adding', or directly to the programmer who inserted the media into its correct placement, adjusting Lingo programming when necessary. Clearly this was not an option for building many models, quickly and cheaply. But substituting the media files in the prototype with a fresh set of video files that used the same files names etc, without touching the programmed elements of the prototype, could possibly provide usable experimental models.

A SWOT analysis for this approach was applied, (see Appendix 8.17: Pathscape SWOT analysis), but did not present any immediate conclusions for pursuing the 'file substitution' strategy for building experimental models. However, it highlighted the need for monitoring and evaluating interactive experiments with great detail than had been applied to the *Pathscape* project [6].

5.4.2 Hypervideo Tools

During the course of the broader literature search when distinctions between narrational and relational structures or modalities in time-based media were being sought, I became aware of researchers in the field of hypervideo. They had developed their own software to either demonstrate or measure their research studies and outcomes. Their objectives were for the most part different from my own, being concerned characteristically with achieving improved performance outcomes in the storage and retrieval of movies from large collections stored in customised video databases. The tools they had made to facilitate hyperlinking between video media files – hypervideo – could possibly be adapted for my purposes.

The advantages of approaching these other researchers would be:

- the possibility of a ready-made tool with which I could build models and artefacts (as a code-writing illiterate, this would be a huge advantage!);
- in the academic tradition of sharing knowledge, enable exchange of my data as further evidence of the efficacy and possible augmentation of their tool usage;
- inform my own approaches to the gathering of evidence, in particular, by avoiding the duplication of evaluative material derived from this research;
- lead to possible future collaboration in further development of the tools operating in both narrational and relational modalities.

Following an extensive internet search, the two groups of central relevance were the *Hyper-Hitchcock* team (Girgensohn et al 2004) and the *HyVal* team (Zhou 2005). Results of the way in which they had developed their projects had been published in several papers – see Chapter 2.6.2 - and had contributed significantly to my ability to clarify the distinguishing features of the research objectives. Their approaches acknowledged the value of modifying a narrational approach to organising information using the *detail-on-demand* principle. After many months of searching and communicating, the short-listed systems considered as adaptable tools are summarised.

5.4.3 MediaLoom

The Hypervideo Engine was *'based explicitly on a hypertextual link-node arrangement, hypervideo is a medium for computer-based narrative created by an interactive montage of text and video clips'* (Tolva 1998). Though this system was dependent on using words within its design, it was followed up as a possible authoring tool. The author, John Tolva, was happy to send me the system for trialing, but after successive attempts, the same runtime error was encountered and any further attempt to use it was abandoned.

5.4.4 Korsakow-System

The Player – see section 2.6.3 - has three small screens fitting beneath a screen three times the size, on which the movie plays (Fig. 2.22). The three screens beneath show still images of optional scenes that when selected fade out the top picture and sound, before beginning the one selected.

This pre-defined configuration is contrary to the single-screen direction of my research. Though rich with possibilities as a design and play system, the approach relied on a keyword-indexed database. Whilst this is not a problem for the browsing participant, as the words do not form part of the visual display, it relies as an authoring practice based on semantic associative links formed, one step removed in language, from the rich potential of motion picture images. (Thalhofer and Velthoven, 2000-2006, Thalhofer, 2003)

5.4.5 HyVAL team

The functional, distinctly non-immersive interface described in chapter 2.3.2, seemed to be an unlikely possibility for authoring 'interactive cinema'. In the event all attempts at contacting this local researcher to arrange a demonstration of the system proved fruitless (Zhou, 2005).

5.4.6 Impromptu

Impromptu has been developed by members of the Australasian Centre for Interactive Design (ACID) and *'has been designed to provide a highly dynamic real-time environment for crafting multimedia algorithms.'* It was prompted for consideration as it is based on 'time based programming' and contained a vector based graphics engine capable of reproducing video (Brown, 2005). However, it had been developed primarily as a live musical performance tool with the ability to create and modify code blocks in real-time. So to accurately schedule code blocks for future execution, following some experiments, proved difficult. It too was excluded from further consideration.

5.4.7 Hyper-Hitchcock

As described in chapter 2.6.2, this Palo Alta team had developed a hypervideo system enabling a *'detail-on-demand'* function, whereby the user could advance quickly through an instructional video, then quarry down to find the information being sought. Like a DVD controller, the interaction was based on skipping through chapters using visual cues until the item required was recognised. Visual cues included a time-line graphic, segmented clips displaying up to three levels of detail and thumbnails of keyframes (Shipman et al., 2005).

In common with most of the interface layouts concerned with video that were encountered, it offered several different ways of interacting with the video files in the system and was thus cluttered and 'technical'. Whilst taking a worthy approach to the idiosyncratic task of interaction design, it was a cluttered player system designed to feature many options. Such an approach is likely to discourage or frustrate the casual or first-time user of a system (Preece et al., 2002) 29.

As an experimental system, *Hyper-Hitchcock* was tested and evaluated as an authoring rather more than a player system by the Palo Alta team using several groups. It was the only functioning hypervideo authoring system extent and though email contact with the lead author, Frank Shipman was successful, proposing access to the system for further sets of experiments, a referral to the company who owned the research and the system, FXPAL in Palo Alta, produced no response[7].

5.4.8 Precepts as Propositions

One of the conclusions arrived at by the Hyper-Hitchcock team was: *'Rigorously following a particular design pattern so that the hypervideo structure is predictable may help'* (Girgensohn et al., 2004). This precept I analysed from the representation of the *retrieval event* as using a grid shape and a series of mnemonic prompts.

The sketch of the hypothetical model is a 250 square metres of ground of 50 x 50 metres dimension ('Piece Park') with a marker embedded on the movie at each 10 metre interval, of the 10 movies that describe the entire grid (fig 5.16). The gesture to the top of the screen runs the movie forwards, to the bottom of the screen running the movie backwards, thus allowing in the control system the ability to navigate – More-Same-Less (MSL) - to any of the bounded squares.

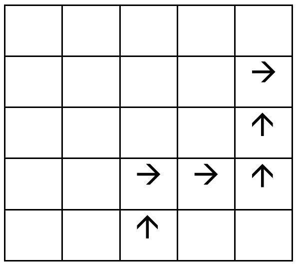

Fig. 5.16: Retrieval event from Piece Park grid pattern

The interactive retrieval event combines knowledge of the shape of a grid with the shape of a coordinate, (for instance, to the right by the fence, confirmed by the presence of a specific object). Such a 'literal' interpretation of the predictability pattern for browsing and searching – the grid - can be seeded as tacit knowledge presented at the outset of the browsing process: we know that through a combination of turns to the left and the right, we can move diagonally across a grid pattern or shape, to its far corner.

If the grid is a pattern of inner city streets, this could be also achieved using a map but, from prior experience, we know we have a reasonable chance of arriving, using trial and error and an explorative spirit. We navigate the grid, counting or noting the turns as we go, or simply recognising and remembering visual features along the way: the pub on the corner, the bus stop near the red house, the traffic lights at the main road, etc. The shape of the grid is augmented with this information. This acquired knowledge we can use to retrace our steps, or intuitively follow alternative routes using a combination of learned knowledge transcribed into the overall bounded area in the shape of the grid. It is an example of Baddeley's visuospatial sketchpad, (see section 2.2.4), and the means by which at an everyday level, Suchman's 'situated action' occurs (Suchman 1987).

In discussing the emergence of patterns in hypertext usage, particularly websites, Bernstein uses the conceptual metaphor of a neighbourhood. Though specifically concerned with the design of links between blocks of text and graphics, visual motif often reinforces the identity of such places:

> A Neighbourhood establishes an association among nodes through proximity, shared ornament, or common navigational landmarks …. a prominent church spire shows a walker that two spots separated by long winding streets are still in the same neighbourhood..' (Bernstein, 1998) 25.

He makes a distinction between 'neighbourhood' emphasising *'the presence of patterns of meaning in the hypertext'* while Rosenberg's formulation of '*episode'* places *'greater emphasis on the experience these structures create in the reader's perception'* (Rosenberg, 1996)

On a more abstracted level, orientating in a strange setting using so-called primitive shapes, we can superimpose on the information terrain a pattern for movement through the space, in this case a city district of a grid of streets.[8] We know how to 'walk around in circles'. The triangle, as we have prior knowledge of how the intersections would appear, guides us in diagonal navigation of the neighbourhood, extending the search in the classic pattern of triangulation. Combined with a grid we can anticipate conceptually the shape of lines as they cross these boundaries as an aid to spatial orientation.

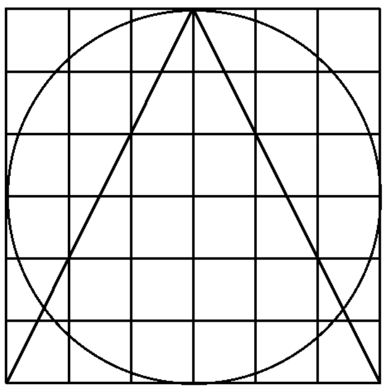

Fig. 5.17: Primitive shapes as an aid to spatial orientation

For interactive principles to be modelled using mnemonics as a relational device in the models to be built, video footage captured to the computer and prepared using non-linear video editing tools are rendered to individually named files as primary data.

5.5 Primary data

Gathering primary data was achieved with a series of models and artefacts, designed to explore taxonomies based on visual mnemonics for storage and retrieval of digital video. Whilst the theoretical issues described in Chapters Two and Three informed progression through the practice-based stages, the literature survey is attenuated at this stage. In the words of hypertext researcher, Mark Bernstein: *'we need to describe phenomena, whatever our theoretical beliefs.'* (Bernstein, 1998)

Seven experimental and Test Models were built between September 2006 and May 2007. This was to be achieved employing a customised design support tool based on the *Pathscape* Director framework. The initial specification for the Model framework guided my research programmer, Adam Hinshaw, in building what we called the Mnemovie Engine. It was to operate as an interactive system addressing external video movies – the collection - and an instruction set contained within an XML-file. Video material was gathered prior to the build of the engine.

5.5.1 Video shooting and post-production

Interaction in the initial *Lanes* Model is not only about navigating information but also the spatial representation within which information is embedded. It uses the video output from two video cameras, simultaneously recording the view whilst walking through each street of an inner city district, giving synchronised 180˚ coverage. Following the matrix of the street plan, each street is recorded from one end to the other. Following post-production and authoring of the video files, the interactive participant is able to navigate up and down and around the seven streets that comprise the precinct. The indexical device is the familiarity with 'grid' street pattern of residential areas – 'turn' left, right, go straight on, or turn around and retrace steps.

The video material was shot using a specially adapted camera mount, with one camera pointing forward, the other identical camera pointing backwards (Fig 5.18).

 

Fig. 5.18: Two-camera handheld mount, with wireframe viewfinder.

Recordings were made over the period of a few hours, each camera running for 10 seconds at the beginning and end of each street walk. With the video captured as files to the computer – forward and backward view – using non linear video editing (NLVE), each file was aligned to image match the beginning of each take, before being trimmed to have the same duration. The file showing the view behind the direction of travel, whilst showing the 180˚ viewpoint, also was moving away from the point of departure. Within the precept, it would be necessary to return to the point of departure, so the file was simply re-rendered in reverse using NLVE.

5.5.2 The Mnemovie Engine

The specification for the *Mnemovie* interactive Engine is based on an interactive paradigm for navigating the *Lanes* movie collection (Appendix 8.18: Iterative Progression – Propositions and Resolutions). The complexity of this specification relative to the other paradigms identified, (Appendix 8.13: Mnemonic Paradigms – early notes), enabled the Engine to be used for various less complex experiments. Six items were listed for discussion with the research assistant charged with programming, including earlier considerations concerning tacit knowledge structures as an approach to navigational structure, *'..the image of a grid, or a triangle, or a series of intersecting circles/loops'.*

The specification was informed by:

- Iterative development by other research projects already discussed, of Hypermedia theory relevant to the mnemonic movie precept;
- Hypervideo results obtained by other research projects;
- Analysis of the *Pathscape* prototype, the adaptation and re-use of some of its framework in detailed discussion with the Research Assistant.

The outcome of these initial discussions revealed what was to be viable within the time and budgetary limitations. The conceptual model of the system would move away from hard-coded ‘content’ to a modular and externalised framework, (.mov, .swf, .dcr files), subject to an “external importation routine” incorporating an XML file, *“..more extensible to handle growth of later versions.”*

Later it was found that the RA’s approach had more recently adopted by other developers whereby a:

> “…presentation engine allows content authors to describe … content through associated XML files. Interpretation of those files, content layout, and all … communication is automatically handled by the presentation engine. The content is described external to the application, creating a natural separation from the … interface.’ (Mentor, 2006)

In Fig. 5.19, the conceptual data model for building the *Mnemovie* support tool comprises the software framework, the presentation engine and the media directory.

Root Directory of Model	Presentation Engine	Media
Mnemovie b3	• MNEMOVIE (application) • Mnemovie.dcr • movie_data.xml	MOVIES (video files directory)

Fig. 5.19:Table of Mnemovie conceptual data model

Media files are prepared using NLVE and saved with consistent resolution and frame size into the directory. The .dcr file compresses specification data for the Director application. The file movie_data.xml contains a description of the tags and the layout of the program source code specific to the manipulation of the movie files contained in the adjacent Movies directory. The modular construction of the source code enables the researcher to expand the scale of the instruction set according to the requirements of each experimental Model.

The XML-file structure throughout was based on a binary system of motion picture representation - Forward and Backward. Semantically, however, there are further distinctions concerning the pro-filmic space of the image frame, according to the Model to which it is applied (Fig. 5.20).

Binary	Semantic	XML tag	XML value
Forward ↑-gesture	looking forward; moving forward.	dir=	“F”
Backward ↓-gesture	turning through 180˚ and looking (behind); moving forward (behind) reversing the motion picture	dir=	“B”

Fig. 5.20: Table of motion picture direction semantic.

The semantic outcome is according to the movie saved into the Movies directory, not through instructions generated by the instruction file. Thus Forward and Backward movie files are essential components in each <track>, the ‘base unit’ in the XML-file structure. Each <track> has a <movie id> for the Forward motion movie and a different <move id> for the Backward motion movie. In Fig. 5.21, data recording the links affecting other files are contained in each <track> with the <link> tag (“L” or “R”) to make the link to the Left or the Right of the picture area, within a range specified by the time-code (TC).

Binary	Semantic	XML tag	XML value
Left ←-gesture	Link to	<link side= start_time= end_time= movie_id= link_start_time=	“L” “00.00.00” “00.00.00” “00” “00.00.00”
Right →-gesture	Link to	<link side= start_time= end_time= movie_id= link_start_time=	“R” “00.00.00” “00.00.00” “00” “00.00.00”

Fig. 5.21: Table of Left / Right gesture as motion picture linking semantic

The file to which the link is made uses a movie_id convention addressing the Movies directory in the same string.

Mnemovie Beta ver1.0 used the following structure (sample), showing the Forward (PZF) and Backward (PZB) files within the <track>:

```
<track id="PD"
        <movie id="PZF" file="movies/PulledZfore.mov" dir="F" ><!--F-->
                <link side="L" start_time="00:00:13" end_time="00:00:14"
                movie_id="11" link_start_time="00:00:00" />
        </movie>
        <movie id="PZB" file="movies/PulledZback.mov" dir="B" ><!-- B -->
                <link side="R" start_time="00:00:12" end_time="00:00:13"
                movie_id="R11" link_start_time="00:00:00" />
        </movie>
</track>
```

As experimentation progressed iteratively through the *Lane* experimental Model and the later series of models, the <link_> group of tags operating within the system were increased, offering additional linking possibilities for schema design, (refered to in the following section 5.6).

5.5.3 Resolutions and Propositions

Through a series of meetings and email communications, the *Mnemovie* engine moved through three Beta versions, each Model and Model iteration informing progressively the additional development of each Beta version 1 – 3. (Appendix 8.18. Mnemonic Movies: Iterative Progression – Propositions and Resolutions). Formal reports were kept of each stage, providing Secondary data based upon the Primary evidence and data, from which would be built the Practice and Test Models for later evaluation.

5.6 Mnemonic Movie Models and Secondary data

The production of Secondary Data from practice-based methods for collecting and analysing data employed a checklist of the key elements recorded:

- Initial starting points or motivation for the project or work;
- Prior models or theories about how to create, perform or realise a creative artefact, act or outcome;
- Time frame for the work or works created, performed, realised;
- Role of the creative artefact in the interactive process;

- Environments and tools required to achieve the output;
- Information gathered about the thinking, methods, tools, resources, support, collaboration;
- Methods for collecting and collating data;
- Methods for analysing collated data;
- Expected outcomes of the research process;
- Relationship of the practice outcomes to the argument of the thesis.

The secondary data was gathered during and following each iterative stage of each model, through further reflection on the success or otherwise of the paradigm presented. Does the taxonomical device function, as a way of retrieving a specific digital media file? Is there a limit to the size of the collection or quantity of files that can be addressed using each model? Or does it function better as an memory aid in a random way? How might this paradigm be expanded, or related to another? Could there be qualities in each that might combine to form a new model? Is there value to maintaining a text-based component alongside the visual system?

The checklist principles would be applied across a range of Model experimental scenarios. The characteristics of the movie collection within which hyperlinking would be created and the means by which linking could be indicated to the user participant, formed the basis of each experimental Model.

In the initial stages, shortcomings with the *Mnemovie* framework required programming alterations to be made, resulting in three Beta versions being developed between September and November alongside the development of the initial Models. The process of developing each Model was tracked using a Report template addressing: Objective; Materials; Method; Observations; Issues Arising: technical, cognitive, creative; Evaluation against Objectives; Resolution / Reframing; Proposition.

(A example of the Report template in Appendix 8.20: Mnemonic Movie Model Report (Sample), demonstrates how the template was used). Fig. 5.22 is a summary of the Models, their attributes and stage of development attained.

Title	Attributes Summary	Stage / end Date
Lanes (GRID)	GRID shape: Forward/Backward (as 180˚ POV); L/R: turn corner; or launch 'object' mnemonic.	1st 12.9.06 2nd 9.10.06 3rd May 2007 (Test Model)
Drawers (PRACTICE)	GRID shape: Forward/Backward (as reverse motion); L/R: drawer 1-20; 'object' mnemonic in drawer; narrative about object.	1st 14.9.06 2nd 28.9.06 3rd May 2007 (Training Model)
Clock	CIRCLE shape: Forward/Backward (as reverse motion); L/R: position of clockface hand and background colour as mnemonic to launch link.	1st 19.9.06
Menu Loop (CIRCLE)	CIRCLE shape: Forward/Backward (as reverse motion) of 'skimmed' movie; L/R: L = whole movie; R = next movie;	1st 4.10.06 2nd 10.10.06 3rd 10.11.06 4th 20.11.06 5th May 2007 (Test Model)
Morph Pans	CIRCLE shape: Forward/Backward (as reverse motion) of 360˚ pans; (from Pathscape zone pans)	1st 5.10.06 2nd 17.10.06
Forest	CIRCLE shape: Forward/Backward (as reverse motion) of 360˚ pans; L/R: line-of-sight link to neighbouring pan	1st 9.2.07
Line (LINE)	LINE shape: Forward/Backward (as 180˚ POV); L/R: launch 'object' mnemonic.	1st May 2007 (Test Model)

Fig. 5.22: Table Summary of experimental Models, Test Models and Practice Model.

The following sections 5.6.1 to 5.6.6 are a summary of the Reports, presented for each Model. As can be seen in the table above, dates indicate that work progressed in parallel across several Models, as each beta version of *Mnemovie* became available. (The complete reports as PDFs can be found on the DVD-ROM, Item 4.)

5.6.1 Lanes

The parent movie is a continuous walking track along each of the streets - the ↑-gesture runs the movie forward, the ↓-gesture turns the viewpoint through 180° and returns (Fig 5.23). Using the ←-gesture or the →-gesture will:

- when adjacent to a street corner, a link to the movie viewpoint of the adjoining street is effected – the movie becomes the ‘step parent’ and the ↑-gesture and ↓-gesture is used at this point until the next corner is reached; it becomes possible to ‘perambulate’ the intersecting grid of streets from a forward moving POV;
- when <u>not</u> adjacent to a street corner, it becomes possible to link to one of the child movies, relational to its Location on a section of the street.

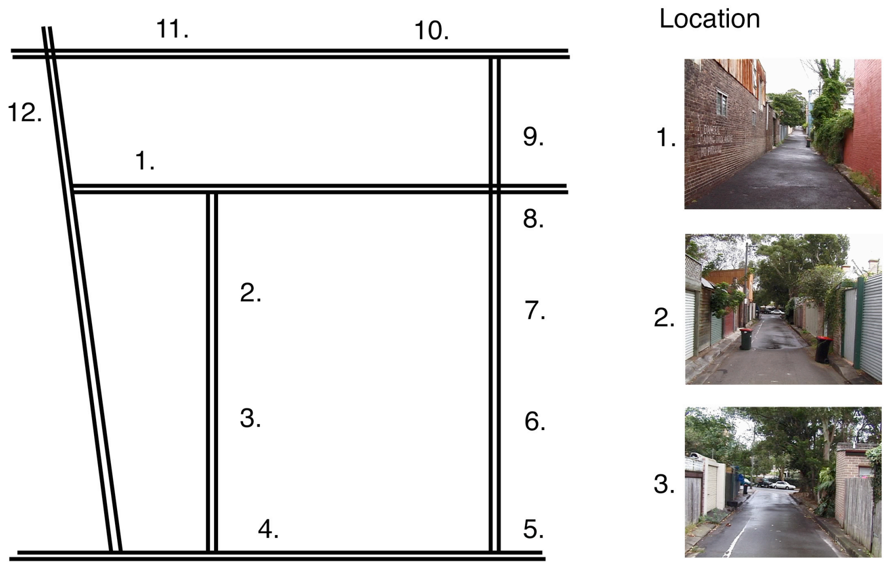

Fig. 5.23: LANES - the Location movie frames represent the ‘parent’, what the interactive participant sees, navigating Location 1 to Location 2 etc. Each Location is linked to a ‘child’ movie. (The map of the inner city Grid of streets, as seen on the left, is the concept schema for authoring the parent / step-parent.)

First Iteration (Beta1: 1 – 12.9.06)

The initial objective was to prepare the individual movies and the XML-file to enable interaction with the movie image and thereby navigate the intersecting streets. The issues arising were considerable with this initial version of the engine and the preparation of the XML code and reflection concluded:

i) sound needed to function;

ii) at the end of a movie file, no further interaction was possible: additional link required at movie end either to a ‘step parent’ or to the return (Forward or Backward) movie. (Some links seemed erratic – later found to be XML coding errors).

iii) size of image and excessive movement on screen lead to excessive foveal activity. (Nausea inducing and specific to the method of recording using a hand held camera: size of the image on the screen needs to be definable in the code. Also conducted a series of tests on movie codecs to optimise motion and launch qualities).

iv) The locations activated by Left/Right (L/R) gesture to link to a child movie could be extended from static physical attributes (street signs, housing characteristics, parked cars, etc) in the street, to incidents. Dynamic attributes, such as the movement of parking or manoeuvring cars, people walking through the frame, could become ‘portals’ to similar incidents occurring <u>outside</u> the grid – an incident could become a means for linking different grids (neighbourhoods) together.

Observations were also made concerning the actual authoring procedures being used. Initial working with XML structure is time consuming, necessitating having four movie screens open on the desktop at a time to be able to gather the time-code (TC) for the start_time / end_time data required for each link_start_time (see later, Fig.5.36: Morph Pan). A table was devised for this purpose to separate the TC gathering and the TC XML entering processes. (Appendix 8.19: MneMovie Timings : Left / Right + Continuation Links). A further analysis led to sketches for an authoring interface tool to speed this process, (Fig 5.24) later confirmed by my colleague Dr Amitani as a design that could be built as a Java API. Resources for building such a tool were (unsuccessfully) sought.

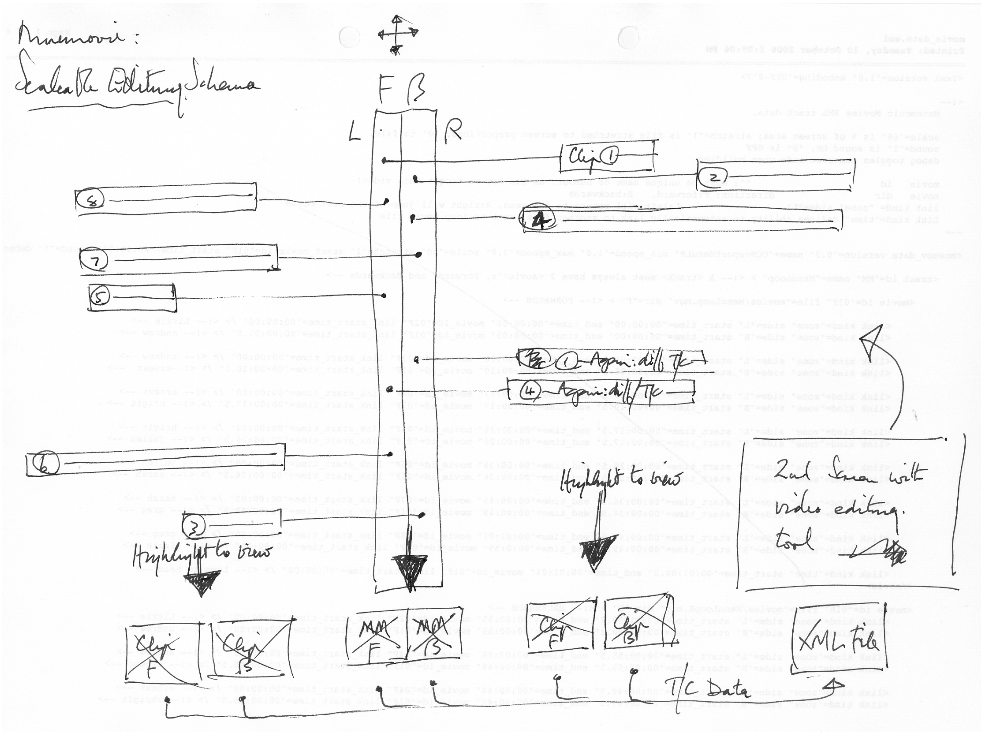

Fig. 5.24: Sketch for authoring interface

Second Iteration (Beta2: 4 - 9.10.06)

Began using Arrow keys for interaction - the mouse was proving to be awkward as larger areas on the screen now set-up as hot spots. Henceforth, the ↑-key will run the movie Forwards, the ↓-key run the movie Backwards. Using the ←-key or the →-key activates the Left or the Right linking, improved interactivity and the sense of immersion in the picture space. The mouse remains as an optional interactive device.

Screen size setting, sound and auto-linking at the end of a movie file are great improvements. Some experiments were also conducted using the Macintosh voice command feature, using the terms ‘To’, ‘Away’, ‘Red’ and ’Green’. Overall reflection was that the system is quite stable once XML-file is set, a straightforward process but excruciatingly tedious to prepare without the aid of a simple API tool to speed the authoring process.

5.6.2 Drawers

Developed from earlier theoretical considerations – see section 5.2.8 - the ‘real world application’ example becomes the basis for an interactive motion picture version, again using the Grid shape, related to the tacit cultural ordering systems learned in the physical world. It was realised during the first iteration that this ordering is not the same in all cultures.[9]

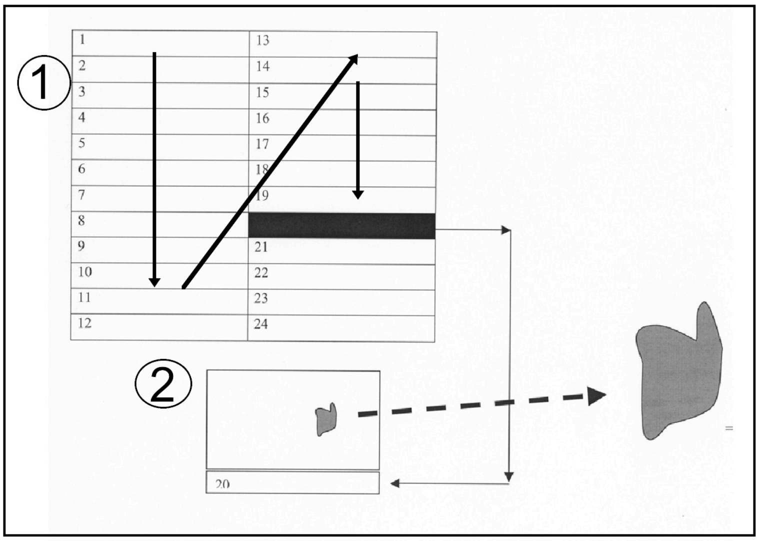

Fig. 5.25: the chest of Drawers object retrieval schema.
1 – drawers; 2 – drawer (No 20); 3 - object. Lines represent sequence of (interactive) events.

The grid pattern of drawers interaction design stimulates spatial memory to provide access to the drawer contents. This is a visible shape, a systemic mapping, rather than a conceptual shape, 'held in the mind' as a mapping system as in *Lanes*. It is a grid applied vertically. Whether an office block; or the front of a chest of drawers, each level of which contains myriad objects, (*der wunderkammer*), or related stories and recorded narratives.

Each of the three stages in the diagram above are recorded on video as separate video recordings (takes).

1. The Chest of drawers: an animation of each drawer opening in turn for one second (25 frames), drawer number 13 is selected.
2. Drawer number 13 (example), showing various contents of the drawer as it slides into view from the top of frame (shot vertically). There is a pause of a few seconds, to allow selection of an object, then the drawer is removed out of view to the top of the frame. (This is repeated for each of the 24 drawers in the above schema).
3. A short narrative about each object in each of the drawers is recorded to video, structured as an explicit narrative.

First Iteration (Beta1: 1 – 14.9.06)

Before assembling the individual movie files in the media folder, the problem of selecting a static object in each of the drawers had to be solved. This would be achieved in the post-production environment of NLVE (Final Cut Pro), combining an animation movie with the images captured from the videotape.

A graphic gauge superimposed with the movie, enabled time-code (T/C) data to be gathered at the point the guage aligned with an object in view. Three versions of a gauge were made with an animation tool, (Macromedia Director), output as movie animations of white on black for later compositing in FCP with movie files:

i) Concentric Circle: (Fig 5.26, 20-second duration)

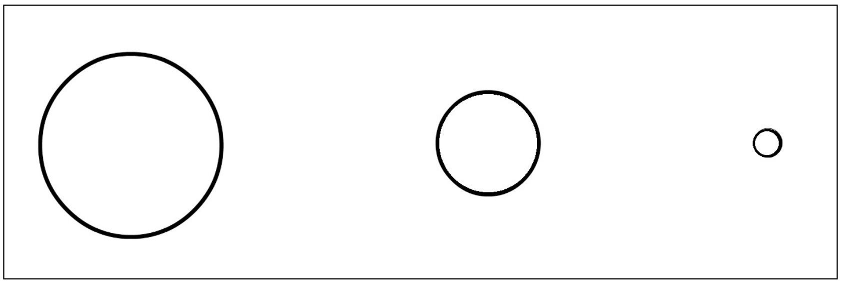

Fig. 5.26: Concentric Circle moves from filling screen to a dot in the centre; left to right, T/C data:

01.05 10.00 18.05

ii) The Spike: (Fig 5.27, 10-second duration)

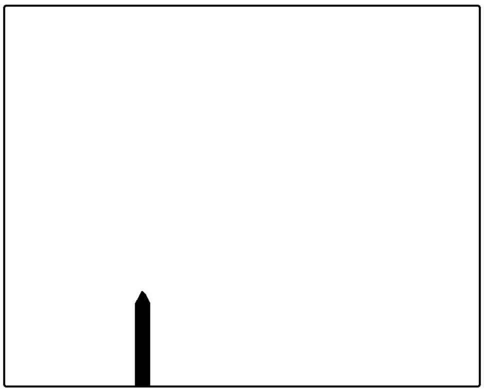

Fig. 5.27: Spike moves from left to right of screen in 10 seconds – position illustrated is for T/C data 05.05.

iii) The Scanner: (Fig 5.28, 10-second duration)

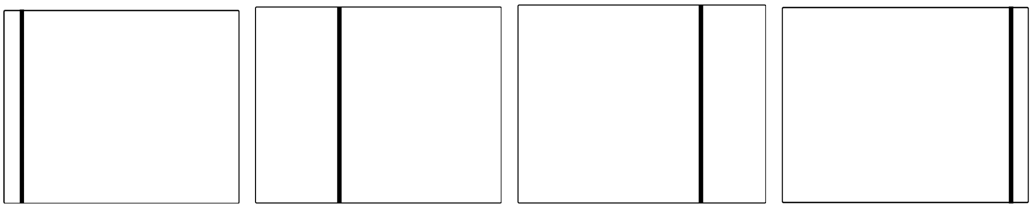

Fig. 5.28: the line moves from left to right of frame in 10-seconds – position corresponds with T/C data 00.00 – 04.05 – 08.00 – 10.00.

The latter ‘scanner’ graphic gauge was selected for combining as a superimposition with the drawer contents movie file, using the NLVE tool (Fig. 5.29).

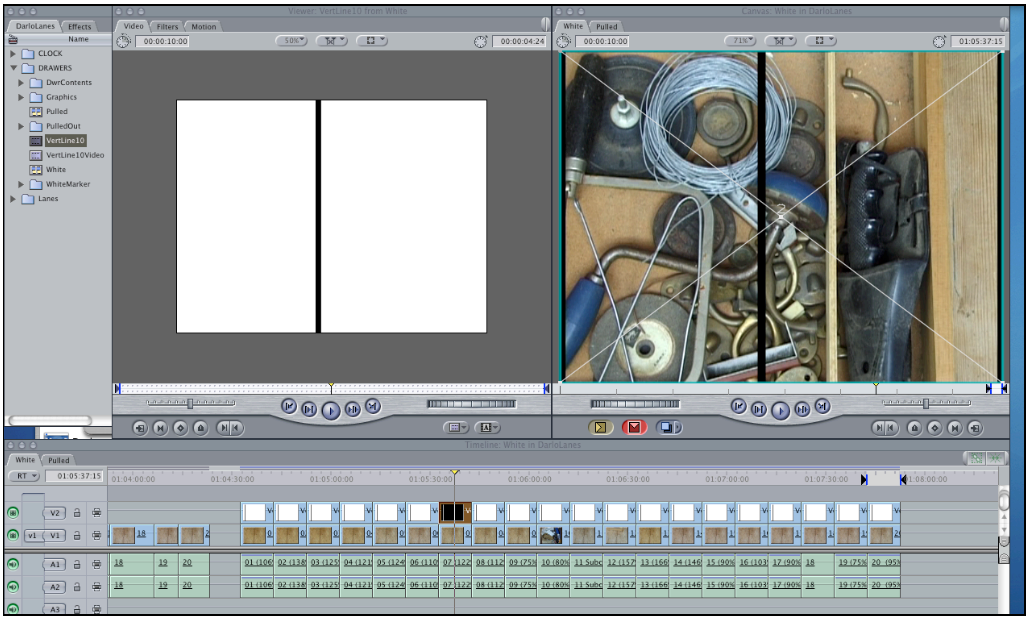

Fig. 5.29: compositing of graphic gauge scanner line with movie in NLVE tool. Left-hand screen: graphic gauge scanner movie mask. Right-hand screen: composited image. Beneath is the Timeline, with 20 ‘drawer movies’. Top to bottom of lower part of screen beneath viewer windows: graphic gauge scanner movie mask (white); movie image clips (Brown); two channels of stereo audio (green).

Each movie, (represented by four oblongs top to bottom of the timeline), is exported individually. The appearance of these movies includes a black vertical line moving from left to right across the screen area (see centre panel in Fig. 5.30). As the line coincides with an object in the drawer, so start_time and end_time T/C data in the XML-file enables interaction with the system, using the ←-key or the →-key to perform a link with the specific file in the collection of drawer content movies that tells the story of the object selected.

Fig. 5.30: Drawers Model navigating a movie collection about the contents of a chest of drawers.
Each movie frame shown, (l-r) represents the moment at which a link can be effected. The position of the vertical line (the graphic gauge scanner), in the centre movie, superimposed as it moves left to right, enables selection of individual objects in the drawer, about which stories are related (third frame).

Second Iteration (Beta2: 27 – 28.9.06)

On a cognitive level, articulation of the information space in *Drawers* combines three forms of visual memory based on shapes, which are regular, irregular and proportional:

i) regular – the 'vertical grid' of the chest of drawers, with oblong proportions as the mnemonic that 'takes us to' the specific drawer;

ii) irregular – the 'mess' of objects, like the 'objects-under-the-sheet' game, next to one another in a specific kind of way, patterned into the remembered image of the entire drawers contents[10];

iii) proportional – objects which are related to the shape of the drawer and the interlocking shapes made with neighbouring objects.

Is recall based on an image of the object, or a recall of the story with which it is associated, as related, as imagined?

The ability to vary the speed of the movie – up to three times normal speed – using the position of the mouse on the image, has been made switchable in the Engine to be 'true/false', a setting option in the XML-code. This is useful as one of the issues with running movies fast or slow is the affect it has not only on the movement of objects – slowed or speeded motion of humans never fails to amuse – but the affect on sound reproduction. (Are these distracting outcomes, or reminders that we are dealing with materials that have no prerogative to maintain an illusion of verisimilitude? As Victor Burgin has observed, *'narrative aspects fall away and the image remains'* (Burgin, 2004). Together with the capacity to link to another file at the completion of the one in view, this beta version has made it possible for the system to operate as a self-managing system until interaction is detected. However, for the present, min_speed and max_speed are both set to "1.0" to maintain a constant 'sound speed equivalent' of 25 fps.

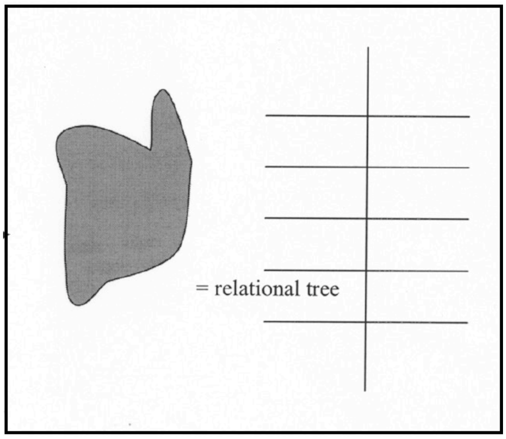

Fig. 5.31: Interactive schema (implicit).
'an object' video loop, to a 'relational tree' of 'off-structure' links

The object 'retrieved' from the drawer in this way becomes the subsequent hypervideo object. Operating in a way similar to the array of objects in the drawer, the 'relational tree', provides (potentially) links from spoken word, or 'image moments', as references to further video files in the collection. Initially explored, once learned, Baddeley's visuospatial sketchmap (Chapter 2.2.4) becomes useful for retrieving the contents of the drawers, the objects and the recorded memories associated with them. The precept establishes the potential for rich story-telling based on episodic memory related to object mnemonics with the additional possibility of interaction with the narrative and branching off, using the same linking commands. Meanwhile, another idea for an approach is considered – the Clock.

5.6.3 Clock (19.9.06)

The shape of the Clock face is the parent, or 'index movie', indexically dividing time and relationally space. This is indicated through the division of the area of a circle into 60 minor divisions and 12 major divisions. A movie loop reproduces this shape endlessly, (as does a clock). In this Model, a 24-hour period is indicated with the passage of light across a background. Thus each hour can be located within the elapsing day or night.

Perceptually does light to the right of frame signify ‘the east’? Is the solar occurrence in the southern hemisphere when facing the equator? In the northern hemisphere when facing the equator, the sun rises on the left of frame. Is this intuited whichever hemisphere we are familiar with? Does the colour yellow at the beginning and red at the end reinforce these ‘bookends’?

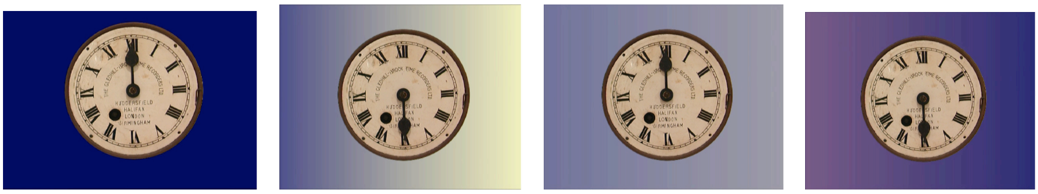

Fig. 5.32: Clock face and colour gradient background

With this Model, the experiment was conducted with the 12 major divisions of each hour. Thus the materials were eleven still photos of a clock face with each hour set, together with an animation of a colour gradient moving across a white background. The animation was made in Director, exported as a DV movie, imported into the NLVE tool and combined with twenty-four images of the clock face. As a composited image this was then exported as a DV size movie (see Fig 5.32).

The potential of this parent movie waned as its hands continuously circled the clock face though the light moving from right to left of the background and the positioning of the hand on the clock face, combined indexically to locate time of day through from midnight to midnight. The symbolic numbering reinforced placement of time and space but is not essential to reckoning. It was reminiscent of the grandfather clocks that contained part hidden images of the seasons of the moon, or images of the seasons, as visual indexes of where in the year the 12-hour clock had reached.

The movie *‘24 hours’* (1983) was considered as the child movie to link with, but was deferred at this point. However, the Model prompted questions about the circle ‘shape’. The circle divided by the hands as a clockface could also be a spoked wheel lying on its side, or a compass, dividing the topography indexically between degrees of arc. Pervasively, the simple image of the ‘circle’, in motion picture terms, becomes the material ‘loop’.

5.6.4 Menu Loop

The shape of the Loop, (or the linear viewed outcome of a video file joined tail to head), is the Parent. The motion is very fast but is able to be read as "speeded up". It is a sampled or 'skimmed' version of six 3-minute ' mini-docos' containing talking heads, diagrams, demonstrations of interactive research installations, etc. The loop enables the user to launch movies, choosing from the six 10-second extracts in the loop, with control of forward and backward movement. This is goal orientated searching, similar to Hyper-Hitchcock's *detail-on-demand*, but based on an image being recognised – a face, a project – on the first run through, as a rapidly moving thumbnail movie. It functions as symbol to the user familiar with the attached 'children', or as an icon or index to the user <u>not</u> familiar with the child movies.

First Iteration (Beta1: 1 – 4.10.06)

The movie collection is six mini-docos, each about 3-mins in duration, about the work of Creativity & Cognition Studio researchers, from which representative extracts are duplicated and assembled into the parent Menu Loop.

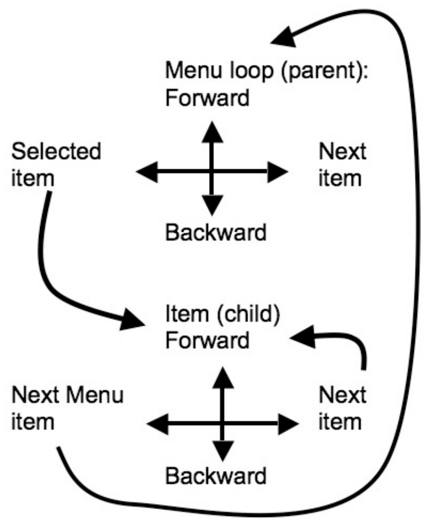

Fig. 5.33: Circle as Menu Loop, interactive schema

The schema is for both the parent and child movies to run forward with the ↑-key, the ↓-key running the movie in reverse. Using the ←-key or the →-key will link from the visible extract in the parent to the child. Exiting using the same keys, back to the parent.

Resolution / Reframing re-maps in the next version to launch from: in the parent Menu Loop – ←-key to the child Item, or skip to the next item on the loop with the →-key; in the child Item – ←-key back to the Menu Loop, or skip to the next item on the →-key.

(In the this first Beta version, looping was not yet possible and defined as a need, thus experiments were conducted with a linear version in this iteration).

Second Iteration (Beta2: 9 – 10.10.06)

In this iteration of the Engine it becomes possible to loop the parent Menu Loop, as an option in the XML-code. Launching child movies with the ←→-keys worked well. Though the intervals for 'capturing' the child from the parent were quite short, using the keys rather than the mouse improved accuracy of navigation. Once the key (or cursor navigation) is learnt, this is a rapid way of moving through movie material, but when this parent is fully populated, what would the limit on the number of children be? As it is goal orientated searching, it is also the kind of material that would work as a demo on a PVP (Personal Video Player – 5.3.3).

Third Iteration (Beta3.2: 9 – 10.11.06)

The parent Menu Loop is based on a 10-second 'sample' made by compressing the duration of each 3-minute item using the NLVE tool. The images seen were therefore entirely random, with selection on a 1:18 ratio, or 2006% reduction of data. However, each 10-second 'grab' left an image, a sense of the shape of each person's endeavours, in pictures and sound on the mini-documentaries.

Other observations made during this iteration included noting that movies needed to launch after link is made, rather than with slight pause as in *Lanes*, so further adjustments will be needed to be made to the Engine. Whilst adjusting the XML-file, the pattern of the code became clearer, reinforcing the possibilities of an automated or semi-automated authoring system – see next iteration.

The rapidly moving images contained in the Menu Loop causes auto-saccadic eye activity. Could this upset and irritate some users? Could it be solved using 'steady-motion' algorithms? Also, is it important to be able to stop the movie?

(By this stage the 4-way interaction function via the arrow keys became the preferred means of interaction with the system. It recalled to mind the remote controllers for DVDs, but also the interfaces for mobile phones, digital cameras, handycams, PDAs etc. – see more later in 5.7).

Fourth Iteration (Beta3.2: 20.11.06)

The parent Menu Loop ‘skimmed’ movies are reduced to just 5-seconds and are still legible. Using the acceleration effect possible when using the mouse can speed this up by three times. This could be useful where the user is familiar with the collection, or seeking of specific items is the search mode being used.

Could it be useful to the curator of the collection to produce a generic XML-file where filenames and durations are standard and the collection is swapped in and out if the ‘movies’ folder? Where a pattern of interaction is consistent and the collection is more functional, the same XML-file could be applied. The filenames and durations of each collection would simply need to comply with the names and T/C used in the XML-file, a task of careful movie preparation at the NLVE stage. These questions will be addressed further in the concluding chapter.

5.6.5 Morph Pans

The complexity of the authoring process is seen in the following Model. A screen grab in Fig 5.34, shows the nine separate windows that use the screen space.

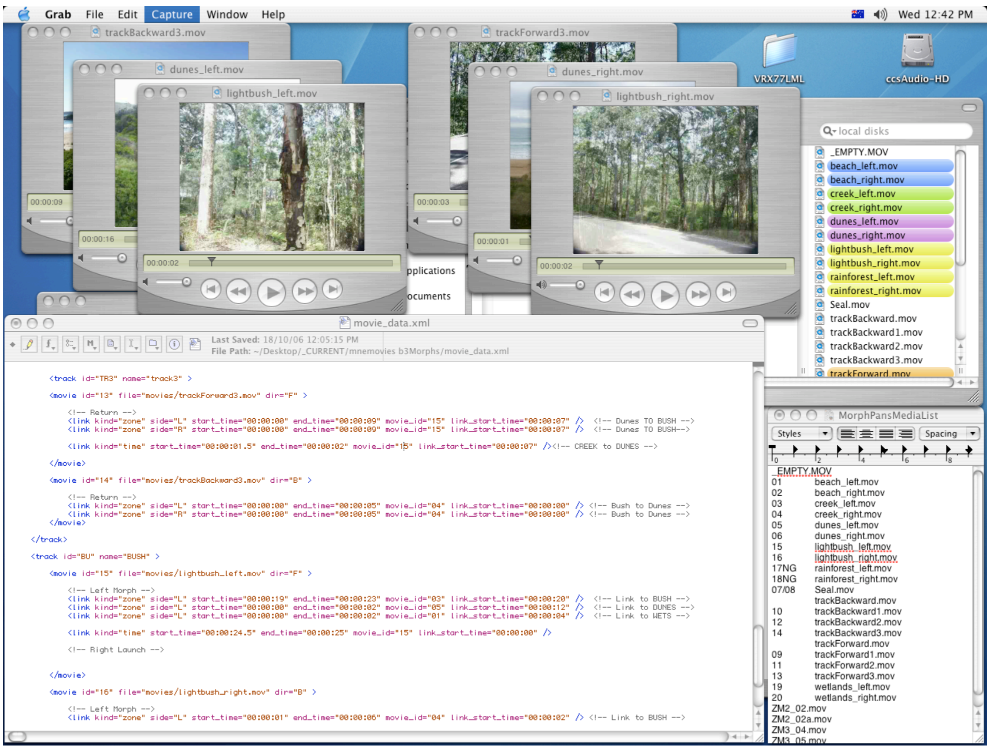

Fig. 5.34: Desktop set-up for authoring Morph Pans.

From top left in Fig 5.34, three cascaded Quicktime windows showing Backward movies: i) Bush pan ii) neighbouring Dune pan iii) linking tracking shot. Next to them, three more movie windows display the Forward movies. In each window is visible the time code T/C for each frame of the movie, and controls for playing, inching etc. The T/C data is copied, by hand and eye, into the line corresponding to the link required in the XML-file in the larger window below (using BBEdit). The smaller window to the right lists the <movie id> number and the filename, held in the Movie folder displayed in the smaller window above.

First Iteration (Beta2: 5.10.06)

The shape of the Spoked wheel lying on its side, (previously discussed in *Clock*, 5.6.3) proposed dividing space relationally, using movies representing 360˚continuous pans linked to other pans in other files. In this approach, the linking options places each of the 360˚ pans in proximity to one another.

This is not goal orientated searching but a way of experiencing being in the landscape through control of movement on the screen and the kind and variety of landscape representations in movement. Interaction explores the range of spaces available and then uses mnemonics to return to a group of linked files to 'work' with them further. Linking is set to move from one pan to the next at the visual line-of-sight, when the position from which a neighbouring pan was shot is visible (Fig 5.35).

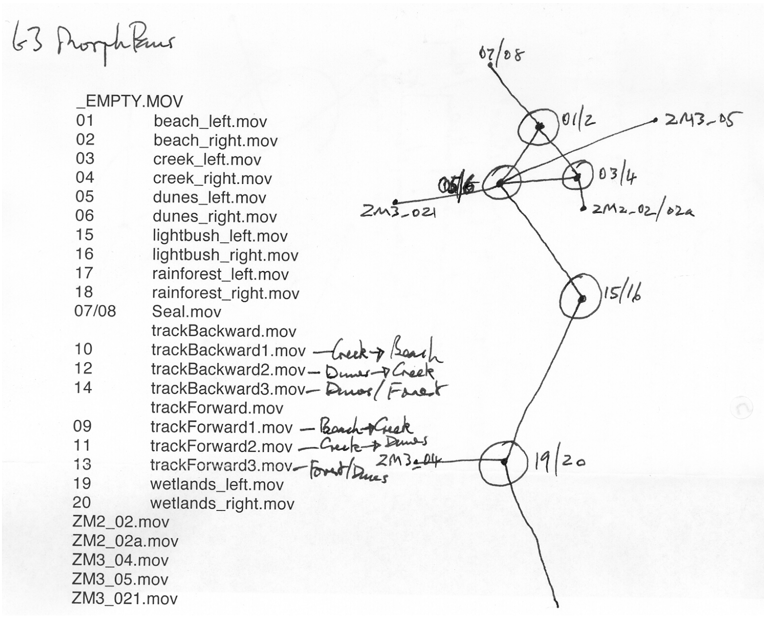

Fig. 5.35: Morph Pans sketches
Linking is set to move from one pan to the next at the visual line-of-sight when the position from which a neighbouring pan was shot is visible.

Morphing pan movements are very fluid and easy on the eye, (compared to the hand-held camera of *Lanes*), even at full screen. Reframing adopts the rule that the link joins the visual line-of-sight with the neighbouring pan's corresponding position in the pan of the landscape: the effect of this will be to 'magnify' the landscape from one pan to its neighbour.

Second Iteration (Beta2: 16/17.10.06)

There is a magnifying effect of linking pans when pointing to the same part of the compass - tracks and adjacent files are now all linked. The pixilated nature of the images – expanding small files up to big ones – gives a kind of watercolour finish to the movie movement. A final adjustment to the movies caused them to run more evenly, thus slowing the whole interaction to a gentle correspondence between image movement and gesture.

As with 4th iteration of Menu Loop, the XML-file could be set up with a regular set of 'shapes' to be interchangeable across domains, (subject/topic area, topography, collection). Standard distances and compass directions between pans causes the shape of interlocking circles to be particularly apt for the next Model.

5.6.6 Forest

'Lost in the woods' is a thematic approach taken with the Model, again using the shape of interlocking circles but shot with a different strategy. The interactive strategy is to find our way out using the surrounding trees as waymarkers between one part of the wood and the next. This involves memorising distinctive features in order to move through the space in a constant direction. Following on from ideas prompted in the previous Model, the series of 360˚ pans were made in a gum forest[11] – it was a windy day with clouds covering and revealing the sun. The strategy was to spread the pans out over an area of about 60m X 60m, roughly following a grid pattern.

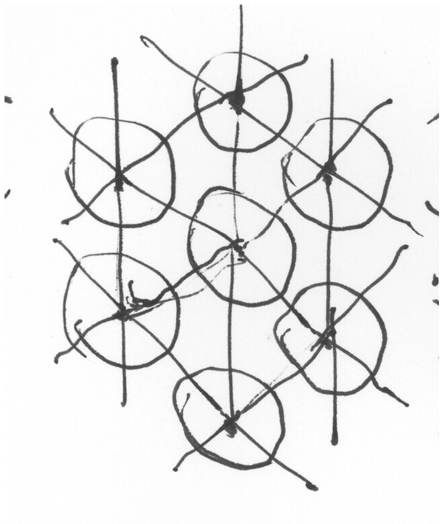

Fig. 5.36: Forest – plan: standard distance and compass direction for pans grid.

The ‘line of sight’ approach successfully demonstrated in the previous Model (*MorphPans*) was adopted in a more advanced and complete form, this video footage being shot specifically for the purpose. However, examining each movie once captured into the computer, to identify visually coinciding files, was time-consuming and tedious – like looking for needles in a forest!

First Iteration (Beta3: 6-9.02.07)

Entering the data into the XML-files became equally tedious. Eventually the system functioned well enough to be able to ‘move through’ the forest. Though this was tricky to achieve - having to find each wheel-spoke that connected to the adjacent pan - there was both a sense of moving through and getting lost, circling back, going round again. But the feeling of forest and the Australian Bush without dimension, envisaged on the big screen in a darkened cinematic space, was tangible.

In the final chapter I return to taking this, the last of the seven experimental models, further.

5.7 Reflective Summary

Within the allotted time span for these new studies, what has emerged from the observations recorded and the propositions advanced? They can be summarised as:

- Researching extent theory concerned with practice-based research and hypertext practice;
- Reframing hypertextual theory;
- Reframing landscape as an indexical system;
- Reframing spatial relationality;
- Building a repertoire of interactive paradigms, and system propositions;
- Building a repertoire of tools for authoring hypervideo;
- Building a repertoire of experimental models;
- Reflection and reframing of models.

The process of developing the experimental models, as anticipated in the methodology, produced predictable and unpredictable outcomes. Initial amongst the unpredictable occurred during the transition from interaction effected using the mouse to the arrow keys, preferred from the second Model onwards. It was observed that physical gesture, at least in the experimental stage, does not imply physical bodily movement, even to the limited extent possible with a mouse traversing a 10-centimetre desk space. It was not until the second or third model was commenced that it was realised that even moving over such a limited space unnecessarily curtailed the ease and speed with which navigation of the motion picture collection could occur. The four arrow keys promised a more effective and immediate mode of interaction, echoing the arrows used in the initial sketch for interaction.

Using the mouse is a gesture with which users have become familiar over the years in many HCI design approaches. There was speculation as to whether the precept of effecting interaction with the motion picture images using the arrow keys could be assimilated by the participant. Until that is, we realised that the 4-way button operated gesture has become, in recent years, a familiar method for interacting with a variety of devices, such as the DVD controller and digital camera and mobile phone interaction, illustrated in Fig 5.37.

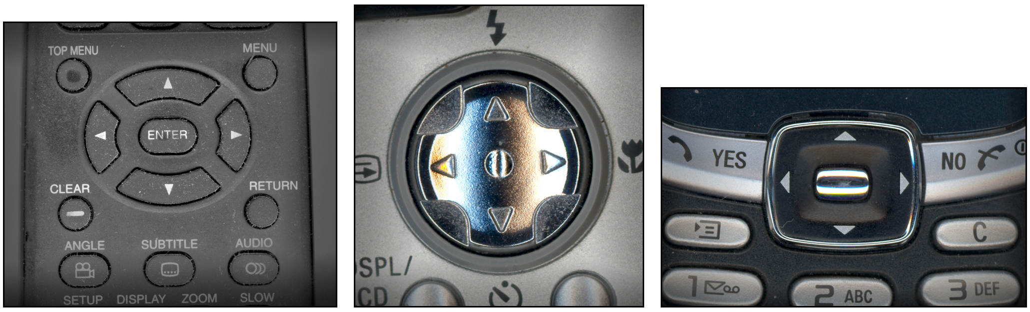

Fig. 5.37: 4/5-way navigator, l-r: DVD controller; digital camera; mobile phone

The Apple Video iPod had also just been released onto the Australian market in 2005 and though not a ‘true’ 4-way interactive device, approached the user interface design with the well-established Apple circular wheel principle. A combination of pressing and rotating enabled the user to scroll through text-based menus and select desired items stored on high visual quality video or mp3 sound. (The recently announced iPhone incorporating gesture and touch with movie viewing indicated the earlier iPod proposal was on the right track - see 5.3.3, also 5.6.4, 2nd iteration.)

Whether research has been conducted into the 4/5-way navigation device used in these and other devices was investigated. It was thought such information might be a desirable component for testing and evaluating the experimental Mnemovie Models. However, very little specific research had been recorded in the form of papers or articles, a fact confirmed by Thea Blackler at QUT whose paper (Blackler et al., 2005) and thesis came closest to the topic. [12]

At the final stage of building the Models, the chimera of a self-maintaining generic system returned for further reflection; a model able to be ‘re-loaded’ with a collection of movies – prepared of course to very precise specifications – selected and named to fit a navigational schema and ready, at the flick of a switch, for interaction, prompted notes that are discussed in the final Chapter. In the process of observing, reflecting and re-framing, moving towards a state whereby the objective of the enquiry is made more tangible to others at this stage of its progress, what remains to be done?

In the following chapter, a formal evaluation seeks to establish a different set of shapes – in the form of graphs, spreadsheets and diagrams - representing how a sample group of participants interact with four *Mnemovie* Models. A Practice Model and three Test Models, based on the seven experimental models, are evaluated using a combination of paradigms and techniques under studio laboratory conditions and conducted as comparative experimental studies. As the participant sample included people experienced to greater and lesser degree with movie files, the method included probing during interviews for responses based on participants' observations and reflection. It was anticipated that interactive behaviours and experiences not observable or measurable by the researcher, but revealed by observing a study group, would feed into the on-going process of planning further research directions and development of the *Mnemovie* system.

5.8 Notes

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[1] The name Mnemovie is derived from a conflation of the term 'mnemonic' and 'movie'.

[2] The author first used a personal computer c.1982, the Apple II+. At about the same time the Apricot series of personal computers appeared in Britain. It had early versions of word processing and spreadsheet software, none of which appealed to the author. At a trade demonstration, I asked the rep if it was possible to combine the two functions into one, so that words, sentences, paragraphs and drawings could be arranged in a kind of plan view. This was the way I had built up the *Image Con Text* project (see 4.3.4) and scripted the films *Vistasound* (1981) and *Friday Fried* (1981). The rep asked a few questions and said he's get back to me. He never did and it was not until hearing about *Storyscape* in 1993 that the concept I had described, no doubt often described to other reps during the intervening decade, was finally delivered.

[3] *Disorientation:* The change could be very slight. For instance, the rainforest is no longer flooded with sunlight. As we walk along the path, with the far distant landmarks obscured, we are as if in a fog, the relationality of visual clues as to our position in the forest broken. We walk using the sound of traffic coming from the highway, and the sound of outboard engines on the lake, as topological audio reference markers for keeping to a constant heading. After two hours we suddenly realise we are retracing our previous steps – we have walked round in a complete circle.
Memory signals imperceptibly a sense of disquiet initially, then the surroundings are inspected more closely for clues – has that view, that sightline through the trees, been seen before? (Not easy to tell in the Australian bush where variation is so subtle). That shape or turn of the path – is it a repeat? Footprints? Flowers? Finally, a tree stump near the path is identified as having been seen – it has a slice cut out in a particular shape. Confirmed. Memory confirms that time and path have looped.
Reorientation: Where to from here? Too risky to carry on the same path, the same thing may happen – now we know why it is people lost in the bush can sometimes walk in circles for ever, however hard they try, without a compass, to use 'dead'-reckoning. Can we risk turning around again and trying to find the way out? It's not like running the movie in reverse, the visual field will be different. Logically, look for the most likely turn to the outside of the circle we had just

completed. That should lead us back to the starting point. We choose correctly. We find our way back.
(The infamous case of the missing flight of P17 Avenger's in the Bermuda Triangle in 1945 was investigated using more recent knowledge of cognitive responses to navigational disorientation. There is often reluctance for the navigator to re-access their decisions, even when flying a compass course. Visual sightings are incorrectly interpreted and lead to doubts about the accuracy of instruments. As ill-informed conclusions accumulate, contradiction and confusion give rise to the abandonment of all rational thought – panic. The last radio contact with the flight of P17s had them flying east away from land into mid-Atlantic. Not so the author's experience of being 'lost in the Bush', recounted here).
Prosthetics: The sun was invisible, we had no visible constant, or index, with which to maintain a single direction. The dynamic symbol of a compass would have achieved such an outcome. Or the indexical well-worn pathway – this path had many indistinguishable turns. A broadwalk, ropeway, or handrail would provide an explicit solution. Some iconic signposts pointing the through path to the road on the other side of the valley would more likely imply an exit.
Or the technology alternative of a Personal Digital Assistant (PDA), or video iPod loaded with a record of the path – so that each sightline along the path could be compared with the movie rendition of the same path on the device, each branch of the path marked with a symbol to indicate the correct one to follow. It's ease of use could be easily tested by successions of bushwalkers, from novice to advanced.
Fictive space is a fabrication, an imaginative representation of a place that doesn't actually exist. Usually populated by people and their stories, fictive space can be a place populated by the subjective mind, an imaginary location. Just as the novel stimulates the reader to enter the constructed world as an observer, the constructed world of the computer-based installation proposes to the visitor a less vicarious or passive stimulation, but an active and interactive series of exchanges.
The interactive installation has the potential for the visitor to alter and effect the physical augmentation presented. Through design of the interface, the screen and its setting, the images and sounds encountered, the type and rate of change between each entity, has one goal in view – to stimulate the imagination and enact great interactive and experiential outcomes.
Why interaction?
Contributors interact with the *Geograph* topographic website by submitting photographs of the British landscape, locating each image using the numerical coordinates from the Ordanance Survey maps. Points are awarded for each submission and a competition amongst the membership is based on top submitters. The site has the feel of a teacher's classroom about it – maybe awarding points and stars reveals this? It's worthy but a bit dull and complacent, with occasional banter about the quality of a landscape photo or the accuracy of its coordinates, rarely anything about the relation between the image, the place and the person who took it. Interactivity is prompted by competition it seems, appealing to primordial instincts, something to which the game industry attests and on which it certainly relies. (Rogers et al., 2003).

[4] The Quicktime application that appeared at the end of 1991 was developed by Apple Computers to deliver media to the screen and was mainly used for video.

In 1997 QuicktimeVR added pseudo-3D and interactivity utilising its container structure and track-based architecture. This included a linking feature using 'hot spots' in the picture area for linking to URLs or other files. The author investigated employing it in the Pathscape project (Chapter 4.4.2) but was not satisfied with the sacrifice of picture quality to interactive options, problems that remain in the current third-party application resources employing QTVR technology. (Source: http://www.apple.com/quicktime/resources/tools/qtvr.html and http://www.theapplemuseum.com/ Accessed 1.1. 2008)

[5] Macromedia Director first appeared in 1987 and rapidly became a standard authoring tool for the design of interactive multimedia applications. It uses film production metaphors for its interface design and in 2008, version 11 was released to an uncertain future. http://www.adobe.com/devnet/director/

[6] It should be remembered that *Pathscape* was a prototype project, not specifically a research project, with the different objective of demonstrating the complex modalities of multimedia as 'interactive documentary'.

[7] In addition, technical problems were identified. "Because it is web-server based, the system is not so easy to install and get running. I used it in my 2004 Computers and New Media class (having the students construct hypervideo) and had some difficulties due to the infrastructure and set-up - Frank Shipman in email correspondence 2005." This underlines the difficulty of re-purposing developmental software, particularly when used for design and play evaluation.

[8] Such primitives are in contradistinction to navigational systems based on symbolic and archaic structure. Yates describes the 15th Century memory theatre of Guilio Camillo as being an art of memory that has become "an occult art, a Hermetic secret' emergent from the Cabalists. Knowledge-based systems structured around pre-defined classifications are discussed further in the final chapter.

[9] 'Western' cultures read left to right, top to bottom – the shape adopted eventually for this Model – but a Model, for instance in Arabic or traditional Japanese cultures, would read right to left, top to bottom.

[10] The artist Eric Lanz in '*Munuskript*', organised the small domestic tools in lines, one beneath another, that when viewed as a complete collection, appeared as hand-writing on a sheet of paper. Using mouse interaction to zoom into the image caused each individual item to be come apparent and selectable, causing a short movie of the item in use to be seen and heard.

11 The forest of young spotted gum trees is located at the end of the Cedar Walk, Bundanon, Nowra, NSW.

12 Her research was concerned with *'the understanding of human-artefact interaction by explaining how and why intuitive interaction occurs and what designers can do to encourage it….'* The apparent absence of papers on the topic of 4-way controllers, (most likely first developed by the military and aeronautical industries), was probably due to the rapid development by international electronic industries of small devices with interactive capabilities, such as VCR remotes, car radios, mobile phones, game-boys, etc. It is a history waiting to be written.

6. Evaluation

6.1. Introduction

"The goal of evaluation is to assess how well a design fulfils user's needs and whether users like it." (Preece et al., 2002) 323.

The previous chapter described the progressive development of seven interactive Models, designed to experiment with collections of motion picture files. Within a hypervideo environment, using the Mnemovie interactive engine, a 'schema' is applied to guide interaction within each Model. The design of the schema, the core of the approach to building each of the Models, is consistent with the operation of the interactive principles of the Mnemovie engine, the unifying principle of the motion picture file collection and the conceptual basis for the relations between each movie file in the collection.

This Chapter reports on the evaluation methods adopted for testing the precept of the designs explored with the experimental models. In Chapter 3.5 the approaches taken have been described as developing from three modified paradigms for producing data objects from user studies: user testing, field studies and predictive evaluation.

In the preparation for the evaluation studies a number a research issues were also explored regarding the qualities of the Mnemovie interactive experience: for example, effectiveness for navigating and retrieving movies from each collection; the effect or impact of user expertise levels on the experience and evaluation of the Mnemovie test models; and differences in efficiency and effectiveness between the test models.

Evaluation was in two distinct phases: the design and preparations for testing, including the recruitment of an appropriate independent participant group; and the data collection and analysis prior to presentation. Data analysis involves a series of iterations, re-examining and reconfiguring the raw data, followed by reflections and discussions of the conclusions that could be drawn. The key findings address implications for further development of the Mnemovie system and fresh approaches to hypervideo system designs for video and movie collections, which are discussed in the final chapter.

For the purposes of evaluation of the precept, three Test Models were constructed, (based on the seven experimental Models described earlier), to link a specific collection of movie files within each Model. Interaction with each Model enabled the interacting participant to retrieve movie files either by conventional text-based indexing taxonomies, or using the novel means of images situated within, or related to, the visual images contained within the collection. In using the same collection of movies – short documentary-style statements made by some of the researchers at the Creativity & Cognition Studios – a comparison could be made between the various characteristics of the Mnemovie Test Models.

A group of thirteen participants were asked to follow a set procedure of interactions with initially a Practice (or training) Model, followed by the three Test Models. These were observed and recorded to tape and paper by the researcher. Two questionnaires and an interview completed by the participants produced direct data [1]. The evaluation follows established paradigms and techniques, outlined in Chapter Three, the objectives being to inform a continuing *formative* process of development of the Mnemovie system. As *active* users of motion pictures a revised approach to storing motion picture files could provide many more ways of enabling us, as creative individuals and collaborative enterprises, to use motion pictures as a creative, knowledge management and writing tool.

6.2. Evaluation Method

Preece has recommended the use of the DECIDE framework as a checklist for the approach to evaluation (Preece 2002),348:

1. Determine goals;
2. Explore questions to be asked;
3. Choose evaluation paradigm and techniques to be used;
4. Identify practical issues
5. Decide about ethical issues;
6. Evaluate, interpret and present data.

The DECIDE framework was adopted in developing the evaluation method and these are now discussed in relation to the Mnemovie Models.

6.2.1. Goals

The goals are to continue formative developments of design concepts. What we need to know at this stage of development is primarily, the quality of the experience and the preferences participants express following the interactive sessions with each of the Models. As creative engagement is considered an essential requirement, whether or not the Mnemovie system is effective for navigating and retrieving motion picture files efficiently, is less important at this early stage of development. Participants' responses to the application of the design precept to their own work with motion picture files is regarded as a valuable indicator for further development of the design support tool.

6.2.2. Questions

Research questions that address the goals include:

1. Is the Mnemovie system *effective* for navigating and retrieving movies from the collection?
2. Does the expertise level of movie users have an impact on the experience and evaluation of the Mnemovie Test Models? And if so, what are the implications of this?
3. Is there a preferred model for efficiently and easily completing the task of accessing and retrieving a movie amongst the three test models?
4. Is there a preferred model for exploring the collection of movies?
5. Is there a model that engages participants with enjoyment and fun rather than for completing tasks?
6. Do the hyperlinking schemas experienced during the testing session suggest possible storage scenarios for participants' personal movie collections?

The scope of questions helps with choosing the evaluation approach to be taken.

6.2.3. Evaluation paradigm and techniques

The Mnemovie Test Models are evaluated using a combination of paradigms and techniques, under studio laboratory conditions, conducted as comparative experimental studies. The studies use a combination of the three paradigms described by Preece: usability testing, field studies and predicative evaluation

(Preece 2002, 340). (Another paradigm she describes, ‘quick and dirty’, has had a part to play throughout the practice-based development of the Mnemovie system during which some seven distinctive models were used to advance the precept – see the previous Chapter 5.5.)

The Model studies compare four different kinds of participant profile, determined from answers to the Participant’s Background questionnaire, completed at the outset of the testing session. Using a points method of assessment we distinguish between those participants who have an occasional, non-expert encounter with motion pictures, through to those with varying levels of expertise, from making simple movies through to working with complex multimedia systems.

Participant Profile	**Paradigm**	**Technique**
Expert	- field comparative modelling of prototypes - predictive evaluation - usability	Observation: timing of specific testing stages, recording confidence levels. Questionnaire requesting opinion. Interview: probing responses, requesting analysis and propositions
Movie Maker user	- field comparative modelling of prototypes - formative evaluation - usability	Observation: timing of specific testing stages, recording confidence level. Questionnaire: requesting opinions. Interview: probing responses, requesting analysis and clarification
Movie Player user	- field comparative modelling of prototypes - formative evaluation - usability	Observation: timing of specific testing stages, recording confidence level. Questionnaire: requesting opinions. Interview: clarification
Non-expert (IT) users	- field comparative modelling of prototypes - usability	Observation: timing of specific testing stages, recording confidence level. Questionnaire: requesting opinions.

Fig. 6.1: table of Evaluation paradigms and techniques for four levels of user profile.

The rational for this mix of paradigms and techniques (Fig 6.1) is designed to return data gathered from a wide base of participants with ranges of skills and experience across the three varieties of Test Model. The capabilities of the participants with the Models guides further research and development in two ways: towards ontology's where the precept may be easily and appropriately applicable; and the creative possibilities of linking motion picture materials as an authoring tool, using Mnemovie principles.

As the Mnemovie system at this stage of its evolution is likely to be of interest to artists, designers and researchers already using motion pictures on their computers, the role of the participants with a spread of skills is central to the evaluation.

At the Expert end of the spectrum, applying the predictive evaluation paradigm with knowledge of user behaviour and heuristics, participants are well placed to: predict problems across the board; detect in the Models emergent properties occluded to the researcher; provide leads for further research, not least within the literature.

The shortcomings of predictive evaluation that have been recorded by Karat, Bailey and Preece can be ameliorated by having several expert evaluators, to reduce the possibility of blind spots and false alarms. (Karat, 1994, Bailey, 2001) (Preece et al., 2002)

6.2.4. Identify Practical Issues

a. Devise a briefly expressed summary of the research project to attract the attention of volunteer participants;
b. Complete Ethics Committee application form;
c. Devise a clearly expressed summary for the operator of the system, its purpose and its operation, prior to testing;
d. Prepare other documentation: permission form; prologue questionnaire; explanation of operating principles across the three Models; instructions for the Practice Model; introduction to the Test Models; instructions for Model A – C; questionnaire at completion of testing; interview questions;
e. Organise data gathering tools: Researcher's Log sheets and interview questions; video / sound equipment;
f. Devise simple tasks to recover specific information from observing participant interaction with Models including timed comparisons;

g. Arrange Pilot Study;
h. Program schedule for user participants during testing period;
i. Collation of data using simple relational database;
j. Evaluation, interpretation and presentation of results.

6.2.5. Determine Ethical Issues

These are covered by CCS/UTS protocols, validated by the University of Technology Sydney and approved - project number UTS HREC 2006-304P – by the Creativity & Cognition Studios research group.

6.2.6. Evaluation, Interpretation and Presentation

Assuring the integrity of data follows Preece's model addressing the reliability, validity, bias and scope of the testing of the Mnemovie system (Preece et al., 2002) 379.

Reliability: participants encountered the same collection of movies, though in a different order, in each of the three Models, (Appendix 8.21 Test Model movie list). The participants encounter the Test Models in a different order, between participants, across a pattern of six variations.

Participant	1	2	3	4	5	6
Test 1	A	A	C	C	B	B
Test 2	B	C	A	B	A	C
Test 3	C	B	B	A	C	A

Fig. 6.2: table of Three Test Models, A to C, rotation testing pattern. Participants 1-6, 7-12, 13-19.

The participants respond to the same instruction sheet and questionnaire. Interviews follow a pre-determined set of questions, to validate observations and probe responses and interactions with each Model. Interviews are recorded to audio. The complete sessions, from beginning to end, are recorded direct to DVD.

Validity: The studio laboratory is prepared as a typical computer play or workstation as found in a home office or studio. Qualitative data is interpreted from that observed against what participants recorded on paper and on tape, (as 'speak aloud' although this will not be requested of participants). Suchman argues that verbal data obtained using video records can more accurately reflect lived experience than verbal data from interviews. Her argument is backed up by results from recent studies using video cued-recall methods. These studies reveal that not only does this method enable participants to recall more detail about their experience but also more importantly to recall pre-verbal perceptual, motivational and affective states that rarely emerge from interview data (Suchman, 1991). As all of the sessions were recorded to DVD, the opportunity for cued-recall was therefore available, but not pursued.[2]

Bias: the Researcher's Data gathering sheet is completed for each participant, to determine whether they operate the system Models in a manner that is Highly Confident or Uncomfortable. In order to minimise variations in this (subjective) judgement, video can be reviewed later to verify these observations across the whole test group, and for further consideration of unexpected behaviours or spoken comments. Time durations recorded for each of the tasks requested, to quantify and support the judgement, take account of different styles of explorative and play behaviour.

Referencing each of the three Test Models throughout the evaluation procedures employed a single Word as Title: on the test station computer desktop, and on the session documentation and questionnaires.

Word (on Desktop)	**Title (on Instruction sheet)**
LINE	LINE: beach to rainforest and back
GRID	GRID: lanes and streets
CIRCLE	CIRCLE Loop: the researchers

Fig. 6.3: table of Test Models - Word and Title.

These namings have three related purposes, the Word being used:

- as a link to the Test Model on the test station desktop, enabling the participant to launch according to the participant rotation pattern (see Fig 6.2):
- for ordering tasks requested in the final questionnaire, avoiding referencing the Test Models using culturally familiar ordering systems, either letters (A,B,C) or numbers (1, 2, 3);
- to aid the participants ability to comprehend the 'shape' of navigation through the movie collection; and

- aid recall for the purposes of completing tasks and questions.

Scope: the participants are drawn from a user group ranging from expert to 'non-expert'. They encounter four different interactive experiences. Findings help to inform user-designed Mnemovie systems and approaches to meta-design methods – see evaluation research questions (6.2.2).

Ecological validity: the participant group are all volunteers who make their way to the testing site (described above) and have a pre-disposition to working with or exploring motion picture images.

6.3. *Evaluation Plan*

To address the research questions we employ the following evaluation plan: recruit participants using pre-determined participant profiles; gather preliminary user information with questionnaires; train participants for using the interactive models; set specific tasks following participant exploration experience of each of the three Test Models; gather responses with final questionnaire about the Models and interview sessions; analysis of data objects and presentation of results. A Pilot Test of the plan is conducted before recruiting volunteer participants.

6.3.1. Objectives

Specific data objectives included:

a) observation of participant's interactive exploration of three Test Model prototypes built using the Mnemovie interactive system;
b) observed responses to retrieving motion picture documents in the tests;
c) qualitative and quantative data gathered from two questionnaires and the researchers log sheets;
d) participant to suggest potential applications proposed by the Models, gathered in the questionnaires - qualified through structured interview questions;
e) analysis and comparison of the data gathered based on observation and task setting;

f) interpretation , discussion, re-interpretation and presentation of the results of analysis;
g) conclusions and key findings.

6.3.2. Materials

The materials use three prepared Test Models, a Practice Model and individual documents to facilitate each stage of the process. In the following section 6.4, the documents used in the testing procedures are examined in detail:

1. A summary for each test participant about the research.
2. A standard CCS release form for the participant to sign.
3. The first questionnaire to establish the Participant's Background.
4. Introduction to the Testing Procedures and Instructions.
5. Overview of the Interactive Principles of the System.
6. Instructions for a Practice Model, (facilitating practice for the participant, an experience of interaction with a similar Mnemovie system).
7. Introduction to the Test Models and description of the *pattern* of testing procedure for each Model. Instructions for each of the three Models (identified in the test as single words describing the schema: CIRCLE; LINE; GRID).
8. The second questionnaire at completion of testing, where the title name is cited; final participant background information requested (words and images preferences, efficacy of system for gathering information).
9. Researcher's Log sheets to record each stage of the testing process:
    a. Accumulative timings;
    b. Observations (confidence of operation; movies watched);
    c. Tasks completed for each Model;
    d. Interview questions based on responses to the questionnaires.

All the activity is recorded with video / sound equipment. Data is entered into a simple relational database designed to both manage and record the sessions, and the data produced. Names and contact details are seperated from data using a record number.

6.3.3. Pilot Study

Following initial planning and the drafting of documents to be used in the testing process, preparation of testing materials and the test laboratory, leads to a pilot study conducted prior to full participant testing. The purpose of the Pilot Study is to observe a user's interaction with the testing design and the researcher's process of gathering data with questionnaires and interview for later analysis. Analysis of the Pilot Study, (see more under Analysis of Results, 6.5), led to the amendment of procedures and data recovery design, prior to participant testing

6.3.4. Participant Testing Sessions

A group of thirteen participants were recruited using flyers distributed amongst the community of computer users in Sydney who access movie files for a variety of purposes. Participant profiles are gathered from amongst forms submitted by volunteers, divided between a mix ranging from expert to non-expert movie users, and near equal gender dispersal. The participants complete an initial questionnaire to establish individual profiles: we ask participants how often they encounter motion pictures, (as cinema, television, online etc.), how often, in which locations and social contexts. Using this data we classify participants as expert, movie-maker and movie-user. As the goal of the evaluation concerns a computer-based system, people who do not normally use a computer were excluded from the testing.

6.4. Evaluation Procedures

The evaluation plan for each session with a participant employs a series of printed Sheets designed to work in conjunction with the on-screen interactive test materials. This section describes the objective of each of the Sheets, the copy used (in *italics*), the options available for multi-choice questions (in **bold**). (Pro-forma copies of these Sheets can be found in Appendices 8.22 – 8.34)

6.4.1. Sheet One: Research Project Background

Background information is presented to the participating participant upon arrival at the laboratory, (see Appendix 8.22: Research Background – Information for participant), following a format established by the CCS research group. This clearly expresses summary about the research, under whose auspices it is being conducted, what it involves, how the data will be used, whether there might be risks. Also information about where and to whom to make comments or complaints, and includes the following statement:

'*What this research is about'*:
This research is to investigate the Mnemovie Player, which has been designed to work with motion pictures on a computer such that the operator's memory is stimulated to enable retrieval of video movie files.

Whilst providing more detail than the previous Call for participation, nothing is stated that might bias the outcome of the testing. As with all other aspects of this research the information is affirmed as confidential. The participant is provided with a copy of this sheet to take away if they so wish.

6.4.2. Sheet Two: Participant Release Form

The participant is requested to sign their consent, project number UTS HREC 2006-304P, formulated in accordance with the CCS/UTS Ethics guidelines. (Appendix 8.23: Participant Consent / Release Form).

6.4.3. Sheet Three: Participant Background

The initiating questionnaire commences the data gathering by requesting background information to be able to profile participants' experience with the use of computers in general, and motion picture movie files in particular (see Appendix 8.24: First Questionnaire – Participant background).

Identity of the participant is established by *Name*. (Contact information is recorded though not used subsequent to the session). *Gender* and *Age* is gathered to indicate if certain age or gender groups encounter particular and consistent difficulty with the Mnemovie system. *Occupation* indicates level of familiarity with computers and motion pictures as useful tools, and possibly learning and adaptability characteristics.

The *Questions* that follow anticipate the cross-referencing of this data with performance and response data gathered during the interactive sessions. They commence by requesting participants' to circle one or several options from multiple choice responses to gauge their level of familiarity with motion pictures as phenomena experienced in different locations, social contexts, delivered by different technical means in different environmental contexts. Where level of familiarity with computers and motion pictures as useful tools are indicated, besides indicating possible learning and adaptability characteristics, this is pressed further in the questionnaire to determine familiarity associated with complex use of interactivity in electronic game playing.[3]

The multiple-choice responses suggested are:

1. How often do you encounter motion picture media? ***Monthly / Weekly / Daily / Hourly*** to indicate level of familiarity with motion pictures as phenomena.

2. Where do you encounter motion picture media? ***Home / Work / In Public places / Other*** to indicate level of familiarity with motion pictures as phenomena experienced in different locations.

3. For what purpose do you use motion picture media? ***Entertainment / Work / Information / Pleasure / Other*** to indicate level of familiarity with motion pictures as phenomena experienced in different social contexts.

4. In what form do you encounter motion picture media? ***Film / Television / Video / Computer Movies / Portable Players / Mobile phone*** to indicate level of familiarity with motion pictures as phenomena delivered by different technical means and in different environmental contexts.

5. *Do you have a collection of movies?* ***YES / NO*** *For what purpose?* ***Entertainment / Work / Information / Pleasure / Other.*** *What form is your collection?* ***Film / Video / Computer Movies / Mobile phone,*** to show that the participant does, or does not, have an active interest in collecting, and also whether this engagement has encountered issues affecting the retrieval of items from a collection, employing whatever indexing means to do so.

6. If you encounter motion picture media on computers, which kind of software do you use? ***Movie-PLAYER applications: Quicktime, Media Player, Real Time, VLC, Other AND/OR Movie-MAKING applications: iMovie, Premier, Final Cut Pro, Avid, Other*** to indicate level of familiarity with computers and motion pictures as useful tools, and possibly learning and adaptability characteristics of the participant.

7. How often do you play on-line or off-line computers games? ***Hourly / Daily / Weekly / Monthly / Rarely / Never*** to indicate levels of familiarity with computers and motion pictures as useful tools, and possibly learning and adaptability characteristics associated with complex use of interactivity.

6.4.4. Scoring Method

The Participant's Background questionnaire provides multiple choices to questions as outlined above. A matrix is employed for scoring points to each multiple-choice question - see Fig 6.4. (In the case of multiple responses to a single question, the highest point is scored).

Points are allocated in a range of 1 – 4 for Expert; Movie MAKER; Movie PLAYER; and NON-user columns. This is informed by Morahan-Martin and Schumaker's study investigating attitudinal and experiential predictors of technological expertise in computer skills and internet usage, when participants indicated their skill level on a scale 1 – 4 (Morahan-Martin and Schumaker, 2006). The four skills levels, (or as we preferred, profile categories), for the Mnemovie study from which the comparative studies between the Test Models could be drawn, are determined from participants actual experience with motion picture files on computers.

In the table (Fig. 6.4) points are allocated to each of the four profiles, for each of the multiple-choice options.

Question	Options	Points	Expert	Movie Maker	Movie Player	Non-user
1. How often do you encounter motion picture media?	**Monthly**	**1**				**1**
	Weekly	**2**			**2**	
	Daily	**3**		**3**		
	Hourly	**4**	**4**			
2. Where do you encounter motion picture media?	**Home**	**2**			**2**	
	Work	**3**	**3**	**3**		
	In Public places	**1**				**1**
	Other					
3. For what purpose do you use motion picture media?	**Entertainment**	**1**				**1**
	Work	**4**	**4**			
	Information	**3**		**3**		
	Pleasure	**2**			**2**	
	Other					
4. In what form do you encounter motion picture media?	**Film**	**1**				**1**
	Television	**2**				
	Video	**3**				

	Computer Movies	**4**	**4**	**4**		
	Portable Players	**3**			**3**	
	Mobile phone	**3**				
5. a) Do you have a collection of motion picture movies? (If Yes, continue with questions).	**Entertainment**	**1**				**1**
	Work	**4**	**4**			
	Information	**3**		**3**		
	Pleasure	**2**			**2**	
	Other					
b) What <u>form</u> is your collection?	**Film**	**1**				**1**
	Video/DVD	**3**		**3**	**3**	
	Computer Movies	**4**	**4**			
	Mobile phone	**4**	**4**			
6. If you encounter motion picture media on computers, which <u>kind</u> of software do you use?	**<u>Movie-PLAYER</u> applications:**					
	Quicktime	**2**		**2**		
	Media Player	**1**			**1**	**1**
	Real Player	**1**				
	VLC	**3**	**3**			
	Other					
If you encounter motion picture media on computers, which <u>kind</u> of software do you use?	**<u>Movie-MAKING</u> applications:**					
	iMovie	**1**			**1**	**0**
	Premiere	**3**				
	Final Cut Pro	**3**		**3**		
	Avid	**4**	**4**			
	Other					
7. How <u>often</u> do you play on-line or off-line computer games?	**Hourly**	**5**	**5**			
	Daily	**5**				
	Weekly	**4**		**4**		
	Monthly	**3**			**3**	
	Rarely	**2**				**2**
	Never.	**1**				
Profile Totals			**35**	**28**	**19**	**9**

Fig. 6.4: Table of Scoring method employed.
Determines user motion picture experience levels (from previous page).

The totals at the bottom of the columns indicate the separations between each of the (hypothetical) participant profiles, summarised in the following section 6.4.5. The Profile totals are used as an indicator of participants' experience / skill levels pertinent to interacting with the Mnemovie system under evaluation conditions. (These were later modified – see Results, 6.5)

6.4.5. Typical Profiles

EXPERT (scores 29-35)

i) a demonstrated engagement with the research into and production of multimedia artefacts;
ii) an advanced knowledge of contemporary techniques of working with motion pictures;
iii) an interest in collecting motion picture files.

Movie-MAKER (scores 20-28)

i) an advanced knowledge of contemporary techniques of working with motion pictures;
ii) an interest in collecting motion picture files.

Movie-PLAYER (scores 8-19)

i) a knowledge of contemporary techniques of working with motion pictures;
ii) an interest in collecting motion picture files.

NON-Expert (scores less than 7)

i) knowledge of motion pictures media;
ii) an interest in collecting.

The method was tested at the Pilot Study stage (see Analysis of Results, 6.6).

6.4.6. Sheet Four: Testing Instructions

With the volunteer participant signed into the testing environment, an Introduction provides some further information about how the testing would proceed (Appendix 8.25: Testing Procedures and Instructions). This use of direct address in written and spoken form was according to the wishes of the participant, an approach to be followed throughout each session:

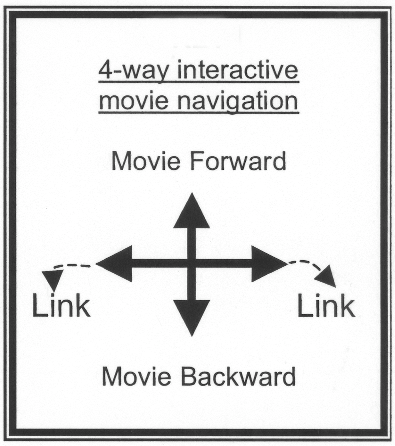
"There are three Mnemovie Models to be evaluated consistently in the studio environment. You will be asked to operate each one in turn, to make performance comparisons between the three Models and have your responses and reactions recorded. This will take between 30 - 60 minutes."

Emphasis is placed upon each session being a test of the computer system and not a test of the experience or skill levels of the participant.

Continuing with direct address:
"I will begin by explaining the principles behind the Models, how interaction is designed to occur with them, and the movies that will be encountered through the interactive process. A Practice Model will be explained to you, so that through practice you can experience interaction with the interactive principles of the system.
The three test Models will be slightly different in their interactive form, but the content, (the video files stored in the collection), will be the same. The movie collection encountered in the Practice Model is different from the three test Models.
The evaluation process will also involve: a Questionnaire, to be completed following testing; an Interview, to assist or clarify the questionnaire; I will be Observing your interaction with the computer system and associated software and will offer assistance if requested during your exploration stage of the session. Interviews and observation may be recorded on video or audio tape for later reference."
The participant is reassured that they do not have to remember all the above, simply be aware of the sequence of procedures being followed. Following any questions from the participant, the next stage of interactive practice with the system begins.

6.4.7. Sheet Five: Interactive Principles

The interactive principles of the system are explained on one sheet with a diagram (Appendix 8.26: Using the Mnemovie system):



The Up Arrow makes the movie run forward.
The Down Arrow makes it run backwards – with two different outcomes, depending on the Model.
The Left and Right Arrows cause a Link to be made between the movie you are watching and other movies in the collection – again, with different outcomes, depending on the Model.
These differences will be explained before you use each of the Models in turn.

6.4.8. Sheet Six: Practice Model

The sheet explaining each Model builds on the information provided in the system overview and is less than 100 words in length, (Appendix 8.27: Practice Model Instructions).

The Practice Model has been prepared employing similar interactive principles, but with a schema and collection of movie files different to that used in the Test Models. In the Practice Model, interacting with the contents of a chest of drawers recorded as a movie collection provides the participant with practical interaction with the principles of the system (Fig 6.5, and Chapter 5.6.2).

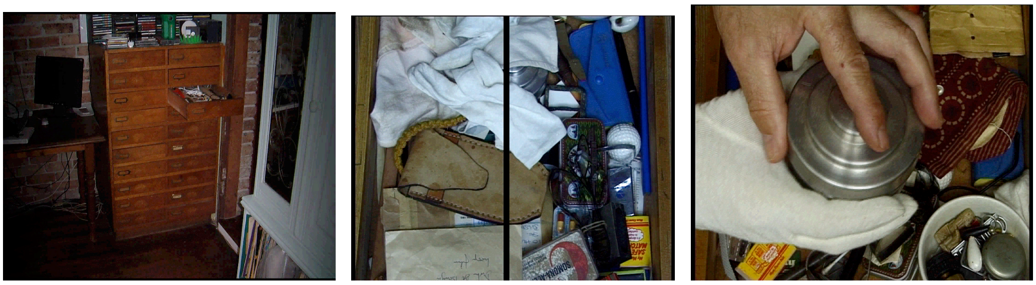


Fig. 6.5: Practice Model navigating a movie collection about the contents of a chest of drawers.

Participants are asked to interact with the Practice Model following written and spoken instruction for each of four interactive procedures. The third procedure sets the task of retrieving a specific movie file linked to one of the objects in one of the drawers. Participants are told that '*remembering where you 'find' the movies within the navigational schema, is important for being able to complete the tasks'*.

The Practice Model is designed to be quite difficult to operate in order to 'skill-up' the participant for the Test Models ahead. (This Model can be experienced using the accompanying DVD-ROM, Item 1, by following the instructions).

6.4.9. Sheet Seven: Test Models

This sheet explains in further detail how the testing proceeds. As with the previous sheets, it is read to the participant unless the participant indicates a preference for reading alone. (Appendix 8.26: Test Model Instructions).

The movie collection used in each of the three Test Models is of micro-documentaries of 2-3 minute durations about some of the researchers and their research at the Creativity & Cognition Studios (Appendix 8.21: Test Model movie list). As with the Training Model, remembering where the movies are 'found' relative to one another, is important for being able to complete the tasks.

The interaction design of each Model is signalled to the participant as a schema[4] for each Model and described to the participant with a single word: CIRCLE, LINE, GRID. The word characterises the name of a shape, (schema), to help with understanding and remembering the difference between the navigational principles of each one. This also enables the naming of each Model in the final questionnaire.

The hypervideo conceptual schemas being evaluated are outlined in the following user scenarios, in which interaction follows a pattern of **navigating**, **linking**, watching, and **returning** to navigation.

6.4.10. Three Test Models: LINE

LINE employs the *loci* principle, (discussed in 2.2.5 and 4.4.2), where the collection of mini-docos are hyperlinked within a landscape setting, (Appendix 8.29: LINE Test Model instructions).

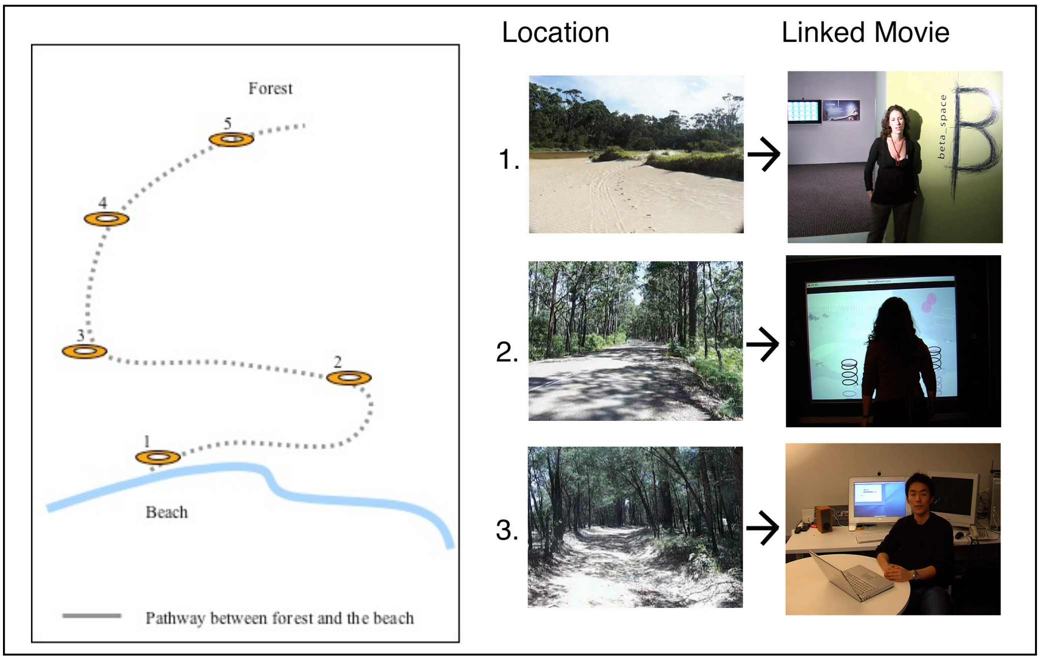


Fig. 6.6: Test Model, 'LINE' navigation schema
Each numbered location in the illustration refers to a location in the Line movie, represented here with a map.

Navigation: (Fig 6.6) the Line is a movie activated using the Up Arrow 🡅-key, the motion picture showing travel from the beach, over dunes, along a road, through scrub bush, across a lake and into the rainforest, as a Point-of-View (POV)[5]. At any point the Down Arrow 🡇-key will show the scene 180˚ (behind) the previous viewpoint, moving back toward the starting point – the user is thus able to 'move' up and down the pathway recorded in the movie.

Linking: the track is roughly divided into twelve sections, each linked to one of the twelve movies in the collection. Using the Left Arrow 🡄-key or the Right Arrow 🡆-key will link to one of the movies, relational to its location on the track. For example, Location 1, 2 and 3 (Figure 3) are the 'places' (the mnemonic), with which a link is associated.

Returning: the 3-minute movie, (which will also respond to forward Up Arrow 🡅-key and backward Down Arrow 🡇-key), can be exited at any point in two ways: using the Left Arrow 🡄-key to return to the same point on the track; using the Right Arrow 🡆-key to link directly to the next 3-minute movie in the collection, beginning with its title written in text.

In the LINE model, the participant has a choice of accessing and viewing a movie using either the visual cues learnt during initial exploration, or the text-based metadata. (This Model can be experienced by following the instructions on the accompanying DVD-ROM, Item 2b).

6.4.11. Test Model: CIRCLE

The CIRCLE Test Model commences with a video that appears as ‘speeded-up’ movement of the audio-visual content. This is achieved by sampling the original video to make a shorter ‘skimmed’ (speeded-up) movie, the original 3-minute movie thereby being reduced to 3-4 seconds. All twelve when assembled into a single continuous repeating CIRCLE, loop at about every half-minute, (Appendix 8.30: CIRCLE Test Model instructions).

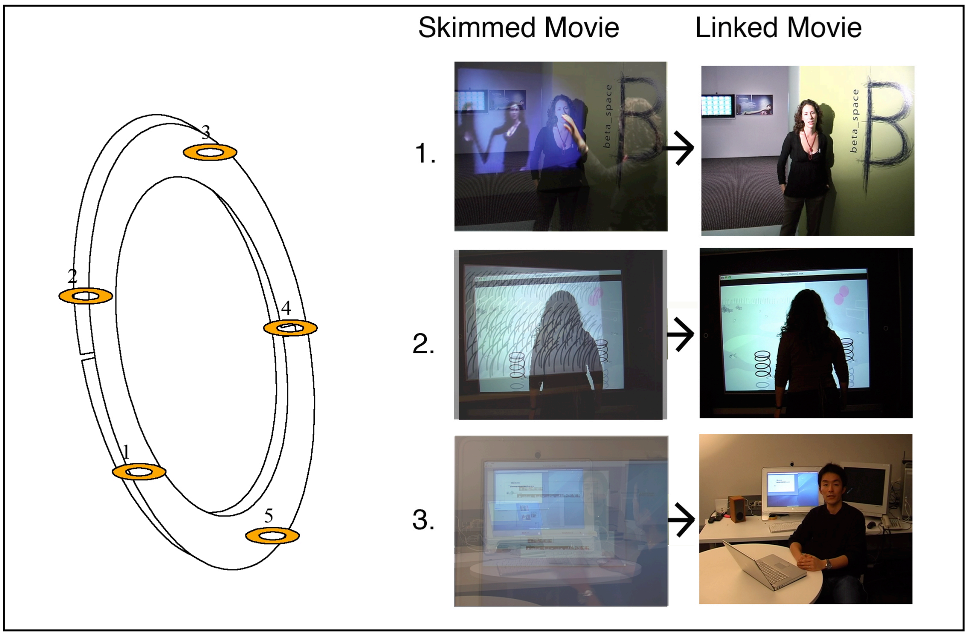


Fig. 6.7: Test Model, ‘CIRCLE’ navigational schema.
Each numbered ‘skimmed’ movie is joined sequentially, the last (of 12) joined to the first to make a loop (as in the diagram at left). Each skimmed movie is linked to the full version and accessed interactively.

Navigating: The 🡅-key causes the movie to run Forward showing ‘skimmed’ copies of each of the twelve movies. The 🡇-key causes the movie to run Backwards showing speeded-up copies of each of the twelve movies.

Linking: is achieved by using the ←-key or the →-key to link to one of the movies, relational to its indexical ‘skimmed’ version on the loop.

Returning: is achieved by using the ←-key again to exit to the previous entry point on the ‘skimmed’ loop movie; using the →-key advances directly to the next movie in the collection, preceded with a title, the name and research topic of the video subject. In the CIRCLE model, the participant has a choice of accessing and viewing a movie using either the speeded-up visual cues or the text-based metadata. (This Model can be experienced by following the instructions on the accompanying DVD-ROM, Item 2a).

6.4.12. Test Model: GRID

‘GRID’ employs the principles described above for ‘LINE’ with the added feature of navigating a series of intercepting straight lines – streets – simulating the grid structure of an inner city block, (Appendix 8.31: GRID Test Model instructions). The map of the inner city grid of streets, as seen on the right, is the concept schema for locating each of the twelve movies divided around the streets, while the arrow shows the interactive route taken to navigate from Location 1 to 3.

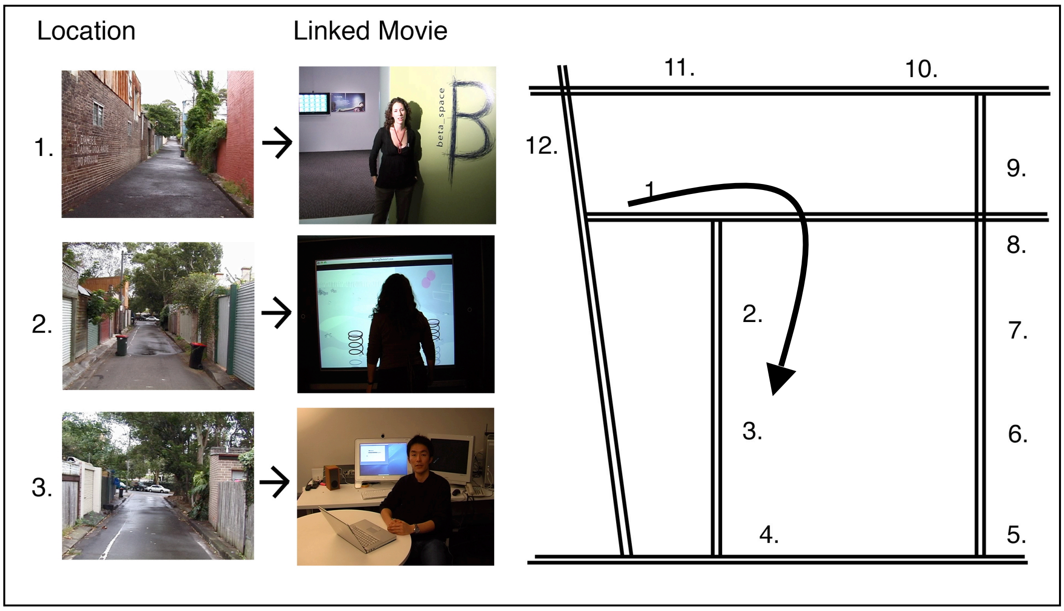


Fig. 6.8: Test Model, ‘GRID’ navigation schema.
The Location movie frames are what the participant sees, navigating Location 1 to Location 2 etc, each one being linked to a movie. (The map of the inner city grid of streets, as seen on the left, is the authoring concept schema for locating each movie: the arrow indicates the corner turned in the POV Location images.)

Navigation: using the ↑-key runs the POV movie forward, the ↓-key turns the viewpoint through 180˚ and returns.

Linking: using the ←-key or the →-key will achieve one of **two** outcomes: a) when adjacent to a corner, link to the movie POV of the adjoining street; b) relational to its location on a section of the street, link to one of the twelve movies. For example, location 1, 2 and 3 (Figure 6.8) are the ‘places’ with which a link to a movie is associated.

Returning: using the ←-key again exits to the same point on the POV movie; using the →-key advances directly to the next movie in the collection, with the Title of the name and research topic of the subject. In the GRID model, the participant has a choice of accessing and viewing a movie using either the visual cues learnt during initial exploration, or the text-based metadata. (This Model can be experienced by following the instructions on the accompanying DVD-ROM, Item 2c).

6.4.13. Procedure

Each Model awaiting launch on the computer desktop, a plain white window, has an icon word, the Title of each Model, (CIRCLE, LINE, GRID), seen in the instruction sheet. Participants encounter the same collection of movies, though in a different order, in each of the three Models. The participants encounter the Test Models in a different order across a pattern of six variations.

Participant	**1**	**2**	**3**	**4**	**5**	**6**
Test 1	LINE	LINE	CIRCLE	CIRCLE	GRID	GRID
Test 2	GRID	CIRCLE	LINE	GRID	LINE	CIRCLE
Test 3	CIRCLE	GRID	GRID	LINE	CIRCLE	LINE

Fig. 6.9: table of Three Test Models rotation pattern for participants 1-6, 7-12.

The testing procedure for each Model follows the consistent pattern of reading, (or if the participant prefers, themselves reading), the description of the interactive principles for each Model (Appendices 8.29 – 8.31). The participant is asked to repeat the principles to the researcher before then launching the specified named Model from the desktop. Following 3-5 minutes of observed exploration and play with the Model, the researcher requests that the participant completes two tasks by retrieving specific movie files. One is of a movie, logged by the researcher as <u>previously seen</u> during the exploration period, the other file logged as <u>not yet seen</u>, (Appendix 8.32: Researcher Log Sheets).

The participant may have encountered the movie as a series of images, or as a series of images preceded by the movie title, (such as 'Interactive Music for Musicians' or 'Investigations into Art Science Collaboration'). To complete the task, it is a <u>description</u> of the movie that will be provided. For example: *'Find the* *movie about the researcher working with the trombone'* or *'Find the movie about the researcher who sits against a red background'*.

Observation of this stage of testing confirms whether the participant prefers to use visual images and the relational indexing method to retrieve files using the Left key, or whether they prefer to use the text-based titles embedded in each of the movies and accessed using the Right key.

The participants are asked to repeat the same steps for the two remaining Test Models. Following completion of interactive testing, the participant is required to complete the second questionnaire, prior to a short concluding interview.

6.4.14. Sheet Eight: Second Questionnaire

The second and final questionnaire is the penultimate task to be completed by the participant and is in three sections. The first section asks participants to reflect and report on their interactions with the Test Models; the second section probes these responses; the third requests further background information that would have biased the tests if asked in the first questionnaire, (Appendix 8.33: Second questionnaire – participant's responses).

The final questionnaire requests the participant to rank several characteristics of the three Test Models, using a matrix table, placing the Test Model Title (CIRCLE, GRID, LINE) in the column orders High, Moderate and Low, in the rows:

- *Ease of use*
- *Opportunity for explorative interactivity*
- *Efficiency of search function*
- *Quality of the experience*
- *Your overall preference*

In the second section, these outcomes are compared to the viewpoints recorded in response to the following questions where participants are asked:

Could you describe the interactive principle of all the Models with a keyword, or short conceptual sentence?

And:

Could you describe i) the strongest and ii) the weakest feature you encountered in the Models?

And:

Could you envisage aspects of the interaction you have been encountering being applied to some part of your previous encounters with motion picture phenomena or movies? If so, please briefly describe.

The third section of the second questionnaire sets out to gather some sense of how each participant understands their usage of images and words as tools, with a statement introducing the final questions:
Words and visual images, separately and together, convey much of how we comprehend the world and our environment. However, we all have preferred ways of using them.

The questions ask participants to proportion by percentage between words and motion picture images according to: the information afforded; the pleasure afforded; the entertainment afforded; the creativity afforded. Though not directly related to the Models under test, the section may help at a later stage in revealing some constants or variables expressed as medians having a bearing on the central questions.

6.4.15. Sheet Nine: Interview

The final section of the session, an interview and conversation, commences with the same questions for each participant, to further probe the responses provided in the final questionnaire, the objective being to further qualify the participant's experience of the Models, (Appendix 8.34: Interview questions).

The participant is asked for a description of the kind of movies or movie collection they have at work or home, the way in which they store and access them, the kind of ways they consider extending their accessing and general usage of movies as a part of work or leisure. Conversationally this moves onto discussing movie collections and the kind of movie or cinema experience that could be produced using the principles demonstrated in the Models, taken to its furthest imaginative state.

The final question to bring about closure to the session asks for any closing thoughts or comments about the session, about the Models or the way in which the session has been conducted.

6.4.16. Sheet Ten: Researcher Log Sheets

A set of four Log Sheets used by the researcher during and following the session, to keep track of each participant's identity and record the durations of each test section and make a provisional judgement – to be verified at the completion of the testing with all participants – of the participant's degree of comfort whilst performing each stage of the testing sequence: *Highly Confident, Confident, Comfortable, Uncomfortable.* (Appendix 8.32: Researcher Log Sheets for PRACTICE, LINE, GRID and CIRCLE).

Recordings (audio and video) are kept of every stage, including the initial explanation and the Practice Model. A written record is made of the sequence of Test Titles as they are presented to each participant. (This varies for each individual, and each Model has a separate Log Sheet).

A reminder at the top of each sheet for the researchers states:
Speak the Instructions for each Model for the Participant to repeat. Respond to only specific questions during the 2-5 min exploration period.

The first Task asked of the participant is to find a movie seen during exploration. The researcher records in the Log each movie the participant watches during exploration to be able to ask this question.

Immediately following on the second Task is to find a movie NOT seen during exploration. The question is posed in the following way, for example: *'Now please find the movie of the man with an unshaven appearance standing in front projected images of musical scoring.'* The same description is employed each time (see Appendix 8.21: Test Model movie list).

The researcher notes the Title of the previously unseen movie requested from the full list of twelve movies. Also the participant's approach to completing the task using one of two strategies is noted; either using the Right Arrow ➔-key to 'page through' each of the test titles until the one is found most likely fitting the description (by guessing); or using the Left Arrow ➔-key to seek from the visual information a relational connection to the requested movie. As this strategy is different between each of the three Models, a loose notation is logged as to the use of 🡐-key or ➔-key and, should this need to be measured more accurately, can be checked with the DVD record.

6.5. *Results*

Before the substantive participant interaction with the Test Models commenced, results from the Pilot Study prompted some changes to the following stages:

Sheet 3: Participant's Background Profile questionnaire

Sheet 8: Questionnaire Addressing All Test Models

Sheet 9: Interview

Sheet 10: Researcher Log Sheets.

6.5.1. Pilot Study Profile

Sheet 3 had been tested initially in the Pilot study with one volunteer, and had produced the following scores:

Question	**Options**	**Points**
How often do you encounter motion picture media?	**Daily**	**3**
Where do you encounter motion picture media?	**Home** **Work** **In Public places**	**3**
For what purpose do you use motion picture media?	**Entertainment** **Work** **Information** **Pleasure**	**4**
In what form do you encounter motion picture media?	**Film** **Television** **Video / DVD** **Computer Movies**	**4**
Do you have a collection of motion picture movies? (if Yes, continue below)	**YES**	
For what purpose?	**Entertainment** **Work** **Information** **Pleasure**	**4**

What <u>form</u> is your collection?	**Film** **Video/DVD** **Computer Movies** **Mobile phone**	**4**
If you encounter motion picture media on computers, which <u>kind</u> of software do you use?	**Movie-PLAYER applications:** **Quicktime** **VLC**	**3**
	Movie-MAKING applications: **iMovie**	**1**
How <u>often</u> do you play on-line or off-line computer games?	**Rarely**	**2**
Participant profile	**Movie-MAKER**	**28**

Fig. 6.10: table of Pilot Study, participant's Scores.
(NB. The Highest points are retained from the multi-options selected by the participant.)

The Pilot participant was scored at the top of the Movie-MAKER category - whilst not an Expert when working with motion picture files, the participant demonstrated: an advanced knowledge of contemporary techniques of working with motion pictures; an interest in collecting motion picture files. This complied with what was known of the participant's experience through further interview.

Sheets 8, 9 and 10 outcomes revealed no major errors during the Pilot study with the following amendments:

1. the addition of Titles to each of the Practice Model movies, (to maintain consistency with the Test Models), such that the Right key would open the movie with a superimposed Title.
2. the preparation of a list of the movie collection, to enable 'neutrally' phrased descriptions of each movie to be used by the researcher for the purpose of consistent retrieval testing. For instance, Andrew Johnston's *Interactive Software for Musicians* is described with the sentence: *'The trombone player facing a large screen with moving graphic shapes'.*

3. some revision to the Interview questions, for the advanced or expert participants responding Yes to question 4. (*Does this navigational approach to interacting with movies suggest to you the kind of movie or cinema experience that could be produced?)*

Following these revisions, the Test Sessions produced useful and revealing results.

6.5.2. Test Model Studies

Thirteen participants encountered the system. *Gender* numbers were seven male and five female. Each evaluation session averaged 75 minutes in duration and the trials were conducted over a two-week period. All volunteers participated enthusiastically, responding fully to interaction with the system and completing both questionnaires. The researcher, (who conducted the interviews), also kept Log Sheets (Appendix 8.32). Sessions were video recorded direct to DVD, beginning either from the Practice Model and /or from the first selected Test Model (only one session was missed, in error). The interview was also video recorded and as backup, sound was recorded for immediate transfer to the computer as a sound file. DVD and sound files were duplicated as backups the same day.

A Filemaker Pro database was used to manage the sessions, the participants and for entering and keeping track of both the qualitative and quantative data. The database application was ideal for this purpose as alterations could be made rapidly to field, layout and report properties in response to the development of the evaluation, particularly at the analysis stage, when a spreadsheet was also used.

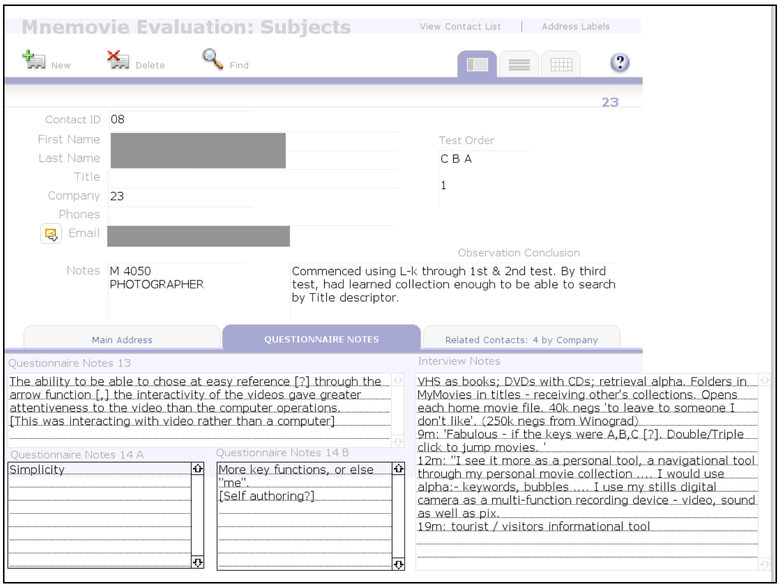


Fig. 6.11: Database interface – participant details and qualitative session data.

Qualitative data from the participants' Questionnaires, the researcher's Log Sheets and summaries of recorded interviews were entered shortly after each session. The quantative data was entered from the two Questionnaires into each participant record in the database (Fig.6.11) for subsequent display formats.

6.5.3. Participant Profiles

The Participant Profiles were scored following the criteria described in section 6.4.4, enabling a count (column Q7X below) to enable placing each participant into one of the user Groups (see section 6.4.5)

Questionnaire 1 : Profile Data

Contact ID	Q1	Q2	Q3	Q4	Q5A	Q5B	Q6A	Q6B	Q7	Q7X	Q7Xrev
17	3	3	1	3	2	3	1	0	3	19	18
06	3	3	4	4	4	4	3	0	0	25	22
05	2	3	4	4	4	3	2	3	0	25	23
08	4	3	4	4	4	4	3	0	0	26	23
04	3	2	4	4	4	3	2	3	1	26	24
19	2	3	4	4	4	4	3	1	2	27	24
01	3	3	4	4	4	3	2	3	2	28	26
09	4	3	4	4	4	4	2	3	0	28	26
03	4	3	4	4	2	4	3	3	3	30	27
11	3	3	4	4	4	4	4	3	2	31	27
02	3	2	4	4	3	4	4	4	4	32	28
18	3	3	4	4	4	4	2	4	2	30	28
10	3	3	4	4	4	4	2	4	3	31	29

Fig. 6.12: Database interface – participant details and quantative session data for Participant Profiles

The initial count of the overall group in Q7X consisted of people selected on the basis that they encounter motion picture media in digital formats at weekly intervals as a minimum. Results from scoring participants arrived at a spread between Expert and Movie-Player, biased to the Expert end: Experts: 5; Movie-Makers: 7; Movie-Players: 1.

To facilitate the formation of three groups the data was inspected again to determine which of the questions might be causing this 'clumping'. On reflection Questions 6a, addressed specifically at Movie-Player respondents, seemed to be creating this problem, as it equated tools that performed the same task - playing movies - with tools that performed a variety of different tasks. Consequently, another column was created (Q7Xrev) that performed a similar count, leaving out responses to Q6A.

The resulting totals spread the profiles out, revised to: Experts: 5; Movie-Makers: 4; Movie-Players: 4. The revised figures enabled the establishment of three distinct groups of user, along the lines described earlier, and enabling a clearer summary of participants' responses to the Test Models at a later stage in the analysis. The groups could now be described with the following characteristics, revised from the initial Typical Profiles (6.4.5).

Group 1 EXPERT (scores 27-30)	i) a demonstrated engagement with the research into and production of multimedia artefacts; ii) an advanced knowledge of contemporary techniques of working with motion pictures; iii) an interest in collecting motion picture files.
Group 2 Movie-MAKER (scores 24-26)	i) an advanced knowledge of contemporary techniques of working with motion pictures; ii) an interest in collecting motion picture files.
Group 3 Movie-PLAYER (scores 18-23)	i) a knowledge of contemporary techniques of working with motion pictures; ii) an interest in collecting motion picture files.

Fig. 6.13: table of Participant Profile Groupings (Revised: non-expert excluded).

6.5.4. Matrix for Ranking of Test Models

Total counts for each Model entered into the database matrix (Fig. 6.14 : A = CIRCLE; B = LINE; C = GRID in Questions below), ascribe ranking preferences of H = High; M = Moderate; L = Low - expressed by each Participant in response to the questions numbered:

8. Ease of use

9. Opportunity for explorative interactivity

10. Efficiency of search function

11. Quality of the experience

12. Your overall preference

Questionnaire 2 Matrix Data

Contact ID	Q8a	Q8b	Q8c	Q9a	Q9b	Q9c	Q10A	Q10B	Q10C	Q11A	Q11B	Q11C	Q12A	Q12B	Q12C
06	H	M	L	M	H	L	H	M	L	H	M	L	H	M	L
19	H	M	L	L	M	M	H	M	L	M	H	L	H	M	L
11	H	H	H	H	H	H	M	M	M	M	M	M	L	M	H
05	M	L	L	M	H	H	M	L	L	M	M	M	H	M	M
02	H	H	M	M	M	H	H	H	L	M	M	M	M	M	M
04	H	L	M	L	M	M	H	L	L	M	M	L	H	M	L
09	H	M	L	H	L	M	H	M	L	H	L	M	H	L	M
01	H	M	H	L	H	H	H	M	M	L	M	H	L	H	H
10	M	L	H	H	H	H	M	L	H	H	M	H	H	M	H
17	H	M	M	L	H	H	H	M	M	M	H	H	L	M	H
18	H	M	L	M	M	H	H	L	M	L	M	H	M	L	M
08	M	M	H	M	M	H	H	M	H	H	H	H	M	L	H
03	H	M	L	M	H	H	H	M	M	H	M	H	H	M	M

Fig. 6.14: Mnemovie Matrix for Ranking of Test Models.

(Key: Q*A = CIRCLE; Q*B = LINE; Q*C = GRID; H = High; M = Moderate; L = Low)

From the database matrix, scores were recorded for each question, totalling the occurrences of High, Moderate and Low rankings. These scores were entered for each question and each Model into a spreadsheet, and the following bar charts produced:

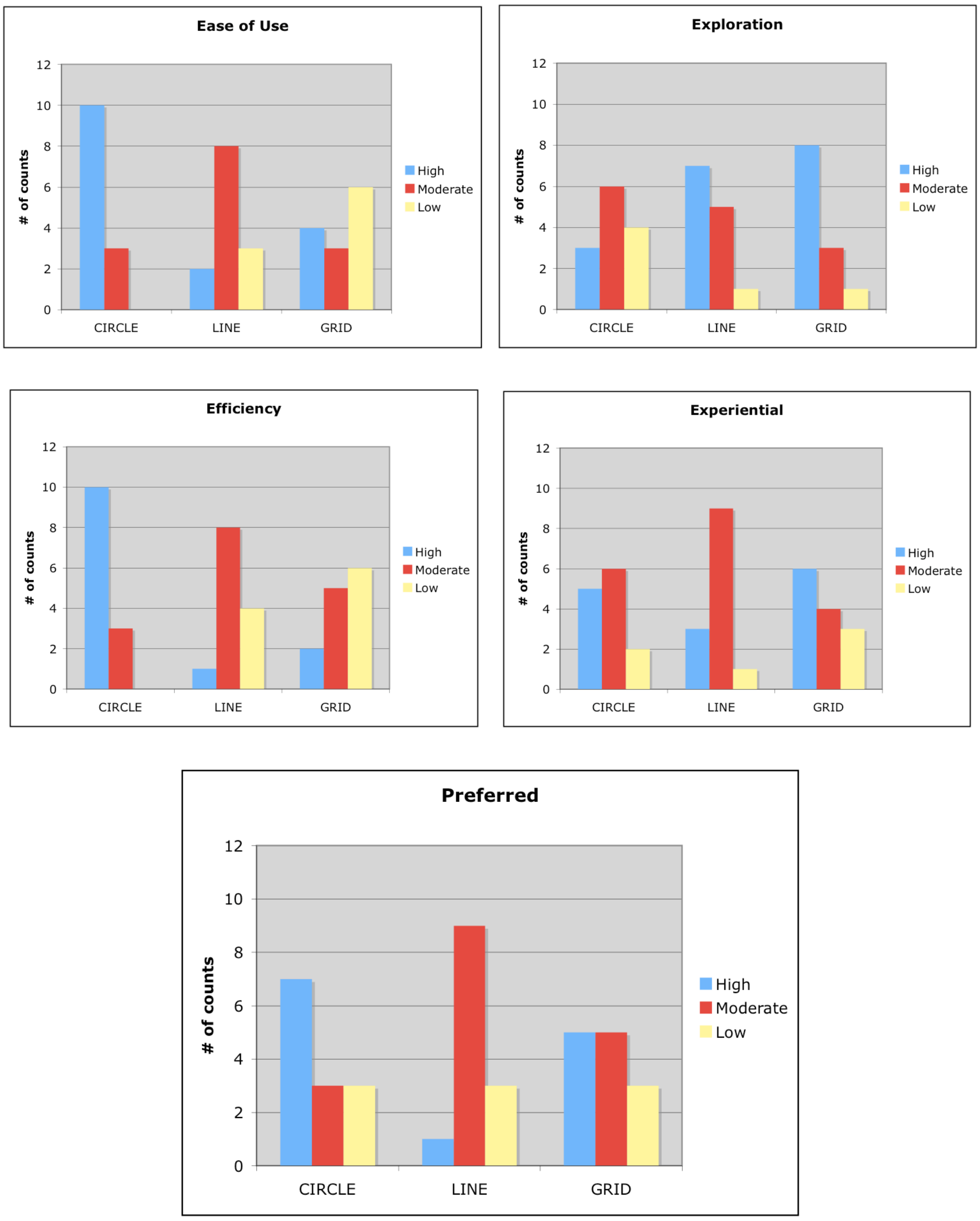


Fig. 6.15: Responses to Test Models: Ranking Matrix graphs (also previous page)

6.6. Analysis of Test Model Results

Initial analysis was based upon the three types of user profiles: expert, movie-maker, movie-user. Though the process of conducting evaluation studies is one of analysing data needs and the techniques required for acquisition, revising and adjusting methods as issues are revealed become necessary as the analysis progresses. As Preece has observed*: 'Most observational data is qualitative and* *analysis often involves interpreting what users were doing or saying by looking for patterns in the data.' (Preece et al., 2002) 379.*

The patterns visible in the graphs based on the qualitative data gathered from the Test Model Ranking Matrix (Fig. 6.15) show patterns worthy of further investigation. The CIRCLE Model quite clearly scores High for Ease of Use and Efficiency in retrieving target movies, and LINE consistently shadows as a Moderate alternative. However, opportunities for heuristic interaction, in which participants explore the range of interaction possibilities with the images on the screen, are quite clearly favoured in LINE and GRID. The GRID model scores consistently in all categories of the matrix with an almost equal mix of the three ratings[6].

Though participants had been provided with only the basic principles of the interface operation, the inconsistency demonstrated that participants regarded each of the different Models as being effective for different purposes. We needed to know more about how individual participants interpreted this by combining their statements with the observational data gathered.

We examined the responses of each of the three user Groups to the questions following the ranking matrix in the second questionnaire. Participants had been asked to briefly describe the interactive principles of each Model, and their assessment of the strongest and weakest features of each one (6.4.14; Fig. 6.11 and Appendix 8.33). These responses were combined with data recorded in the Log Sheets of observed individual interactive experiences and the duration taken to complete each of the tasks.

6.6.1. A Framework Emerges

Comparison of the three User group participants responses to the second questionnaire, with the observations made of participants interactive experiences led us to summarise for each, an 'interaction style'. Provisionally this was categorised into Quickies (Q) – those who regarded the system as a tool for finding stuff; and Explorers (E) – those who expressed a preference to spend time experiencing the system.

The Log Sheets of observations were re-examined to extract data to be subjected to a further series of tests:

‘Style’ Group	T-Time (mins)
Q	16
Q	17
E	18
Q	19
E	19
E	21
E	21
Q	23
E	26
E	33
E	34
E	37
E	46

Fig. 6.16: First summary: Total Testing Duration (T-Time, in minutes).

For Test Model A, B and C, exploration + two task for each Model; sorted by Testing Session duration.

‘Style’ Group	T-Time (mins)
Q	8
E	8
Q	9
Q	10
Q	10
E	10
E	10
E	11
E	12
E	13
E	13
E	17
E	42

Fig. 6.17Second summary: Testing Duration (T-Time, in minutes).

For Test Model A, B and C, two task for each Model (i.e. without Exploration stage); sorted by Testing session duration.

Excluding the outlier (42) in the table (Fig 6.17), average duration is 10.92. The figures (more than less), support the researcher’s summarisation of the participant’s interactive experience as a ‘Style’. With the exception of the participant ID 09, (second from top of in the table above), who in spite of the claim in the questionnaire, when the Log Sheets were checked in greater detail, led to the conclusion that the person is a Quickie.

Third summary: the table (Fig 6.17) was then recombined with the original User Group profiles and the two tables (Fig. 6.18) show comparisons of User Groups 1 – 3, the Test durations (T-Time) and the participants in the new classification of Q_E (Quicky and Explorer).

Q7Xrev	UserGroup	Q_E	T_Time	Q7Xrev	UserGroup	Q_E	T_Time
23	1	Q	9	26	2	Q	8
22	1	Q	10	24	2	Q	8
23	1	E	17	23	1	Q	9
18	1	E	13	27	3	Q	10
26	2	E	11	24	2	E	10
24	2	E	10	22	1	Q	10
26	2	Q	8	28	3	E	10
24	2	Q	8	26	2	E	11
28	3	E	42	29	3	E	12
27	3	Q	10	27	3	E	13
29	3	E	12	18	1	E	13
27	3	E	13	23	1	E	17
28	3	E	10	28	3	E	42

Fig. 6.18: (left) User Group, Sorted by user Profile. (right) Sorted by Task Duration.

Even with one of the participant's styles (ID09) altered, these comparisons show there is no clear correlation between the participant's user profile (Fig.6.16 left) and their style of interaction with the system (Fig 6.16 right) whereby the duration of task duration (T-Time) comes very close to matching style as expressed through Quickie and Explorer (Q_E).

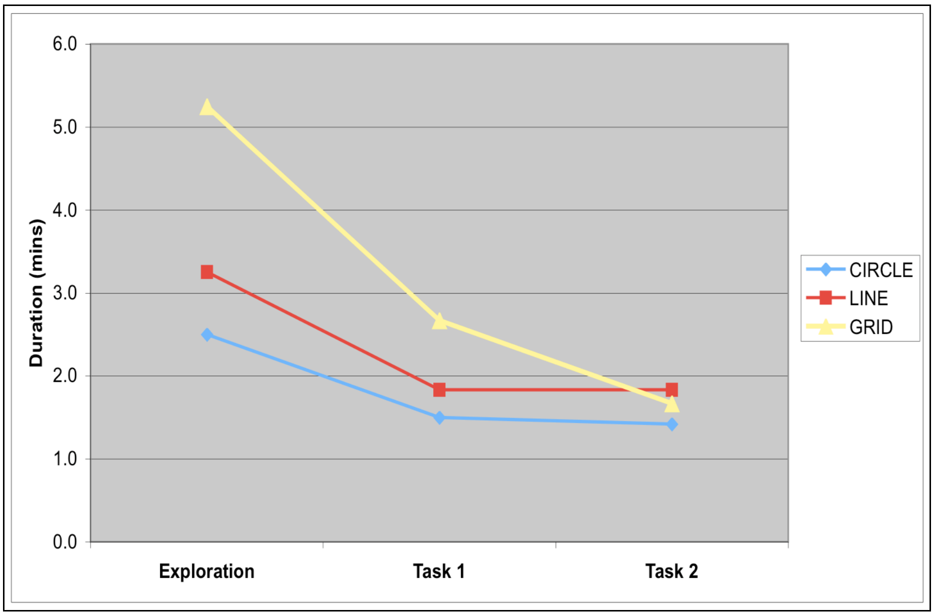


Fig. 6.19: Average durations for Exploration and Task 1 and 2.

In Fig 6.19 the average time twelve participants spent in CIRCLE, LINE and GRID sessions on Exploration, completing task 1 ('find seen movie') and task 2 ('find unseen movie') are compared. One can observe that the time taken to complete task 1 and task 2 are similar in LINE and CIRCLE sessions, while there is a significant improvement in task 2 completion (shorter duration) compared to Task 1 completion duration. This demonstrates the learning gained during Exploration had a significant effect in task completion within the GRID model.

Participants also spent more time on Exploration within the GRID model compared to CIRCLE and LINE models. We hypothosised this difference to be two fold: 1) the GRID model involved more complex orientation (turning left or right on the streets) and therefore the development of a greater number of spatial skills was required; 2) the GRID model required a greater amount of mnemonic effort, as the streets look alike, making it harder for the user to remember specific Locations. Participants' task 1 completion time is significantly higher in the GRID model while the task 2 completion time is similar to LINE and CIRCLE models. This implies that once the users become familiar with the structure of the GRID model they perform as quickly as they did in the other two models.

This supports conclusions drawn by Leritz-Higgins that debunk the user classification approach as conflating the participant's skill set and domain knowledge (Leritz-Higgins, 2004). As the current Profile is based on just that – participant's usage of movie files and their degree of experience in doing so – another approach to analysing the data was determined to better understand this observation.

6.6.2. Emergence of Personas

To develop further the link between the qualitative and quantative data, it was proposed that the construction of 'personas' could help reveal useful conclusions for informing further design development of the Mnemovie system. Developing 'personas' is an effective way to remember for whom we are designing. This method has been used in user-centred design studies, and has proved helpful to interaction designers in making decisions about design features and functionalities (Cooper, 1999, Pruitt, 2003, Leritz-Higgins, 2004). Personas utilize our mind's powerful ability to extrapolate from partial knowledge of people to create coherent wholes and project them into new settings and situations related to an activity, in this case, working with movies on a computer.

> Personas are a medium for communication; a conduit for information about users and work settings derived from ethnographies, market research, usability studies, interviews, observations, and so on. Personas utilize the power of narrative and storytelling to enhance attention, memory, and organization of detailed user data. (Grudin and Pruitt, 2003)

However, Grudin critiques Cooper's use of personas, their goals and activity scenarios for being focused on design. *'Cooper's claims are based on anecdote and on appeals to reason, not data.'*

Though these methods have been developed over recent years for product development, by adapting some of its features whilst being aware of Grudin's comments, the building of personas could help in describing the kinds of style observed when participants encounter interactive systems <u>without obvious functional appeal</u>. In this study we utilized personas to represent specific interaction behaviours during the use of the Mnemovie system. This is different from the way personas are used in the user-centred design process, where personas are created to <u>drive</u> design; in our study personas <u>emerge</u> from the evaluation.

Analysis of behavioural data gathered from the testing sessions demonstrated there were two different 'styles' of interaction observed with the Models. One interaction style was task completion oriented, and aimed to be quick, structured and efficient. The other style was exploration oriented and aimed to be more leisurely and engaging. These two interactive behaviours led to the emergence of two personas based on the earlier conclusion: Quickies – those who regarded the system as a tool for finding stuff; and Explorers – those who expressed a preference for spending time experiencing the system. It was found the total duration of the three sessions across the sample of twelve compared with the Quickie / Explorer framework demonstrated a consistency worthy of further consideration, (Fig. 6.20).

UserGroup	Q_E	T_Time	E_Time	E&T_time
2	Q	8	8	16
2	Q	8	10	18
3	Q	10	9	19
1	Q	9	10	19
1	Q	10	13	23
3	E	12	7	19
2	E	11	10	21
3	E	13	8	21
1	E	13	12	25
3	E	10	15	25
2	E	10	19	29
1	E	17	17	34

KEY:	3	Expert
Participant User Group profile	2	Movie maker
	1	Movie player

Fig. 6.20: table total time spent (mins) to complete E&T (Exploration and Tasks). User Group profile, sorted by interaction style (Q: Quickie; E: Explorer).

These comparative outcomes show there is no clear correlation between the participants' User Profile Group (graph in Fig.6.19) and their style of interaction with the system.

Data gathered from the quantative aspects of the testing procedures, (Fig 6.18 (right) sorted by test task duration), demonstrates two 'styles' of interaction with the Models, identified using the qualitative data, are close to congruence and could form the basis for two personas, the Quickie and the Explorer. Working with the actual words used by participants in describing their responses to the system and the session, the two personas were fleshed out on paper. (*'…from partial knowledge of people to create coherent wholes and project them into new settings and situations.'* (Grudin and Pruitt, 2003).

Our two personas both specify that they need a storage and retrieval system for movie files that meets their practical needs, whilst complimenting their personalities. Meet, Jacky Flash (Quickie) and James Kirk (eXplorer). The two boxes below contain a commencing paragraph, (in *italics),* that is an imaginary scenario or context within which preferences are expressed. Preferences that follow, (in plain), are based on the actual words and expressions used by the Quickie and Explorer participants.

Quickie Persona - Jacky Flash

Jackie works in the ICT industry and has amassed a large collection of home movie files shot on her mobile phone. These she stores on her home computer and needs to show her family when they visit, as her way of illustrating what she has been doing, who she has been seeing, etc:

Jacky likes the interaction that enables her to accelerate the movie from one *loci* to another, triggering search functions so that she is able to go faster, over there, there, there….. Whilst she understands the object is about locating content, her preference is to quickly tab through many movies as she talks. Like many of her human relationships, she has quickly developed her own principle of interaction, consistently using the most direct method of quickly completing a search task.

Explorer Persona - James Kirk

James is a photographer and keen local historian and uses his video camera to record the places and people who are the subject of the history he records. He needs to organise this material on the computer so he is able to 'perform' a history, a bit like a lecture, with his subjects and their stories centre-stage.

James intuitively interacts with the system using visual cues and his memory of which part of a movie can enable him to lead to another movie. Each occasion was an intuitive sense of discovery. He learns to 'know' where a movie is, without really consciously knowing, enjoying the mystery of it and the challenge….. He uses patience to eventually learn what can happen. It gives him lots of ideas too about the extent to which one can differentiate the content of the stories, because it is more exploratory. He feels this is interacting with video rather than a computer.

The Data Log Sheets were analysed further in order to support with more specific data, the persona characters described above. Initially, the matrix displays the levels of confidence observed in the participants for the three Test Models, CIRCLE, LINE and GRID, for the Exploration and Task stages of each period of interaction:

ID number						Exploration	Task 1	Task 2	Overall	Exploration	Task 1	Task 2	Overall	Exploration	Task 1	Task 2	Overall	Quickie / Explorer	User Group
	TRAINING					CIRCLE				LINE				GRID					
	Ob3	Ob4	Ob5	Ob6		OA1	OA3	OA5	OA7	O1B	O3B	O5B	O7B	OC1	OC3	OC5	OC7	Q_E	
5	5	F	6	C		C	HC	HC	HC	C	HC	HC	HC	F	F	C	C	Q	1
6	4		6	F		F	HC	HC	HC	C	HC		C		HC		C	Q	1
19	3	C	4	C		HC	HC	HC	HC	HC	HC		HC	HC	HC		HC	Q	2
9	10		6			C	C	HC	C	C	C	C	C		HC	HC	HC	Q	2
3	5	C	6	HC		C	HC	HC	HC	HC	C	C	C	C	C	C	C	Q	3
17	4		14	U			HC	HC	HC		HC		HC	C	C	HC	C	X	1
8	3		7	F		C	C	HC	C		C	C	C	C	HC	C	C	X	1
4	3	C	6	C		HC	HC	C	HC	C	C	C	C	C	C		C	X	2
1	7	C	8	C		HC	HC	HC	HC	F	C	HC	C	F	C	C	C	X	2
18	2	C	8	C		C			C					C			C	X	3
10	3		8	F		C	C		C		HC	HC	HC		C		C	X	3
11			11			C	C	HC	C	C	C	HC	HC	C	C	HC	C	X	3
2	5		10	F		C	C	HC	HC	HC	HC	C	C	F	F	F	F	X	3

Fig. 6.21: Participants confidence levels when interacting with Test Models.
User sorted by Q_E (NB Explorer = X).
(Key: HC: Highly Confident; C: Confident, F: Comfortable; U: Uncomfortable)

The numerical data recorded the actual durations measured in the participants for the three Test Models, CIRCLE, LINE and GRID, for the Exploration and Task stages of each period of interaction:

ID Number	Exploration	Task 1	Task 2	Overall	Exploration	Task 1	Task 2	Overall	Exploration	Task 1	Task 2	Overall	T_time	Exploration total	Quickie / Explorer	User Group
	CIRCLE				LINE				GRID							
	OA2	OA4	OA6	OA8	O2B	O4B	O6B	O8B	OC2	OC4	OC6	OC8	T_TIME		Q_E	
5	2	1	2	5	1	1	1	3	7	3	1	9	9	10	Q	1
6	6	2	1	9	4	2	2	8	3	2	1	6	10	13	Q	1
19	3	1	1	5	1	2	2	5	4	1	1	6	8	8	Q	2
9	2	1	1	4	4	1	1	6	4	3	1	8	8	10	Q	2
3	1	1	1	3	1	1	2	4	7	2	3	12	10	9	Q	3
17	1	1	1	4	2	2	3	7	9	5	1	15	13	12	X	1
8	4	2	1	7	5	2	2	9	8	4	6	18	17	17	X	1
4	4	2	1	8	8	2	2	15	7	2	1	10	10	19	X	2
1	1	1	1	3	4	4	2	10	5	2	1	8	11	10	X	2
18	3	1	2	6	3	1	3	10	3	1	2	6	10	9	X	3
10	2	3	4	9	3	1	1	5	2	2	1	5	12	7	X	3
11	1	2	1	4	3	3	1	8	4	5	1	10	13	8	X	3
2	3	4	5	6	3	5	7	9	11	5	16	32	42	17	X	3

Fig. 6.22: Durations for each Test Model.
Total task durations (T_time) and total exploration durations (Exploration total).
User sorted by Q_E (NB Explorer = X).

Summarised in Fig. 6.23, a comparison between the Quickie and Explorer personas, reveals a clear distinction between the shorter durations (at the top) and longer durations (bottom) in both the Tasks and the Total, with a centre section where users exhibit shared qualities common to both interactive styles.

Interaction Style (Q_E)	Exploration	Average +/- Deviation	Tasks	Average +/- Deviation	Total	User Group
Q	8	10 / - 2	8	9 / - 1	16	2
Q	10	10 / 0	8	9 / - 1	18	2
Q	10	10 / 0	9	9 / 0	19	1
Q	9	10 / - 1	10	9 / + 1	19	3
Q	13	10 / + 3	10	9 / + 1	23	1
E	9	11.7 / - 2.7	10	12.3 / - 2.3	19	3
E	7	11.7 / - 4.7	12	12.3 / - 0.3	19	3
E	10	11.7 / - 1.7	11	12.3 / - 1.3	21	2
E	8	11.7 / - 3.7	13	12.3 / + 0.7	21	3
E	12	11.7 / + 0.3	13	12.3 / + 0.7	25	1
E	19	11.7 / + 7.3	10	12.3 / - 2.3	29	2
E	17	11.7 / + 5.3	17	12.3 / + 4.7	34	1

Fig. 6.23: table Summary Interaction Style, Task, Exploration Durations (Minutes) Averages and Deviation

Figure 6.24 shows the average durations for exploration, task 1 and task 2 stages in LINE, CIRCLE, GRID sessions for Quickies and Explorers. Quickies' performances in three tasks are shown in lighter lines; Explorers' performances are shown in darker lines.

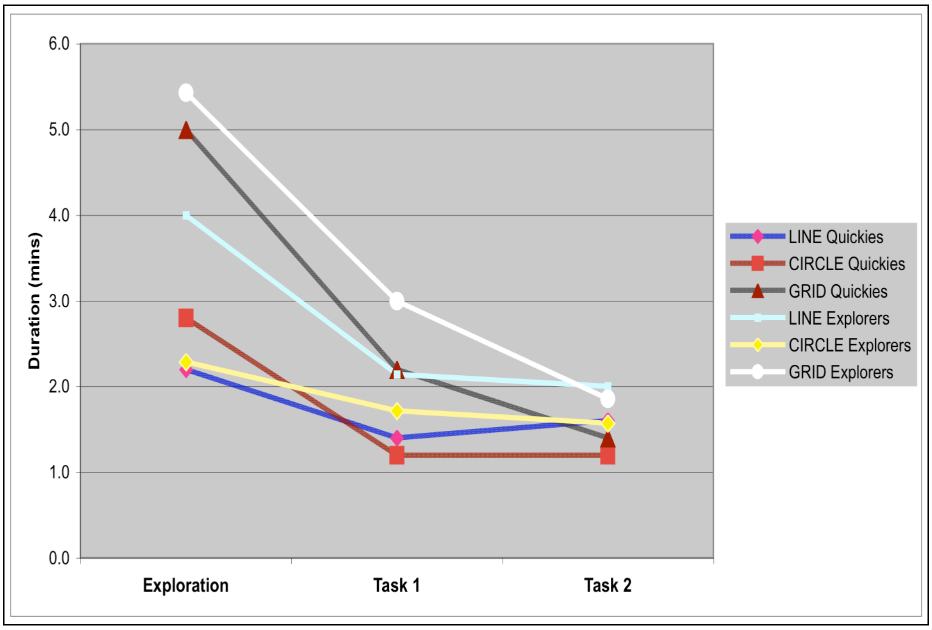


Fig. 6.24: Durations for Explorers and Quickies within LINE, CIRCLE, GRID models. (Graph by Dr Zafer Bilda)

6.6.3. Outcomes

The Quickies and Explorers personas are reinterpreted together with the data represented in the graph (6.24). Explorers spent significantly more time exploring the GRID and CIRCLE models compared to time spent exploring the LINE model. Explorers spent significantly more time to complete Task 1 with the GRID model compared to all other conditions. Quickies spent significantly more time to explore and complete Task 1 within the GRID model, compared to time they spent with LINE and CIRCLE models to perform these tasks.

This shows that all participants whether they are Quickies or Explorers took more time to explore and learn the GRID model. Time to complete Task 2 with the GRID model was similar to completing Task 2 with other models. This shows that a participant's performances to complete a task were similar once they had explored and learned how to interact within the Model.

When we look at performances within the same model, we observed that Explorers always spent more time in Exploration and completion of Task 1 compared to the Quickies. This behaviour aligns with our persona development, that there is a certain tendency for interaction style amongst participants.

A final observation drawn from the graph is the shorter duration the Explorers expended on exploration of the CIRCLE. Could this suggest the Explorers, though more leisurely in their pace, recognised quicker than the Quickies the direct relation between the visual components of CIRCLE and therefore proceeded more quickly to the tasks?

6.7. Findings

The evaluation research questions (6.2.2) addressed the stated goals (6.2.1) as a means of understanding the quality of the interactive experience by the participants with the Test Models. The preferences they expressed were probed for the creative engagement they experienced with the Mnemovie system rather than the effectiveness at this stage of development, of navigating and retrieving motion picture files.

The second of the research questions (6.2.2) raised the issue of expertise levels amongst movie users in the interactive digital environment. The user profile approach was a useful starting point for this evaluation, but its lack of clarity (as critiqued by Leritz-Higgins), has nonetheless contributed to understanding a user experience as being much less about user skills with specific interaction designs, and more about user styles of interaction. This proposition emerged after the interactive sessions had been completed and was not a feature of the interview questions that were intended to provoke discussion during the final session. However, preferences were revealed by the participants about the Test Models encountered, and contributed to the third of the research questions (6.2.2.): in the words of one, commenting about interactive design as being concerned with an experience or a functional tool for instance; *'…depends whether you want it to be more exploratory or more findy/searchy'*.

The models examined in this chapter by the participant group of ‘memory workers’ provides data that address the problems described at the outset (Chapter 1.1), by revealing effective and affecting means by which motion pictures can be stored and retrieved in the contemporary digital environment. The finding addressing the first of the research questions (6.2.2), is that participants succeed in navigating and retrieving motion picture files using the Mnemovie system to varying degrees of adaptability and preference. As Donald Schön has observed: *‘They make and test new models of the situation … to function as transforming moves and exploratory probes.’* (Schön, 1983),166.

This we describe as styles of interaction, a rubric supported by observation of individual participant's encounters with the Mnemovie models and subsequent statements made on paper and in interviews. The epistomological evidence for this is demonstrated in:

- the effective management of motion picture files by the participants through navigational capabilities acquired following brief periods of familiarisation with the interactive principles of the visual mnemonic approach to indexing;
- heuristic agency as an affecting and quality experience to the participant during encounters with the motion picture file collection – Schön's exploratory probes;
- the individual creative initiative proposed by participants for organising personal movie collections using the Mnemovie interactive principles.

Contained in the tables showing declared responses to each of the models, (Fig 6.15), the preferences expressed by the participants showed that the CIRCLE Model quite clearly scores High for 'Ease of Use' and 'Efficiency' in retrieving target movies, and LINE consistently shadows as a Moderate alternative. However, opportunities for heuristic interaction, during which participants explore the possibilities of interacting with the images on the screen, having been provided with only the basic principles of the interface operation, are quite clearly favoured in LINE and GRID. The GRID model scores in all categories consistently with an almost equal mix of the three ratings. Overall these findings affirm the first of the research questions (6.2.2), demonstrating that the participants found the Mnemovie system effective for navigation and retrieval of motion picture files from the collection, though as discussed previously, with some inconsistencies in interaction style.

The inconsistency across the three models suggests that participants regarded the different models as being effective for different purposes. This proposition was tested by further analysis of the observed durations taken for Exploration and Task completion, (summarised in Fig 6.23), leading to the identification of two interaction styles we named as Quickie and Explorer.

The categories of interactive behaviour observed and recorded in the data gathering sheets aided in describing the interaction styles. The quantative data -

the time taken to respond to system affordances presented by each of the models – is summarised with the following table:

System Affordances	**Interactive Behaviour**	
	Quickies	*Explorers*
Interactivity	Infrequent	Frequent
Navigation	Options taken infrequently	Options taken frequently
Mnemonics	Text preference	Image preference

Fig. 6.25: Summary of interactive behaviours observed between Quickies and Explorers

The frequency of interaction with the system reflects how each participant responded to the options presented by the navigational schema. Following the exploration period, a duration determined by each participant, the approach to task completion incorporated a determination by Explorers to defer outright success. It was observed in the Explorer group a tendency to use intuitive senses to extract maximum benefit from the affordances presented by taking navigational options more frequently than Quickies. These exploratory gestures tested the two mnemonic devices within each Model – the schema and the 'image-link moments' – that are the basis of navigation within the movie collection. Quickies by comparison were content to use the text titles as remembered from the earlier exploration or through guesswork based on the titles as description of content. Though participants were reminded to "Please take your time" at the outset of the encounter with each model, the focussed activity of completing a task by the Quickies was in contrast to the Explorers. The Explorers self-directed and open approach sought to enhance the experience of seeking and gathering knowledge more generally from within the system.

These behaviours indicate a certain tendency for interaction style amongst participants. The subsequent development of two 'personas' to summarise the characteristics of the two groups was based on further analysis of the questionnaire responses and the interviews.

The styles of the two personas and interaction with the Models can be characterised:

Quickies (Q):

delivers an outcome with efficiencies aimed at retrieving specific files, using an interface layout and interaction devices that are functional and consistent, providing a direct equivalence between the images in each video file.

Explorers (E):

delivers an outcome emphasising the experience, part of which is the participant having to deduce initially the characteristics of the collection and the syntax employed in relating a moment in the motion picture with a (linked) file.

The results of this approach to analysis show that the thirteen subjects responded to both the functional aspects – ease of quickly finding a specific movie file – alongside the experiential and pleasurable. As one participant put it: *'It was more like interacting with video than a computer.'*

The majority of the participants were observed to be Highly Confident when interacting with the CIRCLE Model (see Fig.6.21), the only one of the models using a restricted visual range. In other words the model has a direct visual relation between the mnemonic moment of one video file and the linked video file, without the schema of the GRID or the LINE being necessary to provide navigational guidance.

Further analysis of the second questionnaire and the subsequent interview examined the actual words participants had used for describing:

- the interactive principles of the Mnemovie system;
- the strongest feature encountered;
- the weakest feature encountered

(Appendix 8.35 – Evaluation Second Questionnaire Results).

These responses addressed the third and the fourth research questions (6.2.2). From the statements it can be deduced participants regarded affordances within the system differently as applicable to their needs, and in varying degree. Primarily participants regarded the Mnemovie system as a navigational tool exhibiting different qualities of navigation to encourage self-directed activities – like exploration – or expedite task orientated activities such as the retrieval of target movies. *"The search function seemed intuitive and second nature using the keyboard arrows"* linking interactive gesture with a quickly understood means for retrieving a movie, described by another as using the arrows *"..to navigate around a spatialised main menu.."*.

The experience for another led to interest in *"..how quickly I began to learn the association of image to content almost without being consciously aware of it….I would seem to know that was where that piece was…I enjoyed the mystery of it".* 'Enjoy…' and 'fun' were words used by five of the participants in the questionnaires and interviews, acquitting significantly the fifth of the research questions (6.2.2). This is amplified by the finding that while most participants were Confident with the GRID Model, only some appreciated its more complex interactive basis. As one observed: *"...it is much more available to the ruminative and poetic mode of knowing than the instrumentalist mode of knowing..."*

Nonetheless the same model led several to describe scenarios for applying the model to their own video collections, in so doing addressing the sixth and final of the research questions (6.2.2). For one with an extensive collection of feature films on a server, applying the GRID Model could turn selecting the movie to be watched into an preliminary expedition: *"In this street, my thriller movie collection; in this one, the comedies; in this house all the Marx Bros; in this dark garage at the back, my horror movies."* Another observed*: "…really interesting from a performative aspect … you'd start collecting filmic media that would respond to this model of interaction".* Such proposals indicated the creative possibilities afforded by the less 'direct' schemas, open to idiosyncratic and personal approaches to the storage and retrieval of varied, (and probably personal), motion picture files.

The evaluation of the Mnemovie hypervideo interactive design at this point in the development process turned to further reflection on the experimental models developed at the outset as having significant implications useful to participants as designers of personal hypervideo systems. In the same way as the process of evaluation has informed our plans for subsequent interactive experiences and scenarios based on movie file collections, the value of openness to experimentation and reflection by the users of creativity support tools needs to be encouraged at early stages - Schön's transforming moves.

Whilst the design concept for the participant with a feature film collection on a local server does not present a problem for the collection owner, the availability of tools capable of hypervideo authoring does, thereby containing implications for interaction design. Authoring as a practice, of text documents predominantly, is widespread with the advent of the personal computer. It has introduced a significant proportion of the population to hypertext on the Web as an organising principle that is relational, (becoming sequential as a result of interaction by the reader with the browser tool). However, whilst digital technology has delivered the videocam, a tool most can use with confidence, organising the video material for presentation using contemporary editing tools is limited by the tools' design. The imitation of analogue media tools – such as non-linear editing applications - using digital technology, leads inevidibly to imitations of the linear, sequential conventions of cinema and television, as is evident on websites such as YouTube and GoogleMovies. Authoring of motion picture files into hypervideo documents for online and offline purposes will require a different set of creativity support tools toward which the Mnemovie experimental system is an initiating step.

The results of analysis in revealing significant difference in styles of interaction among participants, informs subsequent interaction design for hypervideo systems and creativity support tools. This proposes an effective 'search' tool and an (affecting) tool for navigating or 'browsing' movie collections, as the means by which 'memory workers' are enabled to store and retrieve the video files with which we work, communicate and entertain ourselves. These proposals are outlined and discussed in the final chapter.

6.8. Notes

[1] One of the participants has given permission for the video record of their interactive test session to be made available for viewing. This can be found on the accompanying DVD-ROM, Item 5.

[2] A study comparing three Models using this method would be too time consuming and generate too much data to be usefully analysed at this early stage of the Mnemovie precept. However, after some initial conclusions had been reached and the implications for interaction design realised, then the subsequent model or prototype could usefully use the cued-recall approach.

[3] Participants in this final category could well exhibit either great learning skills in operating the Mnemovie system, or extreme boredom, in that whilst operation of gaming systems and Mnemovie were related, the motivation and goals for interaction were different. Whilst a gamer is caught in the thrall of the goal-orientated narrative, the evaluation demonstrates the operator of Mnemovie is able to associate mnemonic cues with movie items, as material information, directly related to their recent or distant personal past.

[4] Schema, from the Greek *skhema*, meaning shape

[5] Point-of-View (POV) is the motion picture image as it would be seen by a human eye moving, (usually walking), through a physical space or series of spaces.

[6] Dr Zafer Bilda generously provided advice for the evaluation plan, and for approaches to detailed analysis.

7. Concluding

The objective of this research has been to propose more effective and affecting means by which creators and audiences can store and retrieve the motion picture video ‘movie’ files with which we work, communicate and entertain ourselves, increasingly each day.

I have discussed how interacting with video is a technology-led development afforded by the migration of motion pictures from the analogue to the digital domains. It is from this material deflection of the motion picture medium which the current research has produced results demonstrating potential opportunities and indicating fresh directions for creative interaction by artists, designers and participants, who share the interactive experience. The production of large-scale immersive interactive video installations and the development of software tools for the support of interactive video (hypervideo) production are envisaged as the follow-up from the research. Further reflection on the outcomes that have emerged will feed into fresh formulations, in this the concluding stage.

> We will see the emergence of new ideas about representation and about computation – ideas that incorporate the economies of action-orientated inner states and continuous analog processing, and recognise the complex cooperative dance of a variety of internal and external sources of variance.” (Clark, 1997),175

A brief reappraisal of the previous chapters will conclude by outlining fresh research directions for understanding more about the relationship between interaction style observed during: the development of the Mnemovie creativity support tool; the interactive participation of a case-study group during the evaluation process.

7.1. Summary

Our interaction with the world and the actions with which the world affords, reminds us that we are able to construct meaning *‘..in both its physical and social manifestations*’ (Dourish, 2001). The experimental models developed have provided the primary data that demonstrates these differences. The assessments of the models as a series of focussed and reflective investigations have been documented as secondary data. Further secondary data has been gathered using an evaluation design that revealed variations in interaction styles amongst a group of participants who use motion pictures in the digital environment for a variety of purposes.

The participants discovered that interaction with the experimental models delivered agency as a component of the experience, in effect frame-by-frame control over the duration of the motion picture document (file) and the order of its succession (replacement) by related files. This is in contradistinction to the conventional motion picture experience of 'watching a movie', when duration and order – filmic montage – are pre-determined by the producer of film and television.[1] The responsibility for making meaning shifts when the motion picture experience is designed rather than engineered and becomes instead an encounter shared between designer and interactive participant.

The previous chapter demonstrates the dubious value of 'user profile' groupings, too tightly defined around a domain group – the movie-users. A key finding characterised as Quickie and Explorer personas, reveals that the style of interaction is a factor determining the uptake of affordances within an interactive system by participants: Quickies exhibit a desire to complete a task rapidly using ready-to-hand prompts; Explorers enhance the process and the experience by gathering knowledge more generally from within the system. The process of investigation thereby amplifies the development of a visual syntax – or schema - by the participant. Cognitive learning and responses lead to interaction 'styles' that are characterised laterally and relationally, rather than vertically and sequentially. The aids to memory - mnemonics – are critical to interaction of this kind.

The mnemonotechnics are memory devices useful to: Short Term Memory (STM) and the immediate experience of the interactive process; and Long Term Memory within the representational system (or content) of the motion picture document. This research has concentrated on the image in motion, STM and the experiential outcomes of interaction with hypervideo systems. It has been encouraged by the work (discussed in 2.2.4), on episodic, recognition-based memory processes (Lansdale & Edmonds 1992) applied to filing systems, *Memoirs*; and the episodic buffer in working memory, particularly Baddeley's descriptions of the 'visuospatial sketchpad' (Baddeley 2000). Naimark's *'Aspen Walk'* (Naimark 1998) and Girgensohn and Shipman's 'detail-on-demand' approaches to interactive video (Girgensohn et al 2003), whilst ably demonstrating the role of STM, have stuck closely to the arcane functionality of the analogue filmic principle: a beginning, middle and an end to each sequence of shots relational to an overall beginning, middle and end of the whole, within which the sequence is sited. This is in contradistinction to a principle of 'more-same-less' that gives the participant agency to determine the order and duration of component shots in an 'auto-constructed' sequence.

Parallel with this research, Adrian Miles has critiqued traditional editing in 'hard video' where an edit is a decision point. *In principle this moment is infinitely divisible and can be connected to any other subsequent sequence, however in hard video once determined this moment and point is single, fixed, absolute and linear. He* uses the term softvideography to describe his approach: *softvideography becomes crystalline in structure where any moment, or point, in a softvideo work becomes a possible point of connection with any other. … When conceived of as a crystalline structure a shot or a sequence in a softvideo work now offers multiple facets or faces of connection.* (Miles 2007)

The images contained within each of the video file collections in both the experimental and the Test Models have been instrumental in determining the interactive designs of each. The designs have explored the mnemonic usefulness of the 'schema', to indicate the navigational precept applied to the collection, but more particularly, the mnemonics embedded within the images captured by the video recording, as a time-based index: useful for pointing toward linked files and continuing interactive engagement; and useful for representing the past in the present. Though gathering specific movie collections has not been the focus for these projects, in summary, the value of interacting with movie files will determine in future research the quality of agency over how the past is represented, an epistemological approach to motion picture images as evidence, as documents representing the past, in the present.

As Clark has argued, we *'…reconstruct past experience, usually for present purposes.'* (1997) It is a phenomenon of our cognitive selves, shaped by our culture and our presence in the world. The ubiquity of the recorded moving image in the modern world demonstrates that it is commonly experienced in a way that goes well beyond the traditional narrative forms based on sequential modalities. This research has begun to reframe the complex relational modalities emerging from movies in the digital domain, through which the majority of motion pictures images are today delivered to users and audiences.

We have examined in Chapter 2 the complexities of the motion picture document, encountered in the contemporary setting of scientists' laboratories and artists' studios and galleries. The demand from security, television and medical industries for the machine processing and indexing of motion picture images has been contrasted with approaches taken by artists and designers creating experiential, immersive informational systems and installations based on the moving image. It has covered the gamut of creativeness recently described by Shneiderman as probably falling into the three kinds of approach: the structuralists: who '*follow an orderly method, typically described with several stages'*; the inspirationalists: who *'advocate working on unrelated problems, getting away to scenic locations … promote meditation, hypnosis, dreaming and playful exploration'*; and the situationists: who *'recognise that creative work is social'*. (Shneiderman, 2007) 25. The implications for interaction design based on Shneiderman's approaches combined with the results from this research are described in 7.2.

The ideas of Norman and Schön have been applied in the practice-based research approach taken to developing the experimental models. The methodology employed is described in Chapter 3 establishes a repertoire of knowledge including systems theory, cognition and memory, semiotics and contemporary media forms as the basis for reflection on the development of the models. Using a journal and technical logs, the process of developing the experimental models as described in the chapter, produced predictable and unpredictable outcomes. Schön's use of the term repertoire as based in *'..our knowing is in our action',* (Schön, 1983) acknowledges situations of uncertainty from which insights emerged. Using the professional foundations described in Chapter 4 of past experience with experimental prototypes and practice-based observation of experimental artefacts in the analogue domain, has added to the repertoire of an understanding of the means by which creative interaction with motion picture files can be facilitated. The problem as described at the outset does not set out to provide a solution, but in being reframed using the approaches described in Chapter 5, New Studies, analyses the issue from a practice base to arrive at what Schön has described as *problem-setting*.

The themes develop from earlier foundations of the image of landscape as a tacit schematic paradigm for knowledge structure. The term 'mnemonic movies' is used to describe the practice-base applied to interrogate the paradigms proposed. The themes are expanded into spatial and temporal paradigms for the navigation of a specific collection of video files in each of several experimental Models, (the primary data), with an interaction design based on 4-way gesture. The transition from using the mouse for interaction to the arrow keys happened when the ease and speed with which navigation of the motion picture collection could occur was realised. The four arrow keys promised a more effective and immediate mode of interaction, echoing the 4-way button operated gesture that has become, in recent years, a familiar method for interacting with a variety of devices, such as the DVD controller, the digital camera and the mobile phone.

Secondary data gathered during the iterative building of the Models included the development of the Mnemovie engine and toolset through three iterations. A summary recorded that transferable knowledge had emerged from researching extent theory concerned with practice-based research and hypertext practice; the reframing of hypertextual theory; the reframing of the image of landscape as an indexical system; the reframing of notions of spatial relationality; the building of a repertoire of interactive paradigms, and alternative system propositions; the building of a repertoire of tools for authoring hypervideo; the building of a repertoire of experimental models; and reflections on the reframing and further development of models.

The evaluation process described in Chapter 6 was designed to reveal the qualities of the *Mnemovie* system, both as a search tool and as a novel interactive experience. The Tests can be characterised as a dialectic between two definitions of motion picture: the form that is the analogue convention, in which the frame-by-frame continuum reproduces a sequential representation of what the camera records, modified through editing to maintain an illusion of continuous time and space, a virtual entity. Secondly, as a form emergent from the digital domain by which the frame-by-frame continuum is relational to the agency of the participating viewer able to determine the duration and order of what is seen and heard. This form of interactive experience was highly attractive to the participants. None of them for instance, 'passively' watched any of the 3-minute documentaries used as the search task targets from beginning to end, as they might a music video of similar duration on television. Most would watch from between a few seconds up to 30 seconds. All were observed as eager, with each of the three systems, to return to interactive engagement.

This eagerness we surmise is due to the agency each of the systems delivered to the participants, as full-frame interactive motion pictures images and sound. From the outset of each session it was moving pictures that were encountered, not tick boxes, highlighted hypertext, filenames or any of the other paraphernalia of interacting with movies on a website or desktop. Each participant was able to determine for how long they would look at something and, following practice, determine the order of what would follow. Emerging from observation of participants, the questionnaires completed and the interviews conducted, it was revealed that alphanumeric titles were an affordance some chose in order to accelerate task completion; others chose to attenuate task completion and instead extend the experience they were enjoying.

The evaluation study was beyond validating whether requirements of a specific design were met, instead providing the artist / designer / researcher with an understanding of the participatory context for the *Mnemovie* system. The researcher was actively engaged in all user research activities such as selecting and recruiting participants, observing their interactions with the system, establishing criteria for the measure of their engagement and their expressed preferences. The in-depth interviews increased the researcher's awareness of participant's experience and thereby understanding of the system. Design and implementation of the evaluation study brought interaction design methods into the artistic creation process through close understanding of lived-experiences.

The evaluation process has shown that the design and authoring of hypervideo strategies for motion picture collections from all manner of sources – feature films to mobile phone grabs – requires further research across a wide user base. The evaluation has concentrated on a computer literate group, revealing the disparity between those who are task orientated and those who de-emphasis the task in favour of the experience. Hypervideo authoring will need to account for a wide range of strategies in the design of tools capable of responding to creative needs and demands.

The development of creativity support tools necessary to address the needs identified in this research will continue using the *Mnemovie* experimental engine. The *Mnemovie* system has not been based on user-centred design methods[2], but created as practice-based research. This has entailed concept development through the practitioner's knowledge, experience, skills and sense of creative enquiry, the approach described by Donald Schön (1983). The *Mnemovie* software engine, built in collaboration with a technical developer, enabled the researcher to reflect upon the iterative versions based on the concept, and later to understand the user experience for each model. As presented in this study, components of user research came into the evaluation process after the test prototypes (designs) were developed.

The digital motion picture file is becoming increasingly widespread as a document for everyday tasks as well as pleasures, applied in a wide variety of contexts, from the mundane to the exotic. The findings have shown that users employ different interaction styles when navigating digital video file collections. This will have implications for future approaches to interaction design requiring alternative methods of retrieval and a range of approaches to storage as a creative practice. The ideas advanced by the participants for storing files, together with conclusions drawn from the practice-base of experimental models developed thus far, begin to describe such possibilities.

7.2. Implication for Interaction Design

With the advent of the personal computer, design and creative authoring as practice, of alphanumeric documents predominantly, has become widespread. As we have seen in the evaluation findings, the design concept for a motion picture collection is unlikely to present a problem for the collection owner. But the availability of tools capable of hypervideo design and authoring does present a problem. Microprocessor technology has delivered, besides the computer, the handycam, a tool most people use with confidence. However, encouraged by the non-linear editing tools currently available, organising the visual and sound material gathered encourages the imitation of linear, sequential conventions of cinema and television. Authoring of motion picture files as hypervideo documents will require a different generation of creativity support tools.

The design of the tools will need to be capable of responding to the needs of authors who have movie file collections and the expectations of the audience who will access them. The support tool used by a collector to build a hypervideo system could have alternative interactive schemas and distinctive design qualities appealing or even useful to Quickie and Explorer characteristics. For Quickies this will deliver an outcome with efficiencies aimed at retrieving specific files, using interaction principles that are functional, consistent and fast to use – the traditional computer application goal. For Explorers, delivery of an outcome emphasising experience will allow the participant to initially deduce the characteristics of the collection and the syntax employed in hyperlinking, then immersing in the images and sounds that are the substance, ‘the content’, of the collection.

System Affordances	**Interactive Behaviour**	
	Quickies	*Explorers*
Interactivity	Infrequent	Frequent
Navigation	Options taken infrequently	Options taken frequently
Mnemonics	Text preference	Image preference

Fig. 7.1: Summary of interactive behaviours observed between Quickies and Explorers

The summary of interactive behaviours described in the previous chapter (Fig 7.1) are characterised by Quickies reducing the number of interactive events and using familiar indexing devices based on alphanumeric; and Explorers taking time to interact with the system and in so doing, work actively with the mnemonics experienced during familiarisation with it. Building on these characteristics, the design qualities of the interactive experience (Fig 7.2) will be reflected in the collector’s interpretation of the collection in its presentational ‘public’ form, or will be selected by the user / participant according to the preferred interaction style.

The reasons for doing so are many. In the words of one of the participants, *‘I valued the maker crafting a path, resulting in a satisfying experience.’* Another participant *‘…was totally surprised at how different the beginning and end experiences were … just navigating the same corpus [collection].’* The Quickie experience as one of the participants described would be more *‘…like reading a book … like jumping links on the internet really … something to do by yourself as your mind goes from one track to another…’*.

Interactive Experience	**Design Qualities**	
	Quickies	*Explorers*
Interactive options	Sparse	Rich
Navigational options	Less	More
Movie speed	Fast	Slow
Mnemonics	Familiar cultural coding (text; actors)	Subtle coding (discovered; intuited)

Figure 7-2: interactive experiences as design qualities

The Tests have also shown that alphanumeric indexing in conjunction with visual cueing explicitly aids interactivity, (a similar outcome from the earlier *Pathscape* project – 4.4.4). Tacitly and implicitly established relational links to other files in a movie collection encourages participants, (particularly those with highly developed language skills), to investigate for themselves means of indexing motion picture information that go beyond the currently constrained approaches used by alphanumeric systems. Domains of particular interest for further work in this respect will be interactive systems designed for trans-lingual contexts, and domains in which knowledge classification is explicit, for instance zoology, geology, anthropology etc. Anthropologists have been increasingly embedding visual technologies into their research, including digital media and hypermedia, suggesting:

> “..two important types of engagement: first with mainstream anthropology and its methodological and theoretical currents; and second with digital work developed in other disciplines, arts practice and theories of representation and communication’ (Pink, 2006) 20.

Further research can now be discussed and will necessarily incorporate design principles for making meaning from a motion picture collection made navigable using hypervideo systems.

7.2.1. Design Principles

We have seen that creativeness in the act of navigating a collection can be as essential as creativeness in the process of designing the experience. Engagement by users with hypervideo systems, where the boundaries between authoring and viewing are blurred, will need to be designed to encourage minds to be creative with collections of motion picture documents of the past, ordering and linking together into the present. Shneiderman's three categories of creativity (the structuralists, the inspirationalists, and the situationists – see 7.1 - (Shneiderman, 2007) apply equally to participants interacting with memory systems of this kind, as it is applied to their designers. The act of creating a narrative, a 'sequence-image' is thus a task of making meaning shared with the author/designer of the hypervideo collection. *… the sequence-image as such is neither daydream or delusion. It is a fact – a transitory state of percepts of a 'present moment' seized in their association with past affects and meanings.* (Burgin, 2004) 21.

The current research has concentrated on the syntactical strategies useful to interactive navigation of a collection rather than the technical means by which this is achieved. The physical means by which this is achieved through gesture has remained in the background. The mouse and the arrow keys, the most basic of interactive devices, have been adequate thus far to facilitate the required interaction. But further consideration of the physical context within which the hypervideo system will be encountered need also to be considered as affecting research design:

- The privately viewed space of the computer monitor accessing a local collection of movies augmented by access to a networked collection, collaboratively assembled onto a server and modified by both contributors and invited 'curators' – discussed next in 7.2.2.
- The larger immersive space of the cinematic installation where interactive gesture is incorporated into the space (the initial starting point for this research [3]) – discussed later in 7.2.4.

These will develop in several ways, as indicated by key aspects that have emerged from the research, to advance the differing needs of 'memory workers', (described in Chapter 1.3: The Outcomes).

The following sections 7.2.2 to 7.2.4 discuss hypothetically the characteristics of hypervideo systems for particular groups of memory workers:

- the general audience, where interactive possibility is made clearly evident for a system encountered in a public place (7.2.2).

- the specialist community (7.2.3), where the needs to be addressed by the system are to be initially defined from within a toolset (such as the *Mnemovie* toolset used to build the experimental models);
- the individual artist / producer / designer, as a creator of systems to be deployed in the contexts specific to their practice (7.2.4);

Finally, a short discussion (7.2.5) of a recent research stream that moves away from the design of creativity support tools for authoring based on the *Mnemovie* principle, toward generic versions in which it is the movie files collections that are tailored to fit the schema, with additionally, potential for generative interaction.

7.2.2. General Principles

The vast increase in the use of audio-visual devices as 'writing tools' requires the repertoire of research emerging from the *Mnemovie* project to respond to the expectations of a 'general user' with the broadest and most intelligible syntax, building on well-established metaphors such as 'the illustrated book', (mixing text, graphics and photo-images), 'the storyline', (in which the story can be expanded or contracted), the directory or encyclopaedia, etc. These follow cultural forms familiar to the general 'memory workers' in Western cultural contexts.

The distinction between the general user and the other two groups can be characterised by comments made by participants interacting with two different experimental systems – the *Mnemovie* system and Andrew Johnston's sound imaging and sonification system. Johnston (Johnston *et al.*, 2006) has developed a software musical instrument that responds to someone playing or singing by creating sound and visual images that capture and reflect the human performance. *'Musicians have described it as rather like playing with a partner'* (Candy, 2007) 28. This echoes one of the participants during the evaluation of the *Mnemovie* Test Models: *'It was more like interacting with video than with a computer.'*

Observations of this kind emerge from the evaluation process as moments of joy. The attenuation of the interface between the machine and its user that such comments imply, is a goal to be eagerly sought by designers of systems. The niggardly negotiation that is so often a feature of interactive encounters of the most basic kind, pressing arrays of buttons and keys both on-screen and off-screen, is clearly best avoided for our cognitive selves.

The Circle Test Model demonstrated that comprehending the interaction design and operating search and retrieval met these requirements for both ‘persona’ groups, the Quickies and the Explorers. The familiar syntax of the video documentary, with talking heads and captions, the ‘speeded-up image’ as encountered during DVD or VCR viewing sessions, was easily understood by participants.

The concept of the ‘cascading menu’ paradigm employed in hypertext theory and practice, though less evident to the general user, was the principle behind the interaction design. The implicit means for interacting with motion pictures has several approaches to extending or conceivably, automating the indexing procedures and further development within the *Mnemovie* paradigm can be outlined. (Appendix 8.38: Mnemovie Cascading Menu Development).

The ubiquity of the Web and the recent development of publicly accessible movie databases, (such as YouTube and Google Movies), has highlighted the appeal such facilities hold for online citizens. Moving away from interfaces of the kind bounded by picture boxes, advertisements and the clutter of interactive instructions could include the absence of traditional text-based indexes. The problem of retrieving movies stored using word indexing is, unavoidably, based on authors inventing titles and keywords, often quite arbitrary metadata annotations of the uploaded video file, which viewers then have to imagine or double-guess. For the viewer seeking specific information, concocted metadata terms results in the unspecific delivery of movies for viewing.

The online development of *Mnemovie* will respond to the tendencies observed during evaluation, the Quickie and the Explorer (Leggett & Bilda 2008), and the potential for collaboration across a networked creative community. The user scenario for such a proposal includes the ability of a participant to upload movie files, create links between them and place the collection into a gallery or forum area where others in the online community are able to interact with and also produce modified versions of the collection. (Appendix 8.39 – Mnemovie Online Development).

Thus the general audience encountering a hypervideo system in a public place, based on the stated principles of ‘gesture’ and ‘shape’, has a requirement that the interaction design is clearly evident. The general audience has the central theme or rule communicated, thereby knowing the governing the factors creating relationships within the collection of movies. In a time-starved environment, the general participating audience needs to know these things quickly, an initial classification based on genre, subject, author and the type of motion picture collection will simplify an approach to visual indexing at the initiation of interactive participation. Remaining a passive viewer becomes irresistible, changing shots on the fly becoming an implicit requirement. The process of meaning-making – active reflection upon the conjoining of two movie shots – begins a longer process of conceptually and actively exploring possibilities, initially as a viewer, then as an interactive creator[4]. Such focus would be the characteristic of building a community collection, which is now discussed.

7.2.3. Community Principles

The generic community (social, ethnic or religious) is a specialist variety of memory worker(s) guided by tradition, consensus or policy. Creativity support tools are required for those who will be instrumental in organising the motion picture collection into a form comprehensible to the rest of the community. The approach to developing the support tools will therefore be tightly bound to the dynamics of the culture and have some of the characteristics of the 'general audience' approach described above, together with the specificity of the characteristics that identify a community.

Communities converge often out of the fact that they are a community of shared locale and indigeneity. A pilot project in Dublin in conjunction with MIT Media Europe described:

> "…how stories of local memory and community can push the boundaries of digital narrative and through the collection, visualization and display of these stories positively reinforce local community. *"An Interactive Portrait of the Liberties"* takes advantage of the modular and anecdotal qualities of community stories."[5] (Burke, 2003)

Meta-design, in taking a framing approach to creative interaction with movie collections, can assist author(s)in the invention of the representational system for such projects. Meta-design is *"…another species of design, where the artefacts being designed are themselves interfaces for designing – hence meta-design'* (Lieberman, 2005). Meta-design takes up many known principles of good design within human-computer interaction, providing options for guiding the users' design process.

The methodology of meta-design is being developed by researchers working closely and sympathetically with community groups to encourage participants to engage in the collaborative construction of artefacts and activities meaningful to the context of their production and social and community usefulness. The relationship between the designers and the community group is symbiotic – researchers, skilled in electronic tools and their use, learn with community members how to organise cultural knowledge in the form of artefacts, oral narrative, performance, etc.,(see 2.6.3). The collaborative project becomes a *"… creative process defin[ing] a 'seed' able to generate endless variations recognisable as belonging to the same idea but open to change"* (Giaccardi, 2005).

Different modes of taxonomic representation emerging through consultation in such a scenario can provide ways of thinking about the representation of memory. The community may not wish this to be for exposure to a wider audience, (anymore than diaries are for a wider audience), so there are many questions about evidence and its remembering in this way, that will be determined collectively, step by step. With further research into the development of appropriate interfaces to help the author(s) define the ontology and epistemology of personal and collective memory, the *Mnemovie* paradigm will help with the communities exploration of the efficacy of relational terms like "more", "same", "less" as the basis of retrieval of audio-visual digital media artefacts.

During 2006, a research proposal to develop the early design stages of practice-based research using meta-design as a conceptual framework was delivered to the Australian Research Council (ARC) - (Appendix 8.15: *Indigitrax*, ARC Proposal Description). The development of the proposal was invaluable in thinking through the implications of using a meta-design approach for a community support tool like *Mnemovie* to be deployed as a development project with an Australian Indigenous community partner.

In Australia, Indigenous communities across the continent, whilst sharing protocols of behaviour exhibit wide variation in cultural forms and knowledge. To respond to this diversity the approach to design is seeding rather than planning. The objective of the proposal was for the team to develop a new design approach with an Indigenous community, the outcome becoming a design system open to adaptation and capable of responding to technology development. The approach would also discover how ‘a new praxis of design’ could enable communities to develop their own computer-based system as an aid to sustaining, growing, preserving and transmitting their culture to successive generations.

Though the proposal was not successful in raising funds, it advanced considerably our knowledge of the means by which the *Mnemovie* paradigm could be usefully deployed into a community. Though anthropologists have been working increasingly in the context of indigenous peoples’ use of media around the world since the 1970s, it is only recently this has included anthropological approaches to producing media with and for local people (Deger, 2006)(Pink, 2006) 11. However, in Australia, Indigenous communities regard many anthropologists with distain of the kind a non-ethnographic film-maker like Rolf de Heer was able to avoid (De Heer 2007)[6].

The exchange of knowledge with the filmmaker, for access to language and stories, has several outcomes satisfactory to the community including access to the wider world. The project advanced knowledge of cross-cultural collaboration, exemplifying the benefits of a community of interest (de Heer and his crew), working with the community of practice (the Yolgnu of Arnhemland), to develop a community resource meaningful inside and outside the location of its praxis.

7.2.4. Specialist Principles

The specialist memory worker is a creator of systems to be deployed in the contexts specific to their practice, whether an artist, designer, scientist, engineer or researcher. Syntactical approaches by these memory workers are dependent on designs from software developer ‘specialists’, who author non-generalised retrieving tools for specialist users. Initially the syntax employed is determined by the ‘sub-culture’ or ontology within which the client operates. Evidence of this is visible on public (and private) blogs and websites, created using non-programmer tools of nominal cost, delivered to office, mobile phone and lounge-room.

The specialist syntax of the visual artist is encountered on the Internet too. Hypertext tools provide the framework for interactive portfolios and occasionally, an interactive artwork, including those based on hypervideo principles. Adrian Miles work over recent years has taken the most direct approach with his ideas about ‘videography’ (see 2.6.3), by utilising the authoring possibilities of the widely used and economical Quicktime movie file format and its characteristics.

Delivered to a user's desktop as a small package of files, an authoring tool, (with several examples of the artist designer's artworks using the tools), combines with a Quicktime Pro version of the application[7] to enable the user to begin linking any movie files together using a word-based interface. Successful interaction with artworks made with this approach to visual syntax is, like other word-based systems, based on the chanciness of terms used. The experience though, is more focussed, using mouse gesturing over the array of images to create outcomes combining the delights of the aleatoric and the clash of juxterpositioned elements. In the private space of the computer monitor, experiments by participants can continue undisturbed by physical or personal surroundings.

In the public physical spaces of the gallery and museum, in the art gallery setting for instance, the physical presence of the visitor is amplified in a constructed environment placed in the real surroundings of a public building. Furthermore, the artefact is contextualised by the kind of building in which it is installed, its histories and the dialogues that flow from the discourse created by previous exhibits. '*Ideas cannot be separated from ideologies'* (Legrady, 2002) 224. George Legrady's installations often generate their own images from objects and activities subscribed by their visitors. Interaction is not so easily contained in this context, where the variables produced from the system are an integral part of the artist/designer's intentions, responding to the contexts of place and discourse. A certain looseness, open to the unexpected and the element of surprise is the expectation if not a need or demand from the art audience. (Sketches for interactive devices with low levels of intrusiveness are described in Appendix 8.37 Sketches – Interactive Gestural Scenarios).

The figure of 'the provisional' has been a constant within the author's and many others' broader art practice. As Ross Gibson has observed: *'But <u>unlike</u> cinema (and unlike nationalism), digital multimedia produces syntheses that are always <u>explicitly provisional</u>.'* (Gibson, 2004) 275. Schön identifies this approach to creativeness in the fourth of the four types of Reflective research, as an action science of *"situations of uniqueness, uncertainty, and instability"* which would *"aim at the development of themes from which, in these sorts of situations, practitioners may construct theories and methods of their own."* (Schön, 1983) 319. The conceptual groundedness of contemporary art has no shortage of audiences ready to interrogate the integrity of artefacts, including the interactive installation, as inevitably the hegemony of the collectable and its monetary value is subverted.

The live performance specialist meets the audience not as a remote figure, but one with a tangible presence, at an appointed time and place. Dance and the taxonomies of the choreographer were briefly explored at the conclusion of this research. The *MNEMOVE* project proposal to the Australia Council for the Arts was to explore discipline specialisms – dance, film, computing - using the *Mnemovie* system. It would *enable interaction during a performance with a collection of prepared movies, linked through principles we refer to as 'material and relational semantics'.* In the context of live performance, the *Mnemovie* system would afford *the precision, flexibility and presence of a musical instrument, embedding the computer in the physically embodied human world of past and present* (see Appendix 8.36 ArtLab proposal). As Darren Tofts observed in support of the proposal:

> Dance, film and computing are all in their own way memory technologies and *Mnemove* explores, at both the corporeal and technical level, the ubiquity of memory ecologies. The relations between the body and sensation, between sensation and its avatars in images, are active features of the project rationale for *Mnemove*. The subtle and liminal membranes between action and its fragile capture as memory, is integral to the very architecture of the project. The principle of human interaction with networked contingency, in the form of hyperlinking, endows this project with a tantalizing contingency; an aleatory force that will ensure that no two performances will be the same. (Tofts 2007)

While proposals such as this are feasible using the present iteration of the *Mnemovie* system, technical and teleological research will be necessary to advance the precept of viewing and creating, interactive agency.

Teleological research can also investigate the feasibility of a generic system for motion picture collections, where the pattern of interaction is consistent and the principle, like CIRCLE, is one of 'detail-on-demand'. Generic-based designs are featured briefly in the next section.

7.2.5. Generic Moves

A late research stream has emerged that moves away from the design of creativity support tools for authoring based on the *Mnemovie* principle toward generic versions of the schema. The approach retains the interactive design principle, but the authoring process addresses the movie file collection, tailoring it to fit a generic, pre-defined schema.

In practice a generic XML-file is employed in the system, the domain specific language filenames and durations of each video file collection needing to comply with the filenames and time-codes used in the XML-file. In requiring a different approach to movie preparation at the NLVE stage, the editing strategies reflect the way in which the movie(s) would be encountered.

The final of the seven experimental models, *Forest*, (described in 5.6.6) takes a 'lost in the woods' thematic approach using the shape of interlocking circles. It is the point from which further research will emerge in response to the Explorers' desire to discover the various ways in which interaction with hypervideo can stimulate and delight creative interaction. The interactive strategy uses the surrounding trees as way-markers between one part of the wood and the next. This involves memorising distinctive features on the trees and between the trees in order to move through the space in a constant direction.

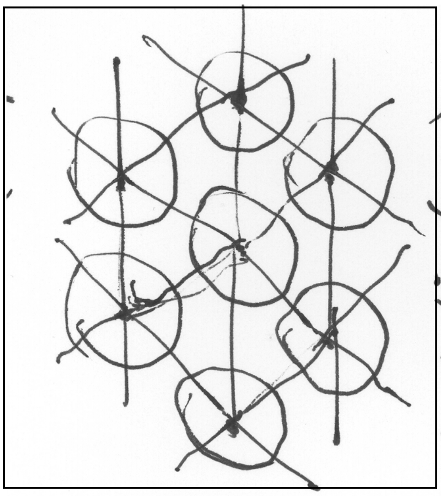


Figure 7-1: Forest –standard distance and compass direction for pans grid (plan view).

Further reflection on ideas prompted in the Forest Model, (the series of 360˚ pans roughly following a grid pattern, made in a forest of young spotted gums, spread out over an area of about 60m X 60m: Fig 7.2), highlight the connection between the durational loop of the interactive experience and the image loop of the circle made by the panning action of the camera. This is knowledge gained through the mnemonics present in each of the loops – patterns of bark on the spotted gums, spatial settings between individual trees, sightlines between trees to distant features, etc. All these mnemonic prompts are used to orientate within the conceptual space of the forest as we interact with the motion pictures, setting directional goals to be able to move through the space, or, as it transpired at other times of experimenting, allowing chance to take me 'backwards and forwards' through this realm of rural light and sound.[8]

Based on results of the evaluation process and the emergence of the Quickie and Explorer personas, it was concluded that precise siting of 'wheel spokes' in *Forest* was unimportant. The precision initially employed is based on recognisable features within specific degrees of arc in the 60-second pan, translated in the XML-code as duration point IN and OUT. It is possible, having learnt the forest as a collection of linked 360˚ pans, to navigate from one circle to the next based on recognising, over successive 'visits', particular trees and other visible features. However, learning the routes, the pathways, requires considerable powers of attention; if the remembered visual cue is not visible in a part of the pan, the outcome of interaction is for the movie being viewed to simply stop. It will be necessary in a subsequent design to encourage the learning, exploration behaviours of participants and not, in effect, to say 'wrong'. (Appendix 8.40: Notes for Generic Navigational Strategies).

The <u>experience</u> of moving through the forest on screen would be as a series of jumps. The <u>practice</u> of moving through the forest on screen would be based on a combination of counting or estimating duration, together with visual clues and other mnemonics in the scene as the forest is 'learnt'. Practice is modified as knowledge of the visual system and the environment is gained, (similar to the discussion of landscape and knowledge structures in Chapter 5.2.6).

Such augmentation, amplifies the capacity of human memory in the visual environment. It demonstrates a new form of knowledge, one that brings together the machine's capacity to instantly respond to the visual needs of the human mind. The responses shared, between human and machine, begin to describe the possibilities of enriching the qualities of our experience in a media-machine environment. As the evaluation participants demonstrated, there is a clear preference for affect over the effectiveness of the ability of human-computer interaction to retrieve specific video files. Unlike the city-dweller walking into a rainforest, there is little trepidation as to what it contains and how its affect will challenge chances of survival.

7.3. Conclusion

During the period covered by this research, my continuing experiments with motion pictures has moved away from earlier concerns associated with the analogue material base of film and video. In essence those concerns foregrounded the reflexivity of the viewer to the dialectical relationship between the conscious act of viewing and the operation of the filmic process upon that act of viewing.

The extraordinary change in motion pictures led away from the physical basis of acetate film and the mylar videotape, both of which confined the experience of the image to linear structures, toward a digital material base. The ‘random’ acquisition of images from within the computer system, images that have a material base described in binary code, enables non-linear structuring of motion pictures through a process that is also dialectical, between the artist / designer of a system and the person or people who become interactive participants of a shared audio and visual experience.

At an early stage in this research a practical way in which this could occur was proposed in a conference paper (Leggett and Amitani 2006) describing a ‘real-life concept’ application emulation for the recently arrived video iPod, (see 5.3.3), based on the Mnemovie principles. The ‘closed-code’ nature of the device made the proposal a hypothetical, however, at the point this thesis was submitted (2008), the iPhone had arrived with the encouragement to developers to create applications. At the point of binding the thesis there are some tens of thousands of iPhone apps demonstrating the willingness and ability of ‘the audience’ to participate in ways that move away from the passive consumption of new technology in general and motion pictures in particular.

The audience is between the state of making and that of participation, of creatively sharing work as a means of modifying the abstraction of their experience, abstracted from the everyday, inserted as an encounter with maximum affect, broadening and stimulating our understanding of the world.

The need for *'the configuration of indexicals'* (indexicality) where communities of expertise can collaboratively establish *'..shared meaningful objects…'* within a referential network (Sarmiento and Stahl, 2007) is a project engaging researchers from many different fields. The development of tools that step outside reproducing in a digital form existing cultural forms is the challenge adopted by increasing numbers of researchers, practitioners of 'fine art' and 'good science' working individually or in collaboration.

In June 2006, one of the handful of invited delegates to the Symposium on Supporting Creativity with Search Tools, Washington DC, affirmed the activity of searching a database or collection as *"…part of a creative process."* (Kules, 2006). Creativeness in this context works on several fronts, and it is this diversity that has been explored in the *Mnemovie* research project. Essentially, it is founded on a sharing of imagination between the maker of the interactive system and the participant who creatively explores its dimensions. Interaction based on this approach is as essential within 'mundane' collections as it is within exotic and speculative collections of movie files.

My enquiry has also confirmed knowledge previously intuited rather than known. Applying with greater care and attention to detail, the processes of practice-based research in the development of an artwork has revealed better understanding of the relationship between the act of making and the act of participating, the sharing of the obscure objects of desire as a means of accessing and thereby modifying abstraction and metadata as an art experience that is an 'open work' as proposed by Umberto Eco (1979).

The research has developed from a vaguely felt generic description of the possibilities of exploring the 'material base' of the digital video image, toward the specific research context. The ensuing process developed through encounters with others in publications and conferences, the language as well as the means for demonstrating as well as evaluating the precept.

The arena of audience involvement with art will shift and mutate towards Toft's interzone (2005), creating human computer interaction of a different order, between respondent and correspondent. The role of initiator and auteur is becoming attenuated, less 'in charge' of how an interactive encounter may proceed. By bundling and linking a variety of electronic and microprocessor devices, this moves the art activity decidedly away from the geographically installed and hard-wired artefact towards systems and processes that are multi-valent, more mobile and harder to classify within the taxonomies of art, becoming instead phenomena of social behaviour.

The implications for interactive artists and designers of our findings is that if the interactive experience has design qualities tuned to the Quickie and the Explorer personas, it supports tendencies that move away from traditional notions of experiencing the individual artist's 'statement'. The artefact becomes an entity open to taking account of the participant's interaction style, the experience becomes an art or cultural practice explored by both parties as an act of shared expression. The capturing or uploading of components into the system become an extension of the participants' interaction progressing with advanced designs coded as system templates, addressing video files accorded specific file naming conventions. The interactive experience thus becomes based on motion picture files selected by participants, specifically for duration and content, to complement the linking strategies conceptualised by the artist and designer.

Increasingly in the contemporary context of tools like the Macintosh lifestyle suite iLife, we can anticipate if not fewer words, then a lot more images to be digitally authored, consigned to data media, before finally sinking to the bottoms of drawers for want of a means to retrieve their autobiographical or historical significance.

Revealing significant difference of styles of interaction among participants has informed subsequent interaction design for hypervideo systems and creativity support tools. These will propose more effective and affecting means by which creators and audiences will be enabled to store and retrieve the video files with which we work, communicate and entertain ourselves.

The *Mnemovie* paradigm sets out to extend the potential of these cultural resources for authors to create a signifying unity for the benefit of others instruction, information and enjoyment, the key components of knowledge exchange. Enjoyment should be the key because, after all is done, and as Andy Clark has commented, *"Memory is but constrained confabulation".*

But time, he went on, is an unreliable way of gauging these things, indeed it is nothing but a disquiet of the soul. There is neither a past nor a future. At least, not for me. The fragmentary scenes that haunt my memories are obsessive in character. Max Ferber, *Migrants* (Sebald, 2002) 181.

7.4. Notes

[1] The habits associated with 'watching movies' has developed over the previous century and are embedded within cultural and social formations that have enabled us, as passive observers, to be guided in the making of meaning from the ordered narrative flow. Immersed in the comforting darkness of the cinema, the language is quickly learnt and undemanding in its popular form. In the noisy light-filled rooms of the household, the television screen flashes, gesticulates and noisily demands the simplest message be understood.

[2] In the traditional user-centred design process (UCD), initial user research defines the design problem. The designer, in correctly framing the problem can then come up with a solution. The concept is developed by gathering information from user interviews, analysis of context, patterns of use and consumption, development of personas, etc. These are often the initial stages for interaction design, the outcome of the concept development is a design then implemented through iterative production stages.

[3] Initial investigation of existing means for 'hands free' interaction commenced this research project. Other researchers with the required technical skills have been developing a variety of sensing devices using cameras and segmentation methods, infrared and ultra-sound detection etc. Outputs from such devices provide data to adjunct or incorporated systems able to interpret the data and trigger outcomes specified by the artist and designer.

[4] Retrieval based on the principles of this research could in such circumstances be very rewarding. Certainly there is unlikely to be any problem in implementing a suitable browser within an intranet. Over the Internet, technically at this stage, there will be considerable problems of latency in the interactive process and for the moment, we will await further technical advances in the delivery of online motion pictures.

[5] "We are the 350 young people from the Liberties in ten primary and three post-primary schools taking part in the pilot-project. The stories produced to-date is available for your entertainment and information on this web site. We, the students and teachers are learning to use digital technology in the development and creation of our own stories and those of our communities".

[6] Rolf de Heer, the Australian director of the film *Ten Canoes* (2006) in an article reflecting on his pioneering collaborative enterprise with the indigenous custodians of the country of Ramingining in the Northern Territory, commented

on the process of communication. The English language was not an option for achieving full participation as apart from few people in the area speaking it, English *'regretfully reinforced notions of white superiority'*. Such perceptions were countered by viewing each days rushes: *'The Indigenous participants not only saw themselves on screen, speaking their own languages, but they also immediately understood this as a successful achievement of something they'd struggled hard for, against the odds, in a medium that was for them, a given of white superiority…and they'd been instrumental in putting it onto that medium.'* (De Heer, 2007)

[7] The application is downloadable from the Apple Mac website at a cost of $AU 45 (2007).

[8] Disorientation – see footnote 3 in Chapter 5.8

8. Appendices

8.1. Appendix : Content-based Video Retrieval (CBVR) & the IBM VideoAnnEx Annotation Tool

Content-based Video Retrieval (CBVR)[i] requires specialised techniques for operating a data base management system. Chua and Ruan described the segmentation, indexing, retrieval and sequencing of video data characterising the basic principles for much research in this area, which has been considerable over the years since their work began (Chua and Ruan, 1995). Similar approaches were used to identify police mug shots in the construction of identikits (Brunelli and Mich, 1998). Related work has been considerable, also in support of law enforcement, and has some relevance to the current enquiry.

Content-based analysis and subsequent tracking or matching of objects within the frame has developed to an advanced level. Sivic and Zisserman demonstrated the retrieval of *"..those key frames and shots of a video containing a particular object with the ease, speed and accuracy with which Google retrieves text document (web pages) containing particular words."* (Sivic and Zisserman, 2003, Fan et al., 2001) As such, the 'marking' of the desired object provided a graphical connection to the content of the video, which the system then tracked through all states of viewpoint, illumination and occlusion.

Petkovic and Jonker (2000) provided a rough categorisation of video retrieval approaches in two classes: machine extracted visual features - colour, shapes, textures, or motion which characterise low-level visual content; and annotation-based features - free-text, attribute or keywords to represent the higher-level concepts of video content. Where the higher-level is *"tedious, subjective and time-consuming,"* at the lower level it is very difficult to explore the semantic content of a temporal sequence of pixel regions at the physical level. (Petkovic and Jonker, 2001)

Though these approaches address the 'industrial' issues of media, entertainment, security etc, Petrovic and Jonkers identify *'bridging the semantic gap'* as the central problem identified, with conclusions from this advanced and highly technical computing science providing a perspective to my HCI-centred research.

The means to describe video concepts on a higher level and to deal with automatic concept extraction based on low-level features from 'raw' data were described as the main objectives of a system prototype, *COBRA*. The techniques they developed, (algorithms, hidden Markov models, Bayesian networks etc), were successfully demonstrated in case study videos of sporting activity (tennis), where the image semantics, whilst complex compared to low level content analysis, functioned within a set range of framing and action parameters. All of these approaches employed an interface displaying both video and text/graphical metadata, requiring time to decode and integrate the functions of one with the meanings of the other.

Similarly, several other projects used the restricted visual range of the newsreaders studio which, (in the context of machine memory research), could be regarded as possessing "high-level concepts". Whilst remarkable in segmenting raw video data, these approaches did not address what the authors in their recommendations for future research call, *"..metaphorical, associative, hidden or suppressed meaning of video content"* (p147). They also suggest that HCI issues associated with their prototype could be improved with relevance feedback whereby:

> "..the system gathers information from the user about the relevance of features, image regions, etc. However, relevance feedback coupled with active learning is [a] relatively unexplored area in video retrieval. Video summarisation, query representation and a multimedia query language are much related problems worth to be explored."
>
> (Petkovic and Jonker, 2004),148.

Clearly they had not heard of Davenport's work at MIT. However, Del Bimbo develops the notion of higher level semantics with reference to semiotics (Del Bimbo, 1999). Interestingly he begins by quoting the philosopher Calvino:

> "We live amongst an unremitting downpour of images. Powerful media incessantly transform the real world into images and re-create it though game-like phantasmagoria: these are images which, for the most part are devoid of that inner soul which should nourish their character in terms of form, meaning, of capability to attract attention, or richness of possible meaning. Much of this cloud of images vanishes immediately, just like the dreams which leave no trace in memory." (Calvino, 1993)

Del Bimbo identifies several important research directions in visual information retrieval. He observes that while <u>querying</u> is used to precisely locate certain information, <u>navigation and browsing</u> offers the possibility of exploring information spaces. The domains he names as information spaces includes paintings, movies or advertising. Meaning he describes as: *the conscious usage of relationships that are created by certain stable categories of the expression, like line sizes, chromatisms, dark and light tones, contrast, dissolves, rhythm, motion.* (Del Bimbo, 1999).

The seeking for a *'certain stable category'* echoes his observation that semantics is concerned with logic relationships between objects and the domain that is represented. This he suggests, indicates clearly the need for a fixed entity or consistency from which, and to which, other objects, such as discrete video files, can be made relational. Del Bimbo develops the representation of content semantics from two different perspectives: semantic primitives, which are usually domain dependent and based upon the recognition of objects, actions, events, viz. the human face; and semiotics, whereby meaning is conveyed with a sign potent within a given context. Two distinct steps can be identified in the production of meaning: a narrative structure – such as is created with signs and signalling in classic film language; a discourse structure, whereby the apparatus of language constructs a story open to individual interpretation and thus meaning. (Del Bimbo, 1999), 28-29.

Annotation of gathered data by Del Bimbo concentrates on industrial television applications such as in programs of news, sport, commercials and movies. Thus indexing is concerned with rapid and efficient storage and retrieval. But he concludes by recommending further pursuit of the topic of semiotics, as a possible aid or stimulant to the interactive process (Del Bimbo, 1999).

Other research projects seeking industrial objectives, (usually visual indexing systems for the television and cable industries), have included the IBM *CueVideo* research project. The project measured the productiveness of automated indexing, browsing and retrieval based on different means of summarising digital video using keyframe storage, and accelerated sound reproduction employing audio processing TSM technology (Amir, 2000.). Whilst the taxonomy is text-based, the final indexing stage that locates sequence or shot is an audio and/or visual abbreviation of content. User testing showed preference for a diversity of search methods. The conclusion the study reached, to which we will return in the final chapter, was that the system should not be optimised for the 'average' user but configured to allow individual choice to prevail.[ii].

The more recently demonstrated HyVAL system uses authoring visualisation of video objects, metadata and the overall hypermedia document as parts of an Editor tool. Shot detection and segmentation algorithms effect a semi-automatic function, giving it great potential for working quickly with large video file collections or through using search engine routines (Zhou, 2005).

Fig. 8.1: HyVAL Editor.

1. document structure; 2. attributes; 3. video display; 4. Player control; 5. video information; 6. video structure.

A functional, distinctly non-immersive interface built for linked indexing purposes, it was an advance on other MPEG7, embedded metadata projects.

Embedded Meta-data Systems

Metadata is a description of data – data about data. The keyboard-entered annotation processes described earlier are an example of the 'higher level' semantic descriptions stored as meta-data. A video file is not only data contained as sequential images, synchronised sound but also provision for meta-data (several standards), recognised for the purposes of efficient storage, transfer between computer systems and playback to the screen.

The Motion Picture Experts Guild (MPEG)[iii] was formed in the late 1980s to establish international standards for the encoding of audio and video files, known collectively as codecs[iv]. MPEG-7 is a standard protocol for describing video files using <u>embedded</u> XML text-based annotations interleaved within the structure of the file. This enables specific moments to be found in a video MPEG file using hierarchical displays of text or icons. Several systems have recently emerged that facilitate the annotation tasks enabling human classifiers to key in, or interact with tick boxes, to describe the motion picture images in front of them. The common factor for all of the three applications outlined below, is the top-down approach to describing motion picture media, following accepted conventions of the <u>sequential</u> shot, retrieved using word-based searches.

In 2003 IBM announced the IBM *VideoAnnEx* Annotation Tool which assists in annotating video sequences with MPEG-7 metadata and is supported and downloadable from their website.

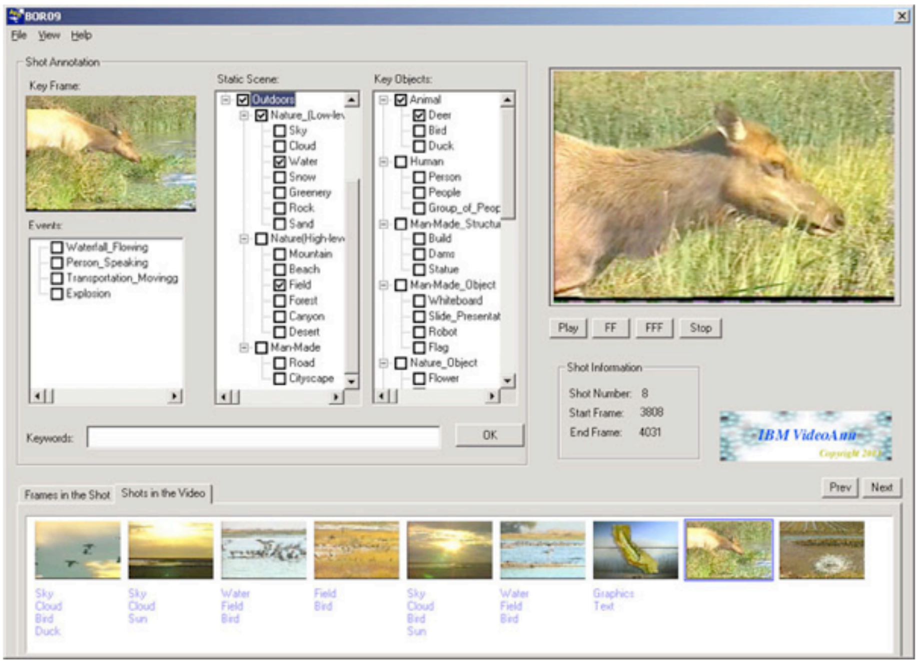


Fig. 8.2: IBM VideoAnnEx Annotation Tool
IBM *VideoAnnEx* Annotation Tool divided into four regions: Video Playback (top right), Key Frame (top left), Shot Annotation (centre), and Views Panel (bottom).

Each shot in the video sequence can be annotated with static scene descriptions, key object descriptions, event descriptions, and other lexicon sets. The annotated descriptions are associated with each video shot and are put out and stored as MPEG-7 descriptions in an XML file. IBM MPEG-7 Annotation Tool can also open MPEG-7 files in order to display the annotations for the corresponding video sequence. IBM MPEG-7 Annotation Tool also allows customized lexicons to be created, saved, downloaded, and updated.

IBM VideoAnnEx Annotation Tool takes an MPEG-7 video sequence as the required input source. The tool also requires a corresponding shot segmentation file, where the video sequence input is segmented into smaller units called video shots by detecting the scene cuts, dissolutions, and fades. This shot file can be loaded into the tool from other sources or generated when the video input is first opened. After IBM MPEG-7 Annotation Tool performs shot detection on a video, the shot file can be saved in MPEG-7 schema for later use. As an alternative, the shot file can also be generated by the IBM *CueVideo* Shot Detection Tool Kit. (Amir, 2000.)

How does it work?

IBM VideoAnnEx MPEG-7 Annotation Tool is divided into four graphical, interactive sections. (A picture is available in the detailed user's guide.) On the upper right-hand corner of the tool is the Video Playback window with shot information. On the upper left-hand corner of the tool is the Shot Annotation with a display of a key frame image. On the bottom portion of the tool are two different View Panels of the annotation preview. A fourth component is the Region Annotation pop-up window for specifying annotated regions.

Source:
http://www.research.ibm.com/VideoAnnEx/usermanual.html#Video%20Playback

Authro's comment: My observations are that this system lacks any connection with motion picture industry procedures, by functioning right to left – editing procedures by convention work left to right. Using a thesaurus established by the archive manager, the human classifier identifies keyframes, ticking boxes to describe the Scene and then the Objects within the frame. The Views Panel enable the operator to view previously classified scenes or in an alternative view, see sequential frames and thus judge by comparison, dynamics of movement within the frame.

8.2. Appendix : RICOH MovieTool

MovieTool incorporated the segmentation capability of shot detection, generating both a four level graphic representation and a tree diagram of the movie shot structure. In the tree window, editing functions can be also used to edit the XML file, which contains the MPEG-7 description.

MovieTool is a tool for creating video content descriptions conforming to MPEG-7 syntax interactively. Ricoh is willing to contribute to the advancement of MPEG-7-related research activities and encourage MPEG-7's widespread use by distributing MovieTool to the MPEG-7 community. MovieTool is a tool for describing video contents. It is intended for use by researchers and designers of MPEG-7 applications.

MovieTool generates MPEG-7 descriptions based on the structure of a video. By using MovieTool, the user can create the structure while watching the video. Alternatively, MovieTool's editing functions can be used to edit the XML file which contains the MPEG-7 description. A major advantage to using MovieTool is that the user can quickly and easily see the correspondence between the MPEG-7 descriptions and the video structure of each scene. Explanatory descriptions can be added for each scene and become part of the MPEG-7 file. The MPEG-7 file can then be used, for example, to search for or jump directly to specific scenes.
MovieTool does the following:
* creates an MPEG-7 description by loading video data.

* provides visual clues to aid the user in creating the structure of the video.
* automatically reflects the structure in the MPEG-7 descriptions.
* visually shows the relationship between the structure and MPEG-7 descriptions
.
* presents candidate tags to help choose appropriate MPEG-7 tags.
* checks the validation of the MPEG-7 descriptions in accordance with MPEG-7 schema.
* can describe all meta-data defined in MPEG-7.
* is able to reflect any future changes and extensions made to MPEG-7 schema.

Using *MovieTool* to create an MPEG-7 description involves the following steps:
1. While viewing the video, create a hierarchical structure.
2. Automatically generate the MPEG-7 description.
3. Use the MPEG-7 editor to append descriptive information

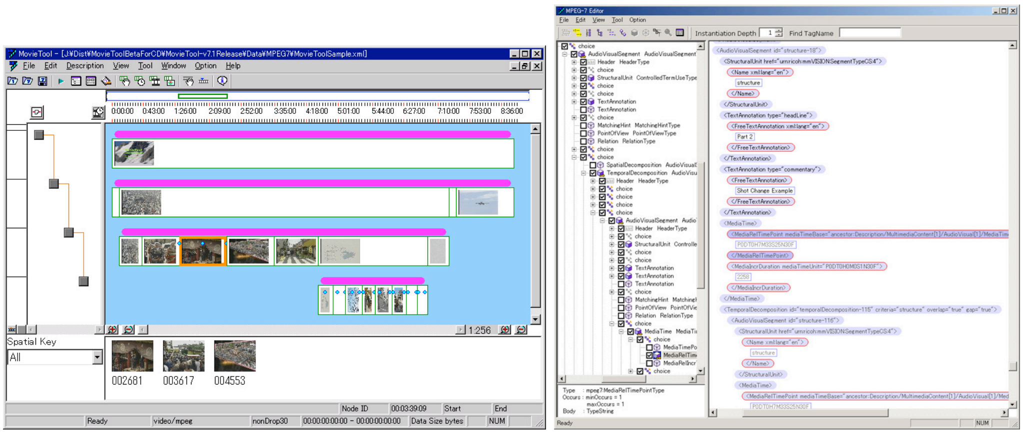


Fig. 8.3: Ricoh MovieTool
Graphic representation (left); Tree structure and XML file (right)

Figure 8.2 shows *MovieTool*'s window after loading the video, which is segmented according to the structure shown at left. Along the top is a bar showing the video as a whole and that it is divided into several scenes. The selected scene is highlighted and can be played. The lower part of the window contains a representative frame from each scene, called a "key frame". In order to create such a structure, MovieTool provides the following functions:

* Automatic segmentation based on feature comparison of still frames within a scene.
* Manual segmentation based on mouse-based instructions made while viewing the video.
* Segmentation based on positional information such as frame number or time.

Key frames can be assigned either manually or by using a specified timing. In addition, once a structure has been created, there are functions for editing or fine-tuning scene boundaries, deleting scenes, or re-ordering the structural levels.

MovieTool will automatically interpret the generated structure as an MPEG-7 description. As the structure is edited, changes are made to the internal MPEG-7 representation. MovieTool allows the user to see and confirm those changes. On the right is the MPEG-7 description, on the left is the schema which defines the MPEG-7 syntax.

The scenes displayed in the Composer Window (left) and the descriptions in the MPEG-7 Editor Window (right are correlated with each other. For example, if the user selects a scene in the Video Composer Window, the corresponding description is highlighted in the MPEG-7 Editor Window. Conversely, selection of a description causes the corresponding scene to be highlighted.

In general, when working with MPEG-7 without MovieTool, this correlation between the MPEG-7 description items and the video scenes can be difficult to grasp.

Thus, MovieTool enables the user, just by changing the structure as displayed in the Video Composer Window, to edit the MPEG-7 descriptions without having to refer to the details of the MPEG-7 syntax.

After creating the structure as described in steps 1 and 2, explanatory text is added, for individual scenes or for the entire video, to complete the content description. To do this, select a scene in the Video Composer Window which causes the corresponding MPEG-7 descriptive items to be displayed in the MPEG-7 Editor Window. The simplest method is to select an item to be added for the selected scene, such as "Headline" or "Commentary", from the "Description" menu. The corresponding tags are automatically inserted and outlined with a red box. You can edit its content by double-clicking the tag. When the description is complete, the file is saved as an MPEG-7 file with "xml" as its extension.

(Source: www.ricoh.co.jp/src/multimedia/MovieTool/)

Author's comments: The Tool was launched in 2002, suspended two months later, then a year later re-launched, before being withdrawn in 2005. Such are the vicissitudes of motion picture research.

8.3. Appendix - Annodex

Media and its annotation has also generated the Annotea project, a web-based annotation server developed by the World Wide Web Consortium (W3C) as part of the Semantic Web initiative *'which we have extended to support annotation of fine-grained contexts within multimedia objects'*. (Annotea) One of these is the Queensland University based Vannotea project that uses a separate annotation database to keep track not only of media being discussed across a high bandwidth network, but also the comments being accumulated collaboratively. (Schroeter et al., 2003, Vannotea, 2007)

Annodex Foundation was launched in 2006 as an open source project.

Annodex is a digital media format developed by CSIRO to provide annotation and indexing of continuous media, such as audio and video. It is based on the Ogg container format, with an XML language called CMML (Continuous Media Markup Language) providing additional metadata.

Annodex is an encapsulation format, which interleaves time-continuous data with CMML markup in a streamable manner. The Annodex format is built on the Ogg encapsulation format to allows for internet servers and proxies to manage temporal subparts and reconstruct files from annodexed clips. This introduces the following stream types:

* A Skeleton meta-header stream
* a CMML annotation stream

Further information can be found at the following site: Annodex Annotation Format for Time-continuous Bitstreams, Version 3.0

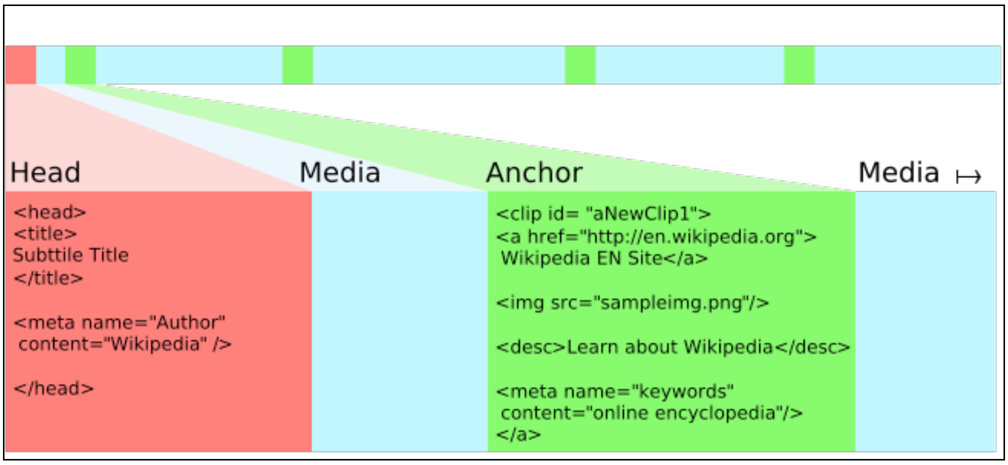


Fig. 8.4: Annodex_file_structure.svg
(SVG file, nominally 653 × 296 pixels, file size: 13 KB)

Source: annodex.org/

8.4. Presence – some debates

Debates around presence over recent years have most often hinged around the notion of telepresence: "..the use of remote control and the feedback of sensory information to produce the impression of being at another location; a sensation of being created in this way." (OED, 2004)
The rapid deployment of global computer networks, in particular the World Wide Web for the general community, suddenly gave presence another meaning. Few of us will forget the first time we linked to a server on the other side of the world, receiving the image of a webpage a few seconds later – the finger tips tingled, the sensation was palpable.

Telepresence as a topic of scientific investigation is a recent area of specialization. The International Society of Presence Research in a lengthy statement describes telepresence as, "…a psychological state or subjective perception in which even though part or all of an individual's current experience is generated by and/or filtered through human-made technology, part or all of the individual's perception fails to accurately acknowledge the role of the technology in the experience." (ISPR, 2004)
The term 'telepresence' is broadly understood amongst media theorists and arts practitioners as that sense of knowing or feeling another human presence across a physical distance ('afar') mediated by media (whether telegraph, telephone, teleconference, etc) and interacting with the other presence; or *a compelling sense of closeness* (Smalley, 2004) and *to be in the telepresence of another, of others who in turn feel your own telepresence close to themselves, is to define community in a quite radically different way* (Ascott, 2003) 265.

From computer games running across LANs and the internet, to websites designed to entice the visitor and have them part with money, the problem of maintaining a sense of self that re-assures and confirms our inclusion in its reality, has become of germane necessity in the fields of HCI, VE and AI. As Carrie Heeter, the Virtual Professor from Michigan observed - *presence research has emphasized engineering the senses more strongly that it has engineering the mind.* (Heeter, 2003)

Heeter's assertion that there is a distinction between a sense of presence in mediated experiences and in unmediated life, has lead her to propose that presence researchers need to study the experience of presence in real life. Heeter's Cartesian re-iteration flies in the face of arguments mounted by Mantovani and Riva. This builds on the work of Zahoric and Jenison (1998), Heidegger – *dasien*, being there - and J. Gibson's ecology approach to issues of perception (discussed in 2.2.3). Their conclusions avoids Heeter's dualistic constructions, advocating the 'ecological approach' and establishing a relational presence based on resources not being the *'properties of either object or subject, but of their relation',* (Mantovani, 1999).

A consequence, whether in a state of telepresence or physical presence, is the possibility of affect on the interacting subject. The notion of embodiment for instance, *'a body's vulnerability to being altered'*, (Vasseleu, 1996) has been debated extensively, in this respect as encompassing the whole aspect of the person. This is the need to map the network of relations between the material and the social, (Plant, 1996).[v]

8.5. James Turrell

The work of James Turrell [vi] – which happens not to be mediated by computer – produces an awareness of interactive potential by amplifying the agency of the subject in defining his or her sense of presence within a room-sized physical installation.

Upon entering the twin portal of James Turrell's *'Between That Seen'* (2001), the visitor[vii] enters a dimly lit space 3 x 8 x 12 metres, at the far end of which, half way up the illuminated wall, is what appears to be a landscape proportioned projection screen. Benches at the rear of the space, facing the glowing screen, suggest that the movie is about to start and I sit to wait. After a minute or two nothing has happened. By now my eyes have grown accustomed to the low light level and I examine 'the screen' more closely. Maybe it isn't a screen. I rise and move towards it. 'The screen' has an edge to it. The edge marks the transition between the room in which I stand and 'another space' beyond. My eyes strain to determine the depth of the space beyond the edge, but fail initially to determine how far back the second space goes, where the 'back wall' may be…. the light is so evenly distributed that it is like looking into a fog……

Returning to the bench in the body of the room I realise I am now sitting in a room with a slot in one wall, not a screen – my initial (confident) perceptions have been corrected following my own investigations. The illusion of being in front of a projection screen having been crafted by the artist through careful control of the light intensity and colour in and around the slot; and the familiar experience of encountering seating facing a prepared (screen) surface; and anticipating sharing the public screening space of the cinema. A little later other visitors to the installation enter the space – I sense my irritation at having my pristine immersive experience interrupted - and my attention shifts to observing their interactions. Being-in-the-world returns to a populated normality and I resist Sartre's famous dictum – 'hell, is other people'.

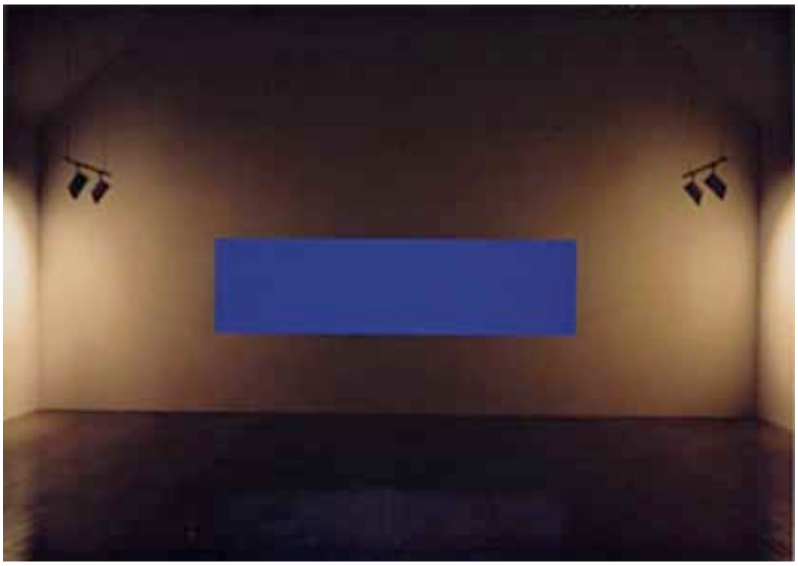


Fig. 8.5: JT2 ganzfeld installation (2005)

I learn later that Turrell has produced a body of 'aperture' works that explore a phenomenon known as Ganzfeld in perceptual psychology, a visually experienced space in which no surface or dimensions are detectable (Fig 2.13). He commented: "Light is a powerful substance…. But for something so powerful, situations for its felt presence are fragile….. I like to work with it so that you feel it physically, so you feel the presence of light inhabiting a space." (Brown, 1985) Thus the physical reality of this space, its construction with perfectly ordinary building materials, is activated by my presence. Arriving with my enculturated baggage of expectations to read the signs directing my behaviour, *('..this trace relates no less to what is called the future than to what is called the past..'* (Derrida, 1973)), eventually I resolve heuristically the set of relations actually in play within the space. Using the most pervasive technologies – electricity, gyprock and paint – "being there" is not a complex emotion to summon. The stages of cognitive information processing that establish a relationship between perception, attention and memory described by Barber helps explain how this occurs (Barber, 1988). Furthermore, with interventions into the space by the 'performing' presence of other visitors, fracturing, spoiling, 'showing the cracks' in the construction of the edifice, a system develops between the protagonists related to a state of distributed cognition (Hutchins, 1992).

Like the subtle gradations of light in the half-darkened space, I am conscious of emotional shifts as I respond to the artwork. Is it possible, and is it useful to measure these responses?

As the ethologist Konrad Lorenz observed, *we live inside our machine to know the world* (Lorenz, 1977). The Virtual Environment which the EMMA project of European researchers proposed, *..focused not only on generating and enhancing presence, but also measuring it*."[viii] (Alcaniz, 2003). In the controlled environment of the laboratory, presence is acknowledged in the subject through changes to the virtual environment. Likewise, the physical environment in which the visitor to an artwork stands can be rendered subtly and almost intangibly.[ix]

8.6. Appendix: Sensing and Interactive Devices - a survey (2005)

Devices are hardware, either controllers which require on-board or network software in order to function, or connector interfaces such as actuators or sensors to issue or receive data to and from other machines in the system. In the case of a network, instructions to and from (Input/Output) will flow via an operating system running on a computer dedicated to the task. If the task is not complex, this not only ties-up an expensive tool but is vulnerable to operating system crashes and the restart procedure hated by every exhibition manager in the world. 'Stand-alone' solutions of the kind described below, are hardware and software stripped back to the bare essentials in order to achieve the desired interaction. A computer is used simply to 'set-up the functioning of the stand-alone components before the installation is left in effect, to look after itself.

A functional block diagram shows the relationship between 'program computer', used to prime the microprocessor in the 'stand-alone' controller with the rules for the system contained in a short program, and the I/O (input/output) devices that in turn control or/and respond to, the other machines:

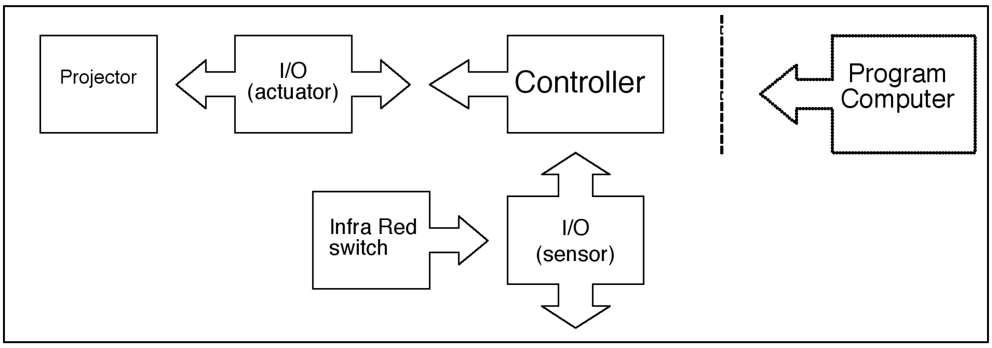


Fig. 8.6: schematic of interactive 'stand-alone' microprocessor to 'program computer'.

The commercial exhibition industry has developed many devices. This is an area dominated by a production model approach and the technology itself has been developed with a linear approach to problem solving. Whilst the experience created may offer some participation for visitors within the work, the engagement, like its genesis, is too often linear, employing familiar sounds and images that deliver what the industry calls 'content' or *edutainment*. Complexity of this kind of course requires considerable computing control.

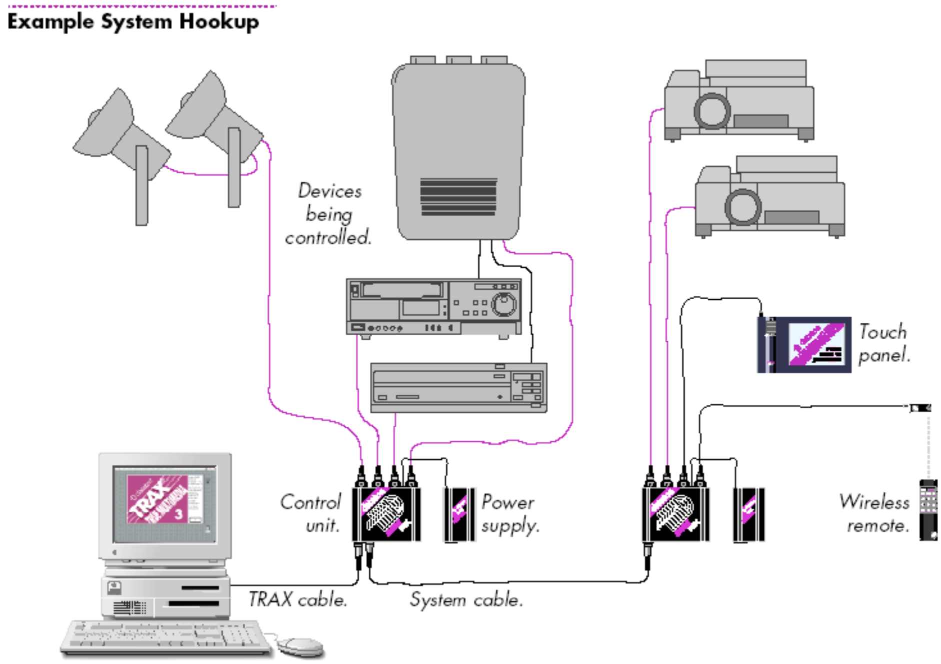


Fig. 8.7: schematic scenario using Trax control technology.

Solutions range from the big budget Integrated Content Servers used either for "The 82nd Airborne's first-ever portable command center employing the power and speed of AMX control technology" or for new permanent museum sites like the National Museum of Australia in Canberra. Down the road at the War Memorial individual exhibits are upgraded at a component level using devices like a controller for a DVD player or digital video server, manufactured by a corporation and costing together $5000 and upwards.

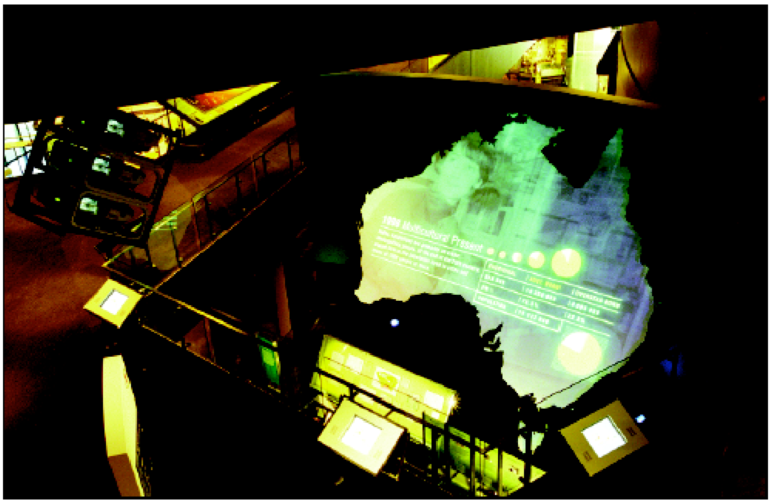


Fig. 8.8: National Museum of Australia, Canberra interactive installation. In the foreground are several touch screens with which to interrogate the database – output to the large display screen of Australia, one level beneath.

The cost of development and short-run manufacture means such devices are marketed only to the exhibition industry, who work within the given set of aesthetic and operating principles realisable by the industry's designers.

Fig. 8.9: digital solid state video server c. 2004

Though some devices like the digital (solid-state) video server are immensely attractive, the artist or interface researcher, due to reasons of cost but primarily objectives, has to take other approaches.

The Canadian artist, David Rokeby describes the principle of exploration and risk-taking in his *'Very Nervous System'* (Rokeby 1986-2000). Besides being an example of the kind of devices that make an installation interactive, is a cogent description:

> "The active ingredient of the work is its interface. The interface is unusual because it is invisible and very diffuse, occupying a large volume of space, whereas most interfaces are focused and definite. Though diffuse, the interface is vital and strongly textured through time and space. The interface becomes a zone of experience, of multi-dimensional encounter. The language of encounter is initially unclear, but evolves as one explores and experiences. *Very Nervous System* is the third generation of interactive sound installations, which I have created. In these systems, I use video cameras, image processors, computers, synthesizers and a sound system to create a space in which the movements of one's body create sound and/or music."

Like the designers of commercial exhibition spaces, approaching the development of art systems can also be affected and predetermined according to the budget available and the knowledge level of the researcher. Locating sympathetic engineers who have worked with artists is one solution. The Sydney-based engineer and artist, Stephen Jones, worked in 2004 with the indigenous artist, Rea, to develop a stand-alone multiple-DVD Player Controller designed around an embedded micro-controller.

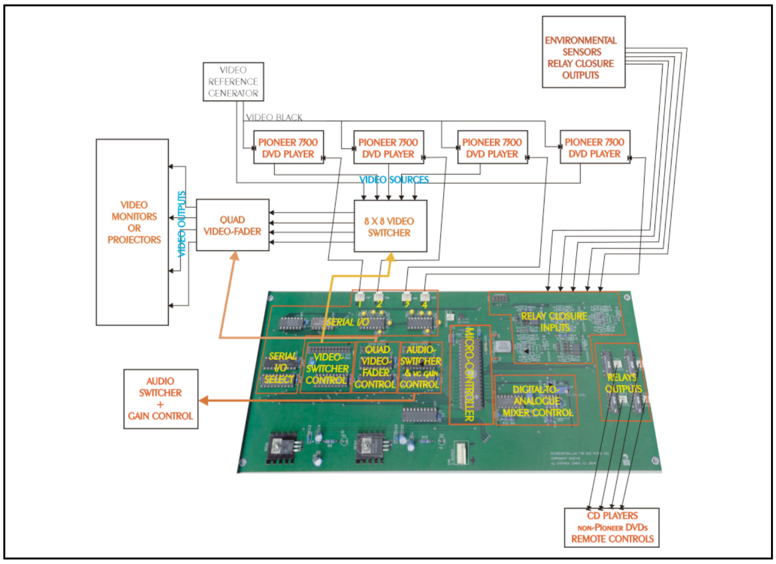


Fig. 8.10: custom design-build multi-DVD controller. (© Stephen Jones)

The device provides for a range of sensor inputs to trigger up to four DVD players, with an option to fade between video channels. Programming the micro-controller uses assembler level language delivered from an external computer.

Customised solutions to specific installation requirements may seem ambitious to an artist's project budget but if the relationship works, the benefits can be exponential in terms of success and the flow-on for both artist and engineer. Jones's service enterprise is part of an extensive network of entities including corporations, small businesses, educational and public enterprises, most of whom enable through their websites, access for different levels of user knowledge, to customized, ready-made, partially constructed devices, in kit or components form.

Public enterprise projects or the 'community of interest' development of tools and devices has of course blossomed under the sun of the internet, particularly by providing on-line manuals and guides to the development of projects accessible to those without many engineering or computing skills. David Rokeby was one of those who contributed to the development of AID (Artists Interface Device). *'The idea here is that a collaborative space is provided to allow the AID community to support itself'*, is how the AID project at interAccess in Toronto, Canada puts it.

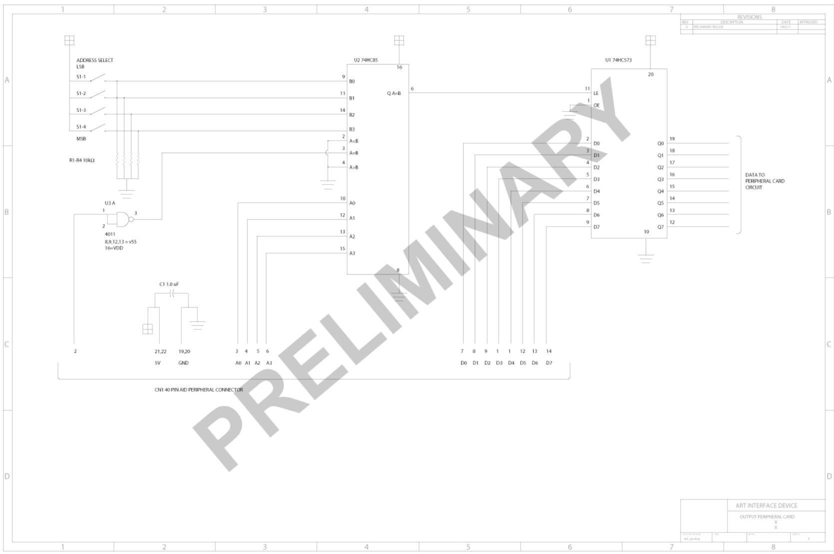


Fig. 8.11: Preliminary schematic of AID multimedia controller unit (© InterAccess, Toronto)

The project description specified that 'The AID will be capable of input and output via USB, RS232 serial and midi protocols. An array of secondary cards will allow artists to control virtually anything that uses electricity, for example DVD and Laser Disk players, lighting, music keyboards, audio CD players, speakers, motors, fans, pumps and so on. These kinds of "actuator" device can also be made to control or effect things which are not electrical.'

Another Art and Technology venture by Casey Smith is named Junkfunnel Labs. As a recent Master graduate from the MIT Media Lab (Smith 2002) and as artist with a collection of work in art and technology, his interest is also *'in helping the field of art and technology grow … and improving artist/engineer collaborations, providing technology resources for artists, or collecting links to the literature and work of the field.'*

Fig. 8.12: MIT Media Lab Cricket.

Another link from this site is to the Cricket. This is a tiny computer, powered by and about the size of a 9-volt battery. It can control two motors, receive information from two sensors and is equipped with an infrared communication system that being wireless, offers advantages over other stand-alone devices. Developed within the Media Lab at MIT, Crickets are the result of 'cross-breeding' with Programmable Bricks, a range of wearable devices.

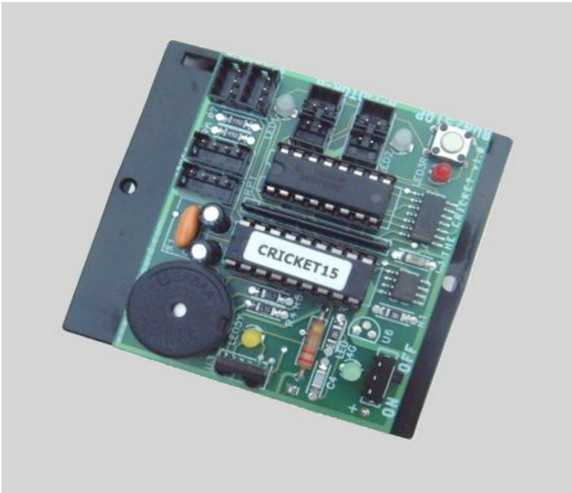


Fig. 8.13: The Handy Board

The Cricket and its technology has emerged from the educational sector and so is freely available to artists and designers to build from components. MIT have also licensed to Handy Board Inc the right to manufacture it under the name The Handy Board. Modifications can include an LCD screen, a servo controller board and an integrated rechargeable battery pack. (This design is also available from RobotOz, a Perth mail-order business for $AU400.)

So the network of possibilities emerges as something more complex than one option or another – from the voluntary to the educational to the small business component and kit provider, all are intertwined in a series of relationships that address both the consumer and the researcher.

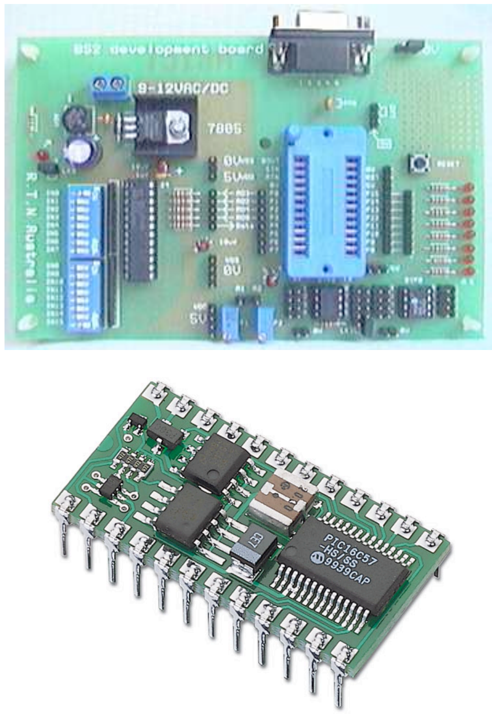


Fig. 8.14: The Basic Stamp programmable controller chip components.

The Perth small business also supply Basic Stamp, another controller device which is sourced from Parallax Inc, a large US electronics distribution corporation, who provide everything from kits and tutorials for people needing to know more about electronic engineering to advanced components and devices used in a range of applications in many different industries.

Fig. 8.15: the Picaxe kit

Another British company, Picaxe, also make re-programmable chips that can be used as what they call “low-cost brains” in many kinds of electronic project. The emphasis here is educational with excellent manuals and cheap $AU40-50 per starter kit.

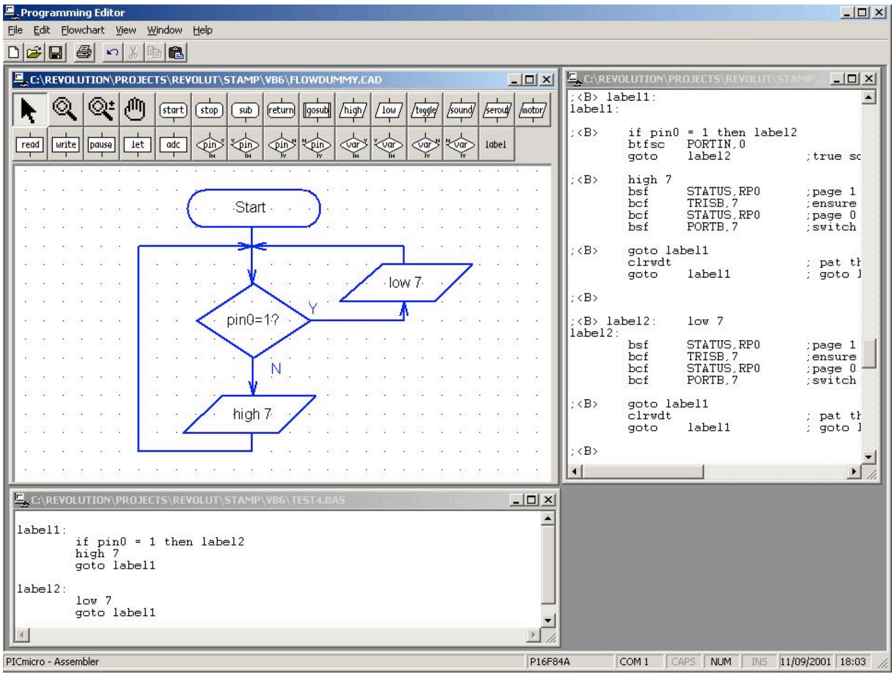


Fig. 8.16: Making Things programming interface.

Making Things also has an educational mission with excellent documentation material but, being in the USA, market their contribution more aggressively. They enable newcomers to build interactive displays, exhibits and installations. Getting started with the Teleo Introductory Set will cost about $AU300.00

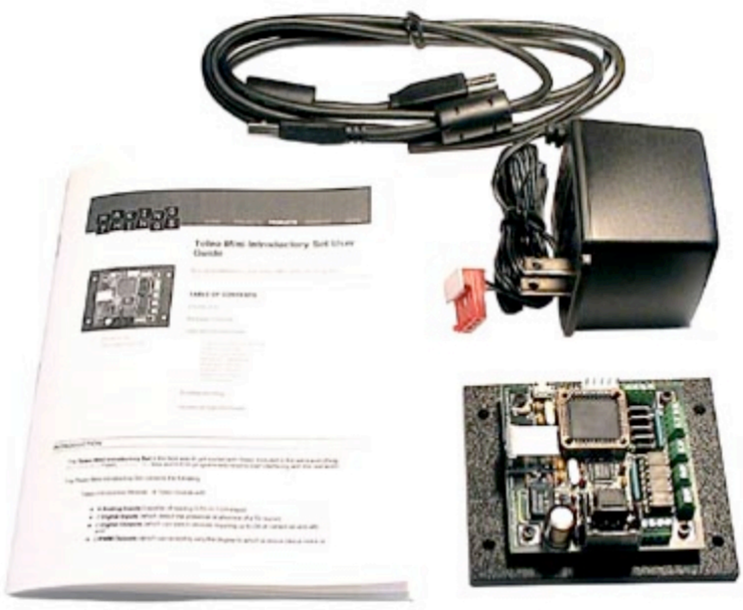


Fig. 8.17: Teleo I/O kit

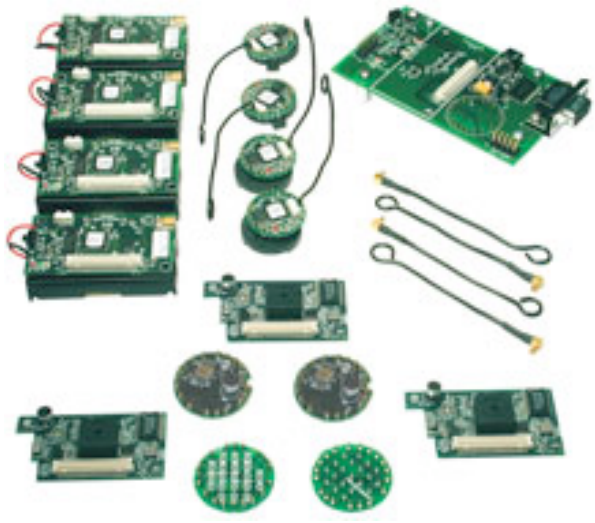


Fig. 8.18: Crossbow wireless 'mote' sensor network components.

Moving into the more advanced areas of user knowledge is another US corporation Crossbow, whose wireless sensor platform known as motes, like the Cricket but on a more advanced scale, gives the flexibility to create powerful, wireless, and automated data collection and monitoring systems. The majority of the hardware is plug-and-play, and all of the components are intended to operate using the TinyOS operating system originally designed by University of California Berkeley as an open-source operating system designed for wireless embedded sensor networks.

8.7. Films and Videotapes made by Mike Leggett in Britain 1965 – 1986

(Formats available in 2007)

1.	1986	Image ConText:Two (video: DigiB; U-matic)
1a	1985	24 hours: 21.6.06 (8mm film-on-video: U-matic)
2	1984	The Body on Three Floors (video for television: 1" spool DigiB; U-matic)
2a	1984	Reading From… (video: U-matic)
3	1983	A History of Airports (video: DigiB; U-matic)
4	1982	Image ConText:One (video: DigiB; U-matic)
5	1981	Vistasound (16mm film)*
6		Friday Fried (16mm film)*
7	1980	Bristol Bands Newsreel (8mm film-on-video)

8	1976	Sheepman & the Sheared: Parts 1-7 (16mm film)* Series completed in 1976:
		part one: Sheep (1973)
		part two: Sheepman (1973)
		part three: Window (1974)
		part four: Lane (1974)
		part five: Farm (1975)
		part six: Red + Green + Blue (1976)
		part seven: Sheepwoman (1976)
9	1975	Eighteen Months Outside the Grounds of Obscenity and Libel (video installation: DigiB; documents)
10	1973-75	The Video Show: Compilation (EIAJ; Phillips; DigiB; U-atic)
10a	1974	Chile Lucha (with John Hopkins: DigiB from EIAJ copy)
10b		Laugh (video broadcast) ref 10.'Compilation'
11	1973	Erota/Afini (book and 16mm film)*
12		The Heart Cycle (video: EIAJ; U-matic)
13		Porter Pac (video: EIAJ; DigiB; U-matic)
14	1972	Tender Kisses (16mm film)*
15		wHole (16mm film)*
16		One (*CCTV video*, 16mm film; DVD 2003)
17	1971	Shepherd's Bush (16mm film)*
18		Unword (16mm film with Ian Breakwell; DVD 2003)
18b		Artists' Placement Group Document (ref APG collection)
19	1970	Sheet (16mm film + DVD with Ian Breakwell)*
19a		Unsculpt (16mm film; photos; sound; DVD 2007)
19b		Improvisation (with Ian Breakwell and Kevin Coyne) photos extent
19c	1969	In the Park (with Ian & Jackie Breakwell) Standard 8mm film on video
20	1968	Three Women of Bristol (Standard 8mm film on video)
21	1966	The Lark (16mm graduation).

*in current distribution with The Lux Holding Company (incorporating London Film-makers Co-operative and London Electronic Arts). Video Formats: EIAJ spool; U-matic (low band); *DigiBeta copies in Scottish Film and television Archive.*

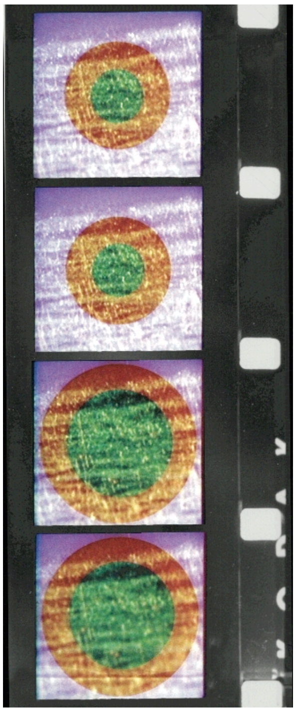
8.8. *Appendix:* Red+Green+Blue *summary*

The strategy was to combine together on the ‘the Debrie’ printer, using the primary colours - red, green and blue – printed through a series of prepared looped graphic shapes using pre-determined dimensions operating as the automated procedure. The duplication film stock, following processing, would then display the complimentary colours – mixes of two primary colours - cyan, magenta and yellow, as a visible system in relation to the primary colours, together with white and black. The process would in effect, synthesize the complimentary colours, together with white as a combination of all three primary colours within the processed emulsion layer of the duplication stock.

As the basis for a series of tests and experiments, an array of groupings for the graphical elements were sketched, initially based on four concentric circles with acetate colour filters introduced into the printer’s optical path. Following repeated screenings of the tests, reflection centred on four observations:

- Circles within the square reinforced the flat surface area of the screen space;
- Juxtaposition of circles within the time signature created apparent lateral (x/y-planes) and receding/advancing vectored movement (z-plane);
- Colour within the circles affirming the ‘flat’ surface area of the screen space;
- The presence of secondary, three-dimensional ‘deep’ imagery.

The conclusion to these experiments led to the plan to use three concentric circles “..linked in their indexical signification” to the three primary colours. The secondary imagery noted determined that the primary colours, instead of originating from acetate filters arranged within the printer, should in keeping with the larger project, be generated by objects in the natural world. *“By obtaining the three primary colour pigments from naturally occurring sources, the sky, the grass and red berries, would permit … the introduction of three dimensional imagery.”* (Leggett, 1977/8)



Initial audience response tended to disregard the notion of systems and autonomy from aspects of the compositional process, possibly in the light that taken overall, it was acknowledged that the film was a highly constructed artefact.

Fig. 8.19: *Red+Green+Blue* 16mm filmstrip of 4 frames (one-sixth second at projection speed)

For the viewer who had come to a similar conclusion but had determined not to begin counting intervals as a means of understanding the system being applied, what engagement with the film remained? Following a screening, people would often remark upon the relationality between objects as images in the field of view of the camera: the image of a cloud suddenly obscuring the Blue of the sky; the shock of a swath of grass suddenly coming into focus from within a field of Green; the massive dimensions of the image of a Red rosehip suddenly coming into focus at the point a large circle of in-focus grass is superimposed. Attention was diverted across the flat surface of the screen by the appearance of objects occupying Euclidian space, de-focusing into areas of pure colour instantly returning the gaze back to the flatness of the projection surface.

Three years later Stoneman observed:

> The resultant pattern/redundancy/variation is not arbitrary in principle, the variable loop length providing relative determinacy of the generative system (apparently aleatoric but within a predetermined structure.) (Stoneman, 1979/80)

Use of the term generative in the context of artists' film of the time was novel. Whilst an iterative approach to film composition was taken in many films made by myself and others* employing loops and other iterative forms, *Red+Green+Blue* was a brief excursion into generative systemics (though the term generative was not used until after Stoneman's comments.)

Making the film *Red+Green+Blue* was in actuality a process of <u>recording</u> the operation of the generative system in addition to its accompanying variables. Each pass on the printer was in affect, a once-only state. By recording 'the results' of the operation of the system, the variables thereafter become constants, each projection of the film simply reproducing them.

The painstaking process of making each print was not dissimilar to the work of the silk screen or lithographic artist working at laying down successive colours. It delivered a similar outcome – a print that was ostensibly unique but able to be produced as an edition. The film print of course deteriorates from its very first screening, picking up dirt and scratches and then, over a longer period of 10 to 50 years, fading. For this reason, of the three prints made of *Red+Green+Blue*, one was used as a duplicating original from which to make projection prints.

The variables, including those already noted are:

- Pro-filmic: - panning, zooming, focus, colour saturation and hue, exposure, visible incident;
- Post-filmic: - film processing; printer lamp; loop and colour film 'damage' (dirt and scratches);
- Performance: - screen surface; projector, lamp and optics; venue ambience; print dirt and scratch 'damage' / fading.

For each subsequent print made from the system, whilst the pro-filmic (point 1 above) would remain constant, the post-filmic (point 2) would introduce another unique set of recorded variables. Performance as projection (point 3) thus remains the only constant variable in the system. (Leggett 2007)

NOTE: Malcolm Le Grice used a converted projector to make prints before the 'the Debrie' printer arrived at the LFMC, demonstrating the aesthetics of iterative method in *Yes, No, Maybe, Maybe Not* (1967). A brief but prescient excursion into the digital exploration of the iterative form was achieved in *Your Lips* (1970) by incorporating on the 'the Debrie' printer, iterative graphics captured on a microfilm plotter device produced using original code he wrote in Fortran, after gaining access to the Atlas research computer at the Atomic Energy Establishment in Berkshire, UK. Described in *Never the Same Again*, (p. 7) in British Artists' Film & Video Study Collection, D. Curtis, Editor. 2004, Central St Martins School of Art & Design: London. (Leggett, 2007)

8.9. *Appendix:* Window *notes*

Original description reads as:

Window (1974) - the camera and operator record 40-60 seconds of film each weekend throughout a period of twelve months from the same vantage point; each period finishes with the camera framing the area in front of the window in the same way as when the shot commenced. Selection of the part of the area with the use of zoom lens and camera movement or decision about time of day (or even day itself) and precise length of run were not pre-determined. The footage obtained is assembled in order of shooting, (April 1973-74), each camera run being indicated by the blanking of six individual frames spaced; 12 + 12 + 12 + 12cut + 12 + 12. A twenty-minute continuous sound recording made at the same window is printed twice onto the ungraded final print with a five-minute gap before the repeat. (Leggett, 1970-76)

8.10. Appendix: The Heart Cycle.

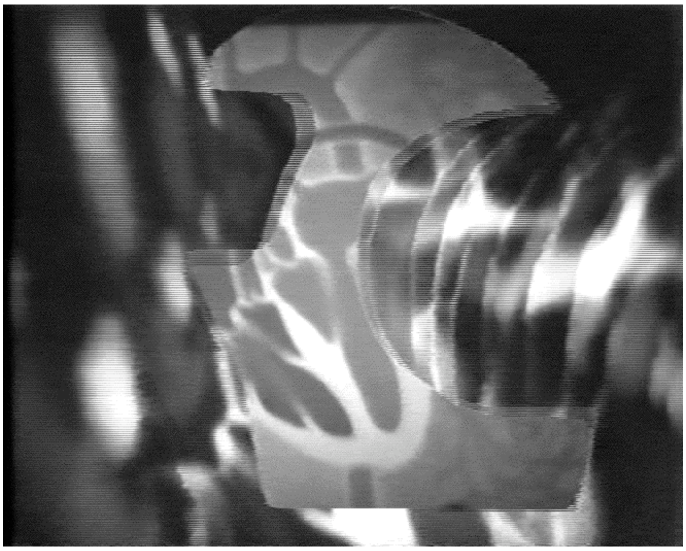


Fig. 8.20 : 'The Heart Cycle' video frame

The Heart Cycle (Leggett, 1972) was a real-time (unedited) 15-minute recording of a closed-circuit installation involving two video cameras fed through a simple electronic mixing and matting box, connected to monitors and a video recording deck. One of the cameras converted the output from a 16mm film projector running an instructional health movie, into an electronic stream. The performance, without audience, involved manipulating the physical and electronic relationships between components to produce the completed tape. After three or four versions were made following approximately the same procedures each time, a final version was achieved.

This tape and others I made during this period were screened during *The Video Show* at the Serpentine (London, UK, 1975), a month long event. It placed production and exhibition in the same space, on-the-fly, live! A program of continuously running video recordings exposed to the public, for the first time for both artists and visitors, the most recent of art forms, video art. Artists' installations were bumped in and out for two days at a time, like so many garage bands arriving for a gig and equally ephemerally.

The Video Show demonstrates many alternative kinds of TV making, and one alternative form of transmitting it: closed-circuit links to small groups and even individuals. (Sue Grayson, Serpentine Gallery director, catalogue note extract)

The installation I was invited to mount, *Eighteen Months Outside the Grounds of Obscenity and Libel*… used as image the grounds and environs of Hyde Park as represented through a series of monitors, cameras and video tape decks. It was a development of *Window*, with a similar durational set of procedures, but constrained by the visually restricted range of black and white video and the two days the installation was in place.

8.11. Appendix: Image Con Text

The *Image Con Text* project comprised three parts.

The first, described some of the conditions that had been involved in giving the films the form they adopted, using a dialectical approach. This took two distinct approaches as presentational performances - from the artists' viewpoint in 1978, ('ICT: One') then later in 1981 from the audience viewpoint, (ICT: Two').

The second aspect of the project was as on-going research, regular live presentations to audiences, the feedback from which could be fed into subsequent presentations.

Thirdly, a videotape version not only archived the presentation performance but extended its effects to later audiences. This process was later extended following transfer to DVD, introducing the possibility of interactive study utilising the dynamic linking of the format (Leggett, 1984, Leggett, 1985), and later on digital tape and DVD (Leggett, 2005a).

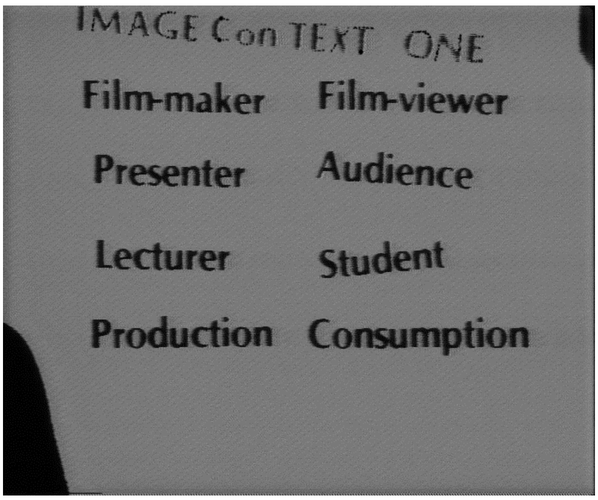


Fig. 8.21: caption frame from 'Image Con Text: One' (1984) video

Within each section, the form of address was sometimes first person, sometimes third. Using a bricolage of narrative forms, throughout the whole presentation it was necessary for the audience member to be alert as to who (or what) might be 'speaking'. Where the meaning lay in relation to preceding and following sections, (the methods of dialectic and proposition), lay in contrast to the abstract and material basis of the 'personal' sections, the two spaces for screening a film or videotape art work in its entirety – these would be selected from several possible titles.

> *Image Con Text* attempts to reintroduce elements of ideological and political discourse to articulate some of the structures that determine the placement and function of avant-garde audio-visual practices at this time, producing an understanding of the processes by which films are financed and distributed. Posing a specific formulation of the present crisis in representation that attempts to break through the limits of contextual containment." (Stoneman, 1979/80)

The 'crisis in representation' identified by the writer for Screen journal had developed from the vigorous debate between adherents and practitioners of several different, often competing, 'research' approaches, (though few amongst the artist film-makers would have described their work in such academic terms). The core of the differences were identified in two articles appearing in the mid-70s; 'The Two Avant Gardes' (Wollen, c1982) and 'Theory and Definition of Structural/Materialist Film' (Gidal, 1974). Gidal maintained that the semiological project instituted by Wollen in his book 'Signs and Meanings in the Cinema' (Wollen, 1972) was too narrowly focussed on recognising and analysing mediated images within the cinematic institution and that the debate should really be a holistic embracing of the entire phenomena of the viewed cinematic experience and its apparatus. Wollen and others critiqued such an approach as *"…seeking an ontology based on the essence of cinema…"* and introduced into the debate further contributions by Derrida, on presence, which was regarded as central to Gidal's formulations on film's material substances and processes. (Le Grice, 2001).

The videotape proved in practice to become an archiving stage of the *Image Con Text* project as few hiring's of the video/film combination were recorded. Perhaps by the mid-80s, the time for analysing the contextual issues for artists' film and video had passed, as attention was taken by the promises of new audiences on the developing television and cable channels across Britain and Europe. Or perhaps the presence of the artist together with the audience experiencing the work was the event that individuals were seeking. In the words of the final caption in *Image Con Text: Two* - Personal OBJECTive : 'the interactive programme' - proximity, dialogue, a kind of interactivity based on both familiar and unfamiliar encounters. (See screen grab 8.19**)

8.12. Appendix: SonTel *prototype response.*

A summary of notes from Buddamarra indigenous community concerning Strangers on the Land (SonTel) prototype.

Budamurra are keen to establish resource and program parameters and to resolve the navigation issues. They have given a priority to achieving integrity in the design of an interface that will allow their stories to be traced and linked with the 'stranger on the land' stories.

This would be managed by:

> Collaboration and consultation is based on the principles of law for cultural exchange activities.
> Cultural exchange activities engaged in by Aboriginal peoples is based on Aboriginal principles of law and culture.
> Cultural protocols include principles of learning from all and respect for one another.
> Cultural protocols in respect of collaboration raise the following issues:
> custodianship and ownership of cultural heritage,
> arbitration on cultural appropriateness,
> authority to speak for country,
> professional best practices,
> concept of community,
> negotiation of terms to ensure equity, and
> the principles of Aboriginal law of meetings.(Wells, 1999)

Furthermore, quite specific needs were described:

> As they go for a walk through this landscape people want to be able to access the stories that they are interested in, meander on when they are no longer interested in stories, discover new stories related to the one they are experiencing, not have to repeatedly go over the same stories because they are lost, see some way ahead, a few steps of where they are going, and be stimulated by the layers of meaning they discover, learn something that they know is based on proper authority, and come to know the landscape and the people who have lived with it, through their memories and stories.

(Wells, 1999)

8.13. Mnemonic Paradigms – early notes

Pathscape had commenced around the concept of linking a representation of a topography and stories associated with the places encountered in the virtual walk through the landscape. New studies would approach the hypervideo precept by commencing with the movie collection, rather than inventing the visual material in response to the structure. Initially then it was a matter of describing the kinds of collections, both common and unusual, that could be used as the basis of the investigation (Fig 5.14).

Paradigm	Mnemonic	Representation
The Seasons	Temporal; appearances of the physical world	Spring, Summer, Autumn, Winter (as time lapse)
The Day	Temporal; directional light, and colour	Sunrise, Morning, Midday, Afternoon, Dusk, Evening, Night. (as time lapse)
The Passing Crowd	Facial features (Temporal)	Facial recognition; identifying the face in the crowd; iconic
The Changing Face	Temporal; Facial features stages of ageing	Individual appearance, birth to death, morphing a series of photos/movies over the years; indexical
The Growing Plant	Temporal; stages of growth	Plant appearance from germination to withering (as time lapse); organisational system
The Performance	Gesture, spoken word and incident (Temporal)	Speeches, exits and entrances, scene changes etc,
The Musical Score / Schematic	Graphic space, and its sound (Temporal)	Musical notation with notes, staves and bars.
The Circle	Temporal;	Divisions of the circle according to indexical convention: the clock face; wheel sectors; etc
The Rainbow Spectrum	Colour occurrence	Visible spectrum ordering: ROYGBIV; indexical, symbolic
The Abstract	Hybrid; etc.	Design principles of the abstract artefact.

Fig. 8.22: table of Mnemonic paradigms and modes of representation.

8.14. Mnemonic iPod research proposal

Extracts from Apple University Development Fund Grant application

Project Title:

Mnemonic Movies: dynamic linking of video files for the iPod

Principal Developers:

Mike Leggett and Dr Shigeki Amitani

Macintosh Development Experience:

Dr Amitani: IDE: Eclipse; Language: Java, throughout Master's course, PhD and current post-doctoral research. I am specializing in software for handling movie files on the Macintosh, using Java APIs for QuickTime and XML in Final Cut Pro.

M. Leggett: HCI researcher and media artist, interactive prototype development. Some experience scripting in Director and Filemaker. Extensive use of QuickTime, Final Cut Pro and DVD Studio Pro.

Project Description:

The mnemonic iPod research proposed here will build in Java, an **emulation** and an **application**. These will demonstrate as Proof of Concept, a valuable possibility for feature development on the iPod and other Apple movie tools. The **emulation** will be of the iPod operating and control system. It will demonstrate one movie file linked directly to another movie file, with successive markers on the movie linking to different movie files. The **application** will demonstrate the way in which a Java-based framework will enable developers to create links between each of the movie files using QuickTime Pro. Exported to iTunes, the movie files containing the additional metadata, can then be imported into the iPod simulation where, in the Movies section of the Menu, an additional Mnemonic Movies option will be found.

The proposal emerges from our current interdisciplinary research into machine memory as a context for understanding its relation to human memory and methods for storing / retrieving movie files. It proposes an approach to indexing audio-visual media utilising a real-world time-space representation as the taxonomy of the indexing procedure. An interactive experimental prototype, PathScape, has provided initial evaluation of the concept and further practice-based research approaches to user-defined storage / retrieval systems for the iPod, as an advanced portable video system, will be described.

Educational Relevance

The iPod user interactively navigates the linkages, either as an exploration of a creative maze, or as a means of recalling a particular series of operations, directions, sequences explained in pictures and sound, but under the direct and immediate control of the iPod user. This feature will enable complex data structures often represented visually – land surveys; mining topographies; design or biological sequences; architectural spaces; construction progress; cultural artifacts; etc – to be made accessible **relationally** rather than sequentially. For example: user-centred product design / protocol analysis / software architecture analysis – the iPod mobile researcher; the life-cycle of the frog – the iPod personal teacher; The Rocks in Sydney or Hill End – the iPod personal electronic tour guide; the redevelopment of the Eveleigh Railway Yards – the iPod planning tool; the Singer Not the Song – the iPod view behind the scenes of the recording session and concert footage.

Defined Deliverables

The project will demonstrate and document the development of a video movie framework, with immediate applicability to the iPod, (assuming the addition of this feature is included in a future software upgrade), but with wider potential based on the QuickTime player and associated applications that use QuickTime. The authoring tool framework will enable users to set the coordinates for the hyperlinks governing the navigation system. Publication about this development in HCI research and applications domains will bring attention to the inter-operability of the Mac OS X system in general and the QuickTime and Java tools in particular.

Novelty

An extensive literature search has failed to reveal software that offers an approach to movie indexing of this kind, though speculation based on analogue influenced experimentation has consistently appeared since the 1970s. The central novelty of this approach to movie indexing is that it will enable an accelerated usage of movie based data or information. The movie being watched will provide the link to the related movie(s), without the need to return to scroll a text-based index menu at the root. A hardware tool such as iPod is an opportune technology for integration with the precept, offering a point of focus for further research toward a product-based outcome with wide HCI application in many fields.

How will your project promote the Macintosh in Education?

Through dynamic non-linear navigation of movies, which represent pedagogical issues, or research data, media production study or methods, visualisation of spatial dimension etc, user defined by teacher and/or student. The iPod will be presented as a teaching tool in the context of its well-promoted use as an entertainment and recreational device.

8.15. Appendix: Indigitrax research proposal

Extracts from Part E – Proposal Description to the Australian Research Council,

written by Dr Laurel Dyson, Steven Grant and Mike Leggett

E1 Proposal Title

Indigitrax: Designing a culturally appropriate authoring tool for Indigenous communities to build interactive multimedia knowledge systems.

E2 Aims and Background

Aims

The Indigitrax project aims to research an innovative metadesign approach to the development of Indigenous multimedia knowledge systems. These are systems which Indigenous communities use to store and view cultural items in multimedia format. The project aims to place authoring tools in the hands of Indigenous people which they can employ to build their own multimedia knowledge system. Both the authoring tool and the knowledge system created by it will be culturally appropriate, cost effective, and provide flexibility from one community to another.

Objectives

In collaboration with two Indigenous communities, Indigitrax seeks to discover how practice-based approaches to metadesign can be combined with Indigenous protocols in systems development. Using this approach we plan to avoid a 'top-down' approach to the design of Indigenous multimedia knowledge systems and, instead, partner with Indigenous people in building prototype authoring software with which they can construct their own multimedia system. The outcomes will provide a basis for evaluating the applicability of the metadesign approach to developing these and other systems.

In addition, the project will evaluate the *PathScape* prototype – developed by the Research Associate on the research team (Leggett, 2005b) – as a culturally appropriate model for the Indigenous multimedia knowledge system produced by the authoring tool. Features of this prototype include its 'Walk through Country' conceptual model, video technology platform and gesture-based navigation.

The major objectives are to:

Develop a protocol for metadesign approaches to the development of Indigenous multimedia knowledge systems, which are culturally appropriate and informed by Indigenous knowledge protocols;

Evaluate the appropriateness of a 'Walk through Country' conceptual model, evaluate video as a technology for creating an interface based on this conceptual model, and evaluate gesture-based navigation browsing;

Develop and build, in collaboration with two Indigenous communities, prototype software for an authoring system capable of delivering multimedia knowledge systems that reflect diversity of cultural expression and are culturally appropriate and straightforward to use.

Additional objectives for the research project will be to:

Provide training opportunities, appropriate to the project needs, for Indigenous community members to share in the development of the prototype authoring system and its tools; and

To implement, where appropriate, Global Positioning System (GPS) data collection for mapping knowledge and cultural items to specific landscape features.

Background

The preservation and revitalization of Indigenous cultures is of major concern in Australia today. The process of colonisation and assimilation prevented the passing on of traditional knowledge from generation to generation in many Indigenous communities and resulted in the extinction of many cultural practices and languages. Today there are concerns that globalisation may contribute to this process still further through the colonising influences of dominant cultures on the Web (McConaghy 2000).

However, technological advances provide opportunities to redress this issue:

Firstly, multimedia technologies offer a way of storing and displaying video, photographs and sound recordings, and so fit with many characteristics of traditional Indigenous culture (Dyson, 2003). The latter is not a written culture, but founded in oral and audio practices (story telling, ceremony, song and music) and also in pictorial cultural forms (e.g., rock and wood carvings; ground, cave and body painting; now paintings in acrylic and print-making).

In recent years multimedia has extended to the development of Indigenous knowledge systems (also commonly referred to as Indigenous living cultural archives), which allow culture and knowledge to be stored and then made available back to the community (Dyson and Underwood, 2005). Furthermore they provide a method of repatriation of digital copies of items held in museums and other collections back to communities (Hunter, Koopman & Sledge 2003). They avoid problems associated with other multimedia technologies like CD-ROMs, which have relatively fixed contents; and web-enabled technologies, which pose problems of slow download speeds (particularly on dial-up connections), limited access for many Indigenous Australians (who have only about a third the Internet connectivity of non-Indigenous Australians (Lloyd & Bill 2004)), potential intellectual property infringements (Zimmerman, Zimmerman & Bruguier 2000), and operations issues for content management.

Developments by Hunter (2002) have resulted in a database, which acknowledges Indigenous knowledge concepts of access (Smith, Burke & Ward 2000) and intellectual property (Radoll 2004). The rights management features of Hunter’s Indigenous Rights Management System are implemented through XrML (XML-based rights markup language) and are compatible with museum archiving standards such as Dublin Core metadata (http://dublincore.org; Hunter 2002). In addition, there is an increasing body of knowledge about Indigenous ontologies and how they can be represented in databases (Christie 2003); and there are now many off-the-shelf database solutions that can be customised.

Improvements in Indigenous multimedia knowledge systems have resulted in a shift from purely text-based lists of available multimedia items (e.g., Nyirti, used at the Wangka Maya Centre in the Pilbara (Dyson & Underwood 2005)), to mixed graphical and textual interfaces arranged in windows (e.g., Ara Irititja, a system developed for the Anangu people of Central Australia (Hughes & Dallwitz in press). More recently the MARVIN system has exploited cartoon characters to deliver government information to Indigenous communities against photo backdrops (AFLF 2005); and this concept of interfaces almost purely of images and sound has been extended to prototype Indigenous knowledge systems now under development (e.g., PathScape (Leggett 2005), Digital Songlines (Leavy in press) and Fountain of Stories Living Knowledge Archive (Chesselet n.d.)).

These last three systems also provide for the first time a culturally appropriate conceptual model, moving away from the widespread ‘desktop’ metaphor, to one based on the traditional Indigenous idea of a ‘Walk through Country’, which allows cultural items to become available as the user moves through a representation of the landscape. This acknowledges the land as the source of meaning and the repository of story for Indigenous people (Turnbull 2000). The field of human-computer interaction tells us that the conceptual metaphor (the set of integrated ideas of how the system should look and behave) is essential to good design (Liddle 1996).

Given the low computer literacy of many Indigenous people (Dyson 2004), most systems have looked at issues like ease of use. One of the more interesting developments is the gesture-based navigation offered by the PathScape prototype, in which the user can navigate the system by gesture control of the screen cursor (Leggett 2005). Moreover, PathScape, unlike the more complex virtual reality systems like Digital Songlines and Fountain of Stories, uses video technology as the basis for its 'Walk through Country': video is intuitive to use and could provide an appropriate tool for communities without specialist IT skills to create their own interfaces. Many communities already have skills and resources in video and sound recording through remote area television production (Langton 1994).

In addition to the issues already resolved by some of the Indigenous multimedia knowledge systems discussed above, there are three further constraints which still need to be addressed.

Indigenous peoples are amongst the poorest in Australia whereas information technology is expensive (Dyson 2005). All of the systems mentioned above, except for the simplest and not very culturally appropriate off-the-shelf databases, require development teams from outside the community, often at considerable cost.

Indigenous communities, spread across remote, rural and urban settings, are different with quite specific needs in relation to storing and accessing cultural material (McConaghy & Snyder 2000). Hard-coded, one-off implementations, such as Aṟa Irititja (Hughes & Dallwitz in press), do not provide the flexibility to be adopted successfully by other communities or even to be modified across time.

As part of Indigenous people's desire to achieve self-determination, there is a need to exercise control over their multimedia knowledge system. Computerised systems 'can never be completely extricated from the language, culture, and context in which they are designed and implemented' (Schoenhoff 1993, p. 10). Systems designed *by* Indigenous people may have the best chance of being consistent with Indigenous cultural and social goals.

In order to address these issues and constraints a new approach to designing Indigenous multimedia knowledge systems needs to be considered which:

Is appropriate to Indigenous culture, particularly its oral and graphical strengths;

> Acknowledges Indigenous knowledge protocols, security concerns over who has access to secret or sacred knowledge, and protects intellectual property;
>
> Embodies a conceptual model that is founded in Indigenous culture;
>
> Provides ease of use and navigation;
>
> Is cost-effective;
>
> Allows for community diversity and cultural change over time;
>
> Provides community control over contents and over design, development and implementation.

E3 Significance and Innovation

The Indigitrax project addresses the problem of cultural renewal and revitalisation in Indigenous Australian communities. It does this by adopting a new approach to the design of culturally appropriate multimedia knowledge systems.

The significance of the Indigitrax project is that we are concerned with the design *process*: how, by pursuing a metadesign approach integrated with Indigenous knowledge protocols, we can arrive at a system which fits better with Indigenous culture. It is innovative in that we wish to move a step back from the design of the Indigenous multimedia knowledge system itself, and instead consider the design of authoring software which will allow Indigenous people themselves to create their own systems for storing and viewing their culture and knowledge. This is radically different from the way that existing Indigenous multimedia knowledge systems have been implemented, where the development has adopted a more traditional systems design methodology and centred on the end product: the multimedia knowledge system itself. By placing the *authoring tool* into the hands of Indigenous people, each community will be able to create an Indigenous multimedia knowledge system that truly reflects their particular culture and their community's specific needs.

Through its design approach, this research will advance knowledge both in the specific area of Indigenous informatics, and most importantly across the whole field of human-computer interaction. Metadesign is at the cutting edge of current design methodologies: it seeks to aid communities to solve their own design problems by providing them with the support to do this (Fischer 1999).

The project will develop both a new methodology (a protocol for metadesign approaches to developing an Indigenous multimedia knowledge system) and a new technology (the first authoring software to allow Indigenous communities to create their own Indigenous multimedia knowledge system). Furthermore, we envisage an Indigenous knowledge system not merely storing and displaying multimedia but also having a multimedia, video interface. (All currently implemented Indigenous knowledge systems employ a more conventional interface.) By exploring video as the core technology, we build on existing skills in remote Indigenous communities developed with a range of media from radio to television during the 1980s and '90s (Nathan 1997, Rangi 1997).

The research addresses several goals under the national research priority area of Frontier Technologies. It seeks, through its explorations of metadesign, to lead to a better understanding of design processes overall, and this will assist our understanding of systems and ICT in mainstream Australia as much as in Indigenous communities. It addresses the goals of developing new ICT applications, particularly in the interactive multimedia arena. Finally, it seeks to provide a better understanding of the processes underlying technology adoption in Indigenous communities.

E4 Approach and methodology

The overall research approach to the Indigitrax project is practice-based. Practice-based research has resulted in highly successful outcomes and is well described in the literature. It consists of '…acquiring knowledge using sensitive methods for gathering and analysing necessary data' and, most importantly, must be deeply rooted in the actual context and experiences of the participants' (Candy & Edmonds 2002, pp. 39-43). It is a "…creative production process [that] is self-conscious, rational and reflective" (Scrivener & Chapman, in press) It is an approach employed frequently in the end user development of software tools and multimedia, and is therefore appropriate for the framework and operational methods of the Indigitrax project.

Our focus will be upon the early design stages of practice-based research, using metadesign as a conceptual framework. Metadesign is "…another species of design, where the artefacts being designed are themselves interfaces for designing – hence meta-design' (Lieberman 2005). Metadesign takes up many known principles of good design within human-computer interaction, providing options for guiding the users' design process.

The methodology of metadesign has been developed from theoretical and practical investigations in several international centres by a range of researchers: Lazarev (1994), Maturana (1997), Fischer (2003), and Fischer and Giaccardi (2004). Metadesign is characterised by objectives, techniques and processes for creating interactive media environments. This has been achieved by researchers working closely and sympathetically with community groups that encourage participants to engage in the collaborative construction of artefacts and activities meaningful to the context of their production and usefulness. The relationship between the designers and the community group is symbiotic – researchers, skilled in electronic tools and their use, learn with community members how to organise cultural knowledge in the form of artefacts, oral narrative, performance, etc. The collaborative project becomes a *"… creative process defin[ing] a 'seed' able to generate endless variations recognisable as belonging to the same idea but open to change"* (Giaccardi 2005).

In Australia, Indigenous communities across the continent, whilst sharing protocols of behaviour, exhibit wide variation in cultural forms and knowledge. Responding to this diversity, our approach to design will be seeding rather than planning. We will deliver to Indigenous communities a new design approach and a system open to adaptation and capable of responding to technology development. We are going to discover how 'a new praxis of design' will enable communities to develop their own computer-based system as an aid to sustaining, growing, preserving and transmitting their culture to successive generations.

We will also discover how to incorporate Indigenous protocols within our metadesign approach and, ultimately, in the Indigitrax tool. These protocols are well documented and cover both traditional cultural protocols, and more recent media and archiving protocols (e.g., Janke 2002; Museums Australia 1998; Byrne, Garwood, Moorcroft & Barnes 1995). The incorporation of protocols into Indigenous multimedia knowledge systems is absolutely essential, given cultural sensitivities regarding the display of traditional knowledge and artefacts. Indigenous people have concerns over who has the right to knowledge and do not wish unauthorized members of even their own community, let alone outsiders, gaining access to material that is seen as sacred or secret, viewable only by the initiated or by people of a certain gender (Radoll 2004).

The project will bring together researchers in Indigenous cultural systems, multimedia cultural systems, multimedia production, HCI and interface design with members of two Indigenous communities. Written expressions of interest in the research have been received from an urban community and one in a remote area. Metadesign demands a team with this wide range of skills and sensibilities in order to find a path between a genuinely participant approach, while meeting participant expectations regarding the quality of the outcomes.

We anticipate that our metadesign operational methodology will be specifically characterised by user-centred and participatory design; rapid prototyping of coded modules representing the core structure and processes; iterative development; fluid techniques like seeding, building and 'tearing down of strawmen'; use of APIs for end users to customise and capture their participatory decisions; and free tagging processes rather than predetermined metatags. The system will remain open to participation, evolution and emergence.

Research Plan and Proposed Timeline

Period and Timeframe	Activity	Outcome
Autumn 2007	Identify the design, development and production pathways towards making an intuitive, easy to use, culturally appropriate software that can be controlled and customised by Indigenous end users.	Schedule and detailed breakdown of development processes that includes metadesign techniques
2 weeks		
8 weeks	Identification of local cultural and knowledge protocols in the target communities.	Framework of localised Indigenous protocols
3 weeks	Clarify and assess metadesign techniques that fit with Indigenous protocols and are appropriate to discovering how to devise culturally appropriate forms of collecting, collating and displaying Indigenous	Toolkit of metadesign approaches that can be identified as more or less appropriate for a given community
Ongoing	Identify the boundaries and scope of the current design stage.	Overall project schedule
4 weeks	Tender for the coding.	Programmer is
5 weeks	Clarify participant involvement, needs and broader, community-identified issues by means of interviews and exposure to other systems, with reference to proposed metadesign techniques	User briefs v. 1
6 weeks	Coding of front end 'seed' module – a video viewer/retriever.	Front end module v. 1 incorporating navigation, descriptor importer, transitions and mark up functions
2 weeks	Consideration and experimentation with appropriate codecs.	A working technical specification for compression
3 weeks	Coding of the backend, database 'seed' modules from off-the-shelf database developers environment.	Backend modules v. 1
Ongoing	Devise appropriate software documentation.	Draft 1 of software documentation
Spring 2007	User testing of coded modules v. 1.	End user observation , feedback and,

8 weeks		recommendations v.1
4 weeks	Recode v. 2.	Version 2 of coded
Summer 2007 - Autumn 2008 4 weeks	User testing v. 2.	End user observation, feedback and recommendations v. 2
4 weeks	Recode v. 3.	Version 3 of coded
Winter 2008 3 weeks	Integrate front and back-end modules, including end-user connection functionality for front to back-end integration	Working 'slice' prototype
8 weeks	User testing and feedback on the 'slice' prototype.	End user observation, feedback and recommendations on 'slice' prototype
Spring 2008 4 weeks	Final coding and modification of 'slice' prototype.	Beta version of 'slice' prototype
4 weeks	Document end user experiences in learning to use the prototype tool and create an Indigenous multimedia knowledge system.	Draft 1 of end user documentation
2 weeks	Identify and undertake preliminary scoping on future modules to be developed such as digital rights management; intellectual property rights; interconnectivity to online collections and interoperability with external databased collections; georeferencing data and 'rubber sheeting' it to the front end interface.	Scope for next development stage
Ongoing	Fundraising and establishing partnerships for the next stage.	Ensuring the authoring tool will get made and distributed
Summer 2008 4 weeks	Project evaluation, documentation and communication of results.	End user documentation and research papers

E5 National Benefit

Outcomes and Impact

Outcomes will specifically address the needs of Indigenous communities and their ability to preserve and revitalize their cultures through effective use and deployment of information technology. We believe that the impact of the research will go far beyond the two communities co-operating in the study, and be applicable to many other Indigenous communities. In addition, there are potential benefits for a range of other defined ethnic and local communities across the nation who would have a use for cultural systems.

Specifically the expected outcomes of the proposed research (cross-referenced to project objectives) are:

A protocol for metadesign approaches to the development of Indigenous multimedia knowledge systems. which are culturally appropriate and informed by Indigenous knowledge protocols (Objective 1);

An evaluation of video as a technology for creating the interface for the Indigenous multimedia knowledge system; and an evaluation of the 'Walk through Country' conceptual model and gesture-based navigation browsing for the multimedia knowledge system (Objective 2);

A working prototype authoring system capable of creating Indigenous multimedia knowledge systems that reflect diversity of cultural expression (Objective 3);

Interfaces for both the authoring software and the multimedia knowledge system that are intuitive, straightforward in use, culturally appropriate and customisable by each Indigenous community (Objective 3);

Technology and skills transfer to the participating communities; and a training schedule and an evaluation procedure for assessing training effectiveness (Objective 4);

Knowledge and cultural items in the collection mapped to specific landscape features using GPS data, where appropriate (Objective 5).

Social and Economic Benefits

The major benefit expected from this research will be social. It will contribute to Indigenous development and welfare by providing ICT and multimedia training to Indigenous community members and give them access to a greater range of ICT and multimedia tools. It will allow Indigenous communities to access records and artefacts now inaccessible to them in museums and other collections. It will give greater status to knowledgeable elders, who will then be in a better position to provide positive role models and guidance for younger members of the community. The research team, by employing a metadesign approach, will have an ethical imperative to act as a creative force and stimulus for community cultural renewal (Fischer 1999). By establishing design protocols capable of integrating modern technologies with traditional Indigenous knowledge and lore, Indigitrax will encourage new forms of social and community creativity and collective storytelling as people customise the tool, populate it, update their collection and cross reference it, according to collaborative deliberations.

Although the immediate benefits are likely to be social, there are additionally potential economic benefits. For example, the Indigenous multimedia knowledge systems produced by Indigitrax could develop into future cultural and eco-tourism initiatives for Indigenous communities: multimedia materials stored by the system could form the basis for Internet promotions of these local tourism enterprises. Moreover, the authoring software would have an economic value to the ICT sector, and the knowledge developed during the research could well have a flow-on effect to other areas of systems design and development.

Contribution to National Research Priority

The Indigitrax project has a potential to contribute significantly to several goals in the national research priority area of Frontier Technologies. There are potentially major contributions to new knowledge expected from this research, particularly in the field of human-computer interaction and multimedia design. The metadesign approach that is being adopted in this project will lead to a better conceptualisation of design processes generally, which will have an impact which extends beyond Indigenous people to mainstream ICT. The technology under development can also give Australian industry the capability to exploit the multimedia market through its investigation of new design concepts such as gesture-based navigational tools and interactive video interfaces.

Moreover, Indigenous multimedia knowledge systems are amongst the most challenging of any systems to design and build. This arises partly from the complexities of multimedia and partly from the often poor understanding of Indigenous needs and the particular constraints operating in Indigenous societies. By collaborating with Indigenous people in this research project, we will gain a better idea of the processes that lead to, or hinder, technology uptake.

E6 Communication of results

Research results will be submitted for review to refereed conferences, academic journals and books. The interdisciplinary makeup of the research team will aid in extending the substance of the outcomes to specialist research communities covering multimedia and HCI, collaborative and metadesign design, Indigenous studies, cultural studies, Indigenous project management, etc.

8.16. Appendix Indigitrax *tools specification*

Stage1: Viewer

1.1 Simple Viewer: configuration of stand-alone viewer to allow video playback using either Quicktime/CoreVideo (QT) or Direct Show (DS). Appropriate movie file codecs to be decided through experimentation processes.

1.2 Navigation: viewer updated to test the gesture / cursor position system to allow manipulation of speed and direction of travel in the on-screen movie.

1.3 Descriptor importer: Inclusion of a configuration file reader used to specify movie source, navigation system and all other functionality.

1.4 Transitions: configuration of HCI and interface protocols defining visual on screen cues and subsequent linking of one movie to another, producing:-

1.5 Mark-up: specification of viewer metadata, including list of file (names and paths), transition options and attributes of navigation. Possibly using XML, to avoiding hard-wiring, that would be read by the description importer implemented at stage 1.3.

Stage 2: Toolset

2.1 Interface design: connecting functionality of 1 – 1.5 above to HCI data.

2.2 Selections: configuring for generating mark-up for preview procedures, setting markers for cues in, directions for cues out, for individual intersections.

2.3 Preview: configuring for generating mark-up for preview at grouped intersections, and options for abort/return.

Timelines

Task	Stage	Duration
Viewer	1.1 to 1.3 1.4 to 1.5	2-3 weeks 1-3 weeks
Toolset	2	4 weeks alpha version (made with specific screen dimensions) 10 – 20 weeks for full application, as dependent on user-development cycle.

8.17. Appendix: Pathscape *SWOT analysis*

The interactive functioning of the Pathscape prototype has been fully described in the previous Foundation Chapter 4. The user controls this movement with gesture, (using a mouse in the prototype), to control an on-screen cursor. The on-screen space is divided into zones that through combinations of rollover or mouse click, cause corresponding commands to be relayed to the database within the system where the media files are stored. Through an interactive process of decision-making, the interacting subject navigates their way through the system database using the landscape setting as the cue for extracting information conveyed through short narratives. Initially, at best, this can be intuitively sensed – for instance that the 3-minute lecture about the physical formation of a sand dune is located as the movie moves us from the beach, over the sand dunes, onto the coast road. The relation between *loci* and the linked narratives is not immediately obvious, it is learned intuitively or aleatorically, and the individual's skill with memory and mnemonics determine how efficiently specific narratives will be retrieved.

This was useful for anecdotally providing useful feedback about the design approach. To determine whether the replacement of files thus avoiding the adjustment of Director scripting would be viable, the Pathscape prototype was subjected to analysis.

*In Table 1***

Information content

Presentation mode

*In Table 2***

Data type evaluated

Evaluation analysis method

and a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis to evaluate its suitability for adaptation to current needs.

Model name	Description: information / 'content'	Description: presentation mode
SonTel (1999) (submitted for Masters)	Landscape & Stories History Ecology 'quotes' x2 indexical devices: border colour: access to 360˚ pan & 'stories' colour coded buttons: access to related stories	Tool: Director Projector Interactive navigation using gesture with Mouse; Linked movie sequences of jpeg still images
PathScape (2000)	Landscape & Stories History Ecology 'quotes' x3 indexical devices: border images: access to 'stories' border colour: access to 360˚ pan & more stories colour coded buttons: access to related stories + text-based information. Text index of sources and citations	Tool: Director Projector Interactive navigation using gesture with Mouse (spatial sensor version defined); Linked movie sequences of jpeg still images + video + stereo sound: Linked to text-based index, linked to stories, (using XML protocols). Link to Web search

Fig. 8.23: table analysis of Pathscape information and presentation mode

Model name	Evaluation: data type	Evaluation: analysis method	SWOT contributing to research claims
SonTel (1999) (submitted for Masters)	Notes from responses to outcomes of specified production process, by production team and invited participants. Examiners, project funders	Comparison of objective of each stage of the production process with observed outcomes. Comparison of project objective with responses.	S: Co-design with modifications to production stages as iterative process; W: Non-immersive O: Revision of project parameters - leads to next prototype specifications (PathScape).

	and audience responses noted.		T: Nil – extra funding forthcoming!
PathScape (2000)	Notes from responses to outcomes of specified production process, by production team and invited participants. Completed prototype – project funders and audience responses noted.	Comparison of objective of each stage of the production process with observed outcomes. Comparison of project objective with funders and audience responses.	S: Co-design new spec., with modifications to production stages as iterative process; XML feature extendable to other platforms and uses. W: Non-immersive; hard-wired to South Coast interactive doco PoC. O: Revision of project parameters - leads to proposal for full development of PathScape installation; Authoring version outlined. T: no further funding!

Fig. 8.24: table of analysis of Pathscape evaluation data, method and SWOT.

8.18. Mnemonic Movies: Iterative Progression – Propositions and Resolutions

(Tracing the development of the *Mnemovie* experimental software framework as an example of collaborative design as described by Fischer, distributed:

- Spatially, across distance,
- Temporally across time,
- Technologically between persons and artefacts.
- Conceptually across communities (not applicable in this context at this time). (Fischer, 2005)

Edited extracts from emails with the research associate, Adam Hinshaw. Italics identify key *propositions* and their *resolutions*.

Beta 1

Propositions 4.7.06

1. *Full screen, DV size*; I suggest this size as media files will be sourced mainly from video cameras (unlike Sontel, which worked to a 640x480 stage, optimising CPU's of the day). The QT files in Sontel were two thirds the pixel dimensions of full screen, so full screen version would be over twice the number of pixels - will contemporary CPUs should be able to handle that plus interactivity?

2.If the orientation for Pathscape00 framework was to tell stories linked to a landscape, then Pathscape06 is (more abstractly) about indexing movie files, using each file to index others. Not all, but others, like using the Track and Zone movie files on PS00 to launch the narratives. The difference being that instead of being built around the Pathway, ie returning eventually to the Track to move onto the next Track or Zone content, it *hyperlinks according to associations* made by the authoring agent *between an object/ event/place on one movie with those of another, in a daisy chain pattern*.

3. The *gesture-based navigation system* for the proposed PS06 is essential as PS00, using top, bottom and each side of the screen area, but mapped for different outcomes as suggested below. How does the interacting subject know how to navigate? This is the question being addressed. Rather than associating narratives that hang off a landscape, *tacit knowledge of structure is proposed at the outset of the interactive encounter: the image of a grid; or a triangle; or a series of intersecting circles/loops.*

4. *Grid*: if we know we are at the bottom corner of a grid, as we move through it we maintain an image of where we are placed within it having turned left or right or retraced our steps. Things and places we pass aid in orientating ourselves to *the overall space defined by the corners of the grid and quickly we are able to move from one specific location to another.* Can the PS06 framework accommodate this knowledge? Can this PS06 framework and the objects within it be linked to other objects as movie files lying outside the grid?

5. Interlocking Triangles on a flat plane: as above, but there are no right angels and so after we turn three corners to the left we suddenly return to the starting point!

6. *Intersecting circles/loops*: each of the loops, having a distinctive appearance - say, red, orange, yellow, green, indigo, blue, violet - enable relational position to be established. Details within each loop lead off to other files - say, blue sky on the red loop (violet) connects to the red poppy on the violet loop. The images constructed on each loop have an intrinsic attractiveness that causes the interacting subject to be compelled to tear themselves away from what it is they are watching to what it is they know is waiting in another loop; or something like that! Perhaps another way to describe how this might work is closest to PS00 - as interaction moves you back and forth through the landscape, you gathered what the shape of the layout was, and its attached narratives.

Resolution 6.9.06

GO FORWARD: (FORWARD ARROW)

[Which would put it at the 50% speed mark]

GO BACK: (BACK ARROW) [As above]

LOOK FORWARD: (W)

LOOK BACK: (S)

LEFT: (LEFT ARROW)

RIGHT: (RIGHT ARROW)

STOP: (SPACE)

Sample data fields for Beta 1

<mnemov_data version="0.1" name="Darlington Streets" min_speed="0.25" max_speed="3.0" debug="0" > <!-- debug toggles onscreen info when building -- >

Beta 2

Proposition 14.9.06

1. Scaling the image

2. At the end of a movie specify where the movie links to (rather than just stop) - this may be to: - another movie (in the Lanes model this would be to the Backward movie if it was the Forward that had been running), or - to itself as a Loop - also useful in other models. (You made some notes: <link kind= "zone" ; "side" ; "time" ; "mouse" start_time= "etc.)

3. OK - and if you could make the forward and back zones broader across the screen (not the video)

4. Sound was the other thing we discussed - if it's possible to toggle on and off, that would be good.

I'll try the voice commands on the Mac and let you know the outcomes.

Resolution 4.10.06

1. Movie Scale control

Add a stretch="1" or "0" to the top <mnemov_data> tag to control whether the movie is stretched to the proportions of the screen or to its own ratio. "1" means it stretches to match screen dimension.

Add a scale="100" to "0" to the <mnemov_data> tag, to define the scale of the screen to rescale the movies to. 50 being half the size of the screen. Use 100 to fill the screen.

<u>2. Time links</u>: Ability to jump to any other movie when current movie falls within a time range (ie to loop movies among other things)
A time link looks like this: <link kind="time" start_time="00:02:02.5" end_time="00:02:03" movie_id="1" link_start_time="00:00:00" />
NOTE: Your start and end times must be different for it to work. You can just use a fractional second difference as above.
NOTE: You may jump past them accidentally if you are going fast and they have a short range. This will not be the case if its one at the end to loop.

3. "kind" attributes on links. This was to facilitate the new 'time' links.
NOTE: You must add kind="zone" to all your existing left/right links.

4. Adjusted mouse zones. As per your Word diagram mouse detection zones have be resized and positioned.
NOTE: Press the "R" Key to toggle them on to see.

5. Sound toggle attribute : Control sound on or off.
Add a sound="1" or "0" to the top <mnemov_data> tag.
This will enable & disable sound globally. (And dependent if movies have a sound track)

6. Key Board Navigation control
To facilitate speech control and other external devices .
Key Map:
UP = look forward
DOWN = look backward
LEFT = look left
RIGHT = look right
SPACE = stop
W = move forward
S = move backward

7. Starting movie attribute (Extra)
Control of where movie starts – speeds up authoring testing.
Add a start_movie_id="??" start_time="??:??:??" to the <mnemov_data> tag to control which is the initial movie and time within that movie.
Useful for testing, ie start it in the section your currently making

8. Cursor toggle (Extra)
Ability to toggle the cursor on or off
Use "c" Key to toggle on or off, or add a cursor="0" to <mnemov_data> tag to hide it from start.
Might be useful when controlling without the mouse in future.*
Sample data fields for Beta 2
<mnemov_data version="0.2" name="Darlington Streets" min_speed="0.25" max_speed="3.0" scale="66" stretch="1" start_movie_id="0" start_time="00:01:32" sound="1" cursor="1" debug="0" >
* This reveals that the commands can be finite rather than incremental without the cursor being visible. But it may be that some users prefer to have the cursor confirmation of their interactions.

Beta 3 Proposition 16.10.06

1. But I've come across one anomaly which is proving to be irritating :

<link kind="zone" .... link_start_time="00:00:00" /> : does NOT launch, requires cursor to be in the top/bottom of screen;
<link kind="time" ......link_start_time="00:00:00" /> : DOES launch
It would make more sense for both to launch at the change as you've made the decision you want to change, you shouldn't have to say it twice! Is this an easy thing to update?

2. The other thing that' s happening isn't really a problem - but following a link kind="time" change can result in the cursor being in the 'wrong' position for the actual movie viz. in the bottom of the screen for a Forward movie etc. Some VERY strange things happen as a result. So "time" only really works as a loop link rather than a hyperlink. However, I've decided it's better to think in terms of toggling between W/top or S/bottom rather than being tied - it allows a wider range of linking to occur and is really quite intuitive using the keys. I have yet to test voice commands across the five models completed, but will be doing so soon.

23.10.06 …

3. Possible to put in a Pause after a link is made, it will help the transitions work even better? …I don't know whether this can effected in the engine or the xml – if it is hard-coded, 12 frames will be about right. It will function in the same way as the time it takes to move the cursor from one zone to its opposite.

As I mention below, the top and bottom zoning in the Beta2 version isn't combatable with the original spec. so the 'turn through 180˚' is no longer needed. Could maybe even remap the W to ArrowUp and the S to ArrowDown? But that Pause will be necessary.

Resolution 20.11.06

1. Continue_hotspot: After a link happens, automatically put the mouse cursor inside another hotspot eg, continue_hotspot="F" The mouse will jump to the forward hotspot. Useful when using a kind="zone" side="L" (or R) link, so you can start the video playing again.
Valid values are "L": Left, "R": right, "F": forward, "LF":look Forward, "B":Back, "LB": Look Back, "C": Centre
There is no need to include this in every <link>.

2. I mapped the Up/Down arrow keys to move fwd & bwd as requested.

3. There are 2 new attributes of the <link > node. * start_delay: How many seconds to wait until the movie starts playing again. eg, start_delay="4". In effect this turns off the hotspot detection for 4 seconds. However if the user moves the mouse (or uses key nav to a different hotspot), it will flush it and they can continue moving. (i.e. delay is cancelled and user takes over again) There is no need to include this for every <link> node, it defaults to 0
Sample data fields for Beta 3
<mnemov_data version="0.3" name="Darlington Streets" min_speed="0.25" max_speed="3.0" scale="100" stretch="0" start_movie_id="0" start_time="00:01:55.00" sound="0" cursor="1" debug="0" >

8.19. Appendix : MneMovie Timings : Left / Right + Continuation Links (sample)

		OUTWARD				INWARD			
Track ID		Forward Movie ID & T/C		Backward Movie ID & T/C		Forward Movie ID & T/C		Backward Movie ID & T/C	
	start								
	end								
	start								
	end								
	start								
	end								
	start								

8.20. Appendix: Mnemonic Movie Model Report (Sample)

Model Title: LANES

Stage / Iteration: **One**

Commencement: 1.9.06

Completion:12.9.06

Objective:

Interaction with movie image to navigate series of intersecting streets.

1. Navigational cue shape: GRID.
2. User to navigate the streets, to learn their spatial relations and features by having options to launch movies.
3. Learn and recall visual cues for navigating from one street location to another.

Materials:

1. Movie files: recording forward and backward simultaneously using two cameras, (see Fig) two files per street, prepared in post-production to represent forward and return journeys.
2. XML-file: enable the user to navigate the streets and learn their spatial relations and features by having options to launch movies.

Method:

Mnemovie beta1 research software tool enabled the subject using either keyboard or mouse to control the movie on screen using the position of the cursor to:

play Forward – top of screen; or play Backward – bottom of screen; look at first frame of Movie A – to left of screen; look at first frame of Movie B – to right of screen.

Structural elements of XML code - <track id= etc> to </track> - copied and pasted with changes made later to parameters.

Frequent testing with engine.

Reference: XML-file screen dump: 5.9.2006, for tag fields and movie data.

Observations:

i) Initial working with XML structure time consuming, necessitating having four QT screens on the desktop at one time to be able to gather the time-code (TC) for the start_time / end_time data required for each link_start_time analysis included sketches for an authoring interface/API. (see Fig) Discussed with SA and emailled EE. Possibility later.

ii) full screen difficult to watch for long, due to hand-held (wobbly) camera.

iii) Sound not operating.

iv) At movie end, just stops.

v) Watching for patterns in the XML to save duplicating effort.

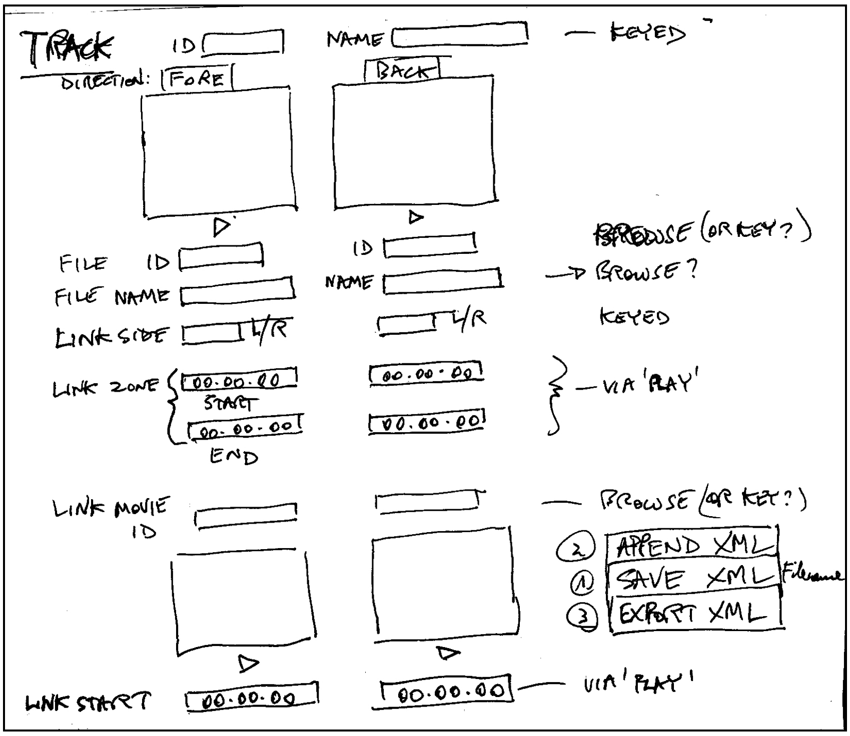


Fig 8.25: Sketches for an authoring interface/API

Issues Arising:

- Technical: size of image needs to be controllable; sound needs to function; additional link required at movie end. At AH's suggestion, tried some alternative codecs to see if movie accelleration/motion improved. (No change). Some links seemed erratic – keep monitoring.
- Cognitive: size of image and excessive movement on screen lead to excessive foveal activity. Nausea inducing and specific to the method of recording used (hand held camera).
- Creative: L/R gesture to be used for 'non-functional' navigation. Such as, incidents repeating from different camera angles and different locations in the streets – such as the movement of parking/manoevering cars – suggested optional links (L/R gesture) between them, or other similar incidents outside the grid. Also 'Mike.mov' linked to passing studio in Shepherd's Lane.

Evaluation against Objectives: navigational functions worked well; street incidents – parking cars etc – suggested options for further development.

Resolution / Reframing: technical requirements discussed with AH (12.9.06). New tags would be added to next beta version (2); also adjustments to zone sizes.

Proposition: Reserved until next version.

Stage / Iteration: **Two**

<u>using beta version 2</u> (new XML-file and .dcr file)

Commencement: 4.10.06

Completion: 9.10.06

Observations:

vi) full screen scaled to 50% - much easier to watch. (Also “stretch” for screen preportions or file preportions).

vii) Sound now operating – some movies required re-exporting to marry the sound.

viii) At movie end, using link_kind=”time” etc, able to link to another movie file instead of simply stopping. Tried ‘coming back’ – makes more sense to turn and seemed to work more reliably. However, Top and Bottom of screen gestures after this feature, caused cursor to be ‘in the wrong place’, resulting in following movie jumping to a corresponding position at the other end of the movie.

ix) Gesture zones altered + addition of key commands to control cursor. (Mappable to voice commands see Technical)

x) In addition: start_movie_id= ; cursor toggle, on and off using ‘C’ key.

Issues Arising:

- Technical: Voice commands experiments (15.9.06) on MacBook experimented with different words to control cursor position. ‘To’ and ‘Away’ worked consistently for forward and backward; ‘Red’ and ‘Green’ for left and right.
- Cognitive: Recurring events and backwards traffic caused ‘double-takes’ (memory replays).
- Creative: Use of mouse found to be cumbersome. Using keys with Forward / Backward as toggle (not Top screen / Bottom screen as with mouse see (iii) above). This allows more immersion, less distraction.

Evaluation against Objectives: navigational functions worked well; street incidents – parking cars etc – suggested options for further development through population of the streets with more stories and external links.

Resolution / Reframing: to follow predicative testing. Further voice-testing required.

Size of image in screen critical to context: installation size will be different from desktop for instance. The system allows this to be easily changed in the XML-file for whatever occasion.

Proposition: Following predictive testing and allowing time for more objective evaluation, decide at later date whether to proceed further with this model, using key or voice control.

8.21. Appendix: Test Model movie list

Test Models movie collection, as used in the testing process.

The title duration column measured superimposed titles of individual micro-docs (MDs) such as they could be eliminated as part of comparative testing. Also shown is the placing of individual MDs within each of the Test Models - thus in the top row, file name 01F would appear 1st in the CIRCLE Test Model, 6th in the LINE Model and 10th in the GRID Model.

Video Title	CCS Research-er	Description (used in retrieval testing)	File name	Placing in Test Models		
				GRID	LINE	CIRCLE
Interactive Software for Musicians	Andrew Johnston	The trombone player facing a large screen with moving graphic shapes.	01F	10	6	1
Stimulating Creative Play	Brigid Costello	The woman moving in front of the large screen with springs, and grass-like graphics.	02F	4	11	2
Generative Music & Cellular Automata	Dave Burraston	The man with an unshaven appearance standing in front projected images of musical scoring.	03F	8	3	3
Research Administration	Deborah Turnbull	The woman with images of Indonesian shadow theatre, and clapping in front of a projected, changing colour field.	04F	3	9	4
Abstract and Generative Constructs	Ernest Edmonds	The man in glasses sitting at a round table with segmented colour fields projected on the screen behind	05F	11	10	5

		him.				
Emergence in Interactive Art	Jennifer Seevinck	The woman with blond hair, with floating shapes, mirrors and colour.	06F	6	5	6
Computer Support for Film Music Composition	Julien Phalip	The young man in a sound studio and a woman floating in a swimming pool.	07F	2	8	7
Audience Experience of Interactive Art	Lizzie Muller	The woman with dark hair, waving hand, then another woman in a reclining chair looking at large projected circles.	08F	12	1	8
To Be or Not To Be: an interactive artwork	Roman Danylak	The big guy at a computer, with words on the screen and people in pirate dress.	09F	1	7	9
In Search of Presence	Sarah Moss	The woman in a darkened screening space, moving in front of the images of fast-moving kids, water, buildings etc.	10F	9	12	10
Designing Creativity Support Tools	Shigeki Amitani	The guy with a laptop in front of him on a round table with thumbnail rectangles on the computer screen.	11F	5	4	11
Investigation into Arts Science Collaboration	Yun Zhang	The woman seated at a round table with diagrams on a red background on the screen behind her.	12F	7	2	12

8.22. Appendix: Research Background Information for participant

Faculty of Information Technology

Creativity & Cognition Studios

Research Project background information

Project title: Mnemovie Player (UTS HREC 2006-304P)

WHO IS DOING THE RESEARCH?

This project is part of research being conducted by the Creativity and Cognition Studios of the University of Technology, Sydney. The Project Researcher is Mike Leggett

WHAT IS THIS RESEARCH ABOUT?

This research is to investigate the Mnemovie Player, which has been designed to work with motion pictures on a computer such that the operator's memory is stimulated to enable retrieval of video movie files. The testing is concerned with your interaction with the system Models in order to understand the process better, not to perfect the Models in order to produce a software package or application.

IF YOU PARTICIPATE, WHAT WILL IT INVOLVE?

Each of three Mnemovie Player Models will be evaluated in a consistent studio environment. You will be asked to operate each one in turn, to make performance comparisons between the three Models and have your responses and reactions recorded. This will take between 30 - 60 minutes.

Each session is a test of the computer system and not a test of the subjects' experience or skill levels.

HOW WILL THE DATA BE USED?

The data will be viewed and analysed by the research team. This analysis may result in statistics, graphs, diagrams, edited audio, or textual descriptions/transcripts. We will ensure that you are not able to be identified in any way in the results of our analysis. The results of our analysis may then be published in some form in an academic journal, book, website etc. The original data will be securely stored at the Creativity and Cognition Studios and will not be used in any other way.

ARE THERE ANY RISKS?

There are very few if any risks because the research has been carefully designed. However, it is possible that you might be embarressed at being asked to 'perform' and being observed. It's important therefore to remember that it is the computer system and software as you operate it that is being observed.

WHAT IF YOU HAVE CONCERNS OR A COMPLAINT?

If you have concerns about the research that you think I, Mike Leggett or my supervisor, Prof. Ernest Edmonds can help you with, please feel free to contact us on 9514 4633.

If you would like to talk to someone who is not connected with the research, you may contact the Research Ethics Officer on 02 9514 9615, and quote this number: UTS HREC 2006-304P

8.23. Appendix: Participant Consent/Release Form

Faculty of Information Technology

Creativity & Cognition Studios

Project title: Mnemovie Player (UTS HREC 2006-304P)

Participant RELEASE form

I, ____

hereby give my consent to be photographed/videoed/sound-recorded/interviewed by **Mike Leggett and designated assistants**, student and staff researchers at the Creativity and Cognition Studios at the University of Technology, Sydney (UTS). The questionaire/ photograph/video/sound recording/interview is to be used in the following project:

Evaluation of MneMovie Player computer system

I agree that the project may in part or in full be exhibited publicly by UTS and/or researcher either on University premises or in another exhibition space. I agree that the project may also appear in multiple copies of a Video/ CD ROM/ DVD/ Web/ Database/Article/Book which may be distributed by UTS. I also agree that the persons who have contributed to the project may include the project in part or in full in their portfolios.

Should the situation arise I do/ do not* give my consent for the photograph/video/sound-recording/interview* to be broadcast, distributed or exhibited by a third party, broadcast on community Radio or TV or used by a third party.

Signed: ____________________________________ Date: _________________

Name and address (please print):

____

____

____

____

8.24. Appendix: First questionnaire – participant background

Faculty of Information Technology

Creativity & Cognition Studios

Project title: Mnemovie Player (UTS HREC 2006-304P)

QUESTIONNAIRE : PARTICIPATING SUBJECT'S BACKGROUND

This questionnaire commences the research by gathering some background information to be able to profile your experience with motion picture media including film, television, video/DVD, portable players/iPod, mobile phone, and the use of computers and movie files. All aspects of this research the information is confidential, as described in the Project Background Information document.

IDENTITY– please circle

Name :……………………………………………………..…………………

Gender: **M / F** Age: **<20 ; 20-30 ; 30-40 ; 40–50 ; >60**

Occupation:…………………………………………….……………………

QUESTIONS – please tick or circle one or several options

How <u>often</u> do you encounter motion picture media? **Monthly / Weekly / Daily / Hourly**

<u>Where</u> do you encounter motion picture media?

Home / Work / In Public places / Other:…………………………………………

For what <u>purpose</u> do you use motion picture media?

Entertainment / Work / Information / Pleasure / Other:……………….………

In what <u>form</u> do you encounter motion picture media?

Film / Television / Video/DVD / Computer Movies / Portable Players/iPod / Mobile phone

Please turn over

a) Do you have a collection of motion picture movies? **YES / NO**

For what purpose? **Entertainment / Work / Information / Pleasure / Other:**……………………………………………………………………………………

b) What form is your collection? **Film / Television / Video/DVD / Computer Movies / Portable Players/iPod / Mobile phone**

If you encounter motion picture media on computers, which kind of software do you use?

Movie-PLAYER applications:

Quicktime ❑

Media Player ❑

Real Player ❑

VLC ❑

Other……………………………………………………… ……..

Movie-MAKING applications:

iMovie ❑

Premier ❑

Final Cut Pro ❑

Avid ❑

Other……………………………………………………………..

How often do you play on-line or off-line computer games?

Hourly / Daily / Weekly / Monthly / Rarely / Never.

8.25. Appendix: Testing Procedures and Instructions

Faculty of Information Technology

Creativity & Cognition Studios

Research Project

Title: Mnemovie Player (UTS HREC 2006-304P)

TESTING PROCEDURES & INSTRUCTIONS

INTRODUCTION

Each of three Mnemovie Models will be evaluated consistently in a studio environment. You will be asked to operate each one in turn, to make performance comparisons between the three Models and have your responses and reactions recorded. This will take between 30 - 60 minutes.

Each session is a test of the computer system

not a test of the your experience or skill levels.

I will begin by explaining the principles behind the Models, how interaction is designed to occur with the motion pictures, or movies, that will be encountered through the interactive process. A Practice Model will be explained to you, so that through practice you can experience interaction with the system. The movie collection encountered in the Practice Model is different from the three Test Models.

The Test Models will be slightly different in their interactive form, but the content, (the video files stored in the collection), will be the same.

The evaluation process will also involve:

1. A Questionnaire: to be completed during testing.

2. An Interview: to assist or clarify this process.

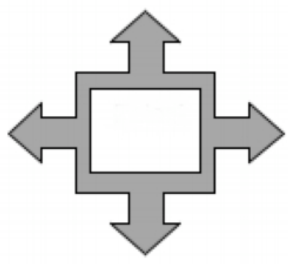
3. Observation: of your interaction with the computer system and associated software.

4. Audio/Video Recording: of interviews and observation may be recorded on video or audio tape for later reference.

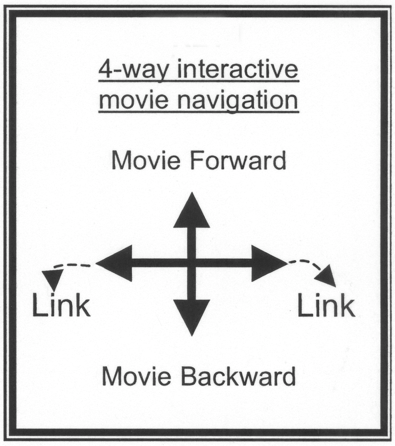
Now I will explain the principles of the system.

8.26. Appendix: Using the Mnemovie system

INTERACTIVE PRINCIPLES OF THE SYSTEM



The Mnemovie computer system uses 4-way gesture to navigate a specific movie collection. You use the Arrow keys on the keyboard to interactively navigate the movies in the collection and at all times you have control over the movie you are viewing:



The Up Arrow makes the movie run Forward.

The Down Arrow makes it run Back – with two different appearances, depending on the Model.

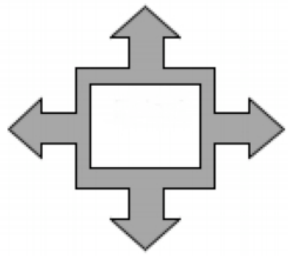
The Left and Right Arrows cause a Link to be made between the movie you are watching and other movies in the collection – again, with different outcomes, depending on the Model.

These differences will be explained before you use each of the Models in turn.

Please take your time.

8.27. Appendix: Practice Model Instructions

PRACTICE MODEL



The collection of movies in the Practice Model is about the contents of a chest of drawers.

Read the first numbered section, then interact with the system, before moving to the next section. Please take your time.

Double-click on the item on the desktop named: PRACTICE. Begin by using the Up Arrow to run the movie forward. After a few seconds, press the Down Arrow to run the movie backwards. Repeat this until you have a feel for this interactive function.

Each one of 20 drawers in the chest can be linked to a movie of the contents of the drawer. Run the movie until you get to Drawer number 12 or 13 or 14 and press Left.

Wait until the line has scanned to the edge of the picture and press Left or Right to return to the chest of drawers. Repeat if you wish.

Run the movie backwards to Drawer 4 or 5, then run it forwards to exactly Drawer 11 and as it reaches the drawer, press Left or Right.

As the black scan line moves from left to right (or right to left if the movie is playing backwards), it crosses each of the objects in the drawer. Use Up and Down to align the line with the **stainless steel circular object** in the centre of frame. Use Left or Right to link a movie that tells a short story about the object selected. Then select some of the other objects.

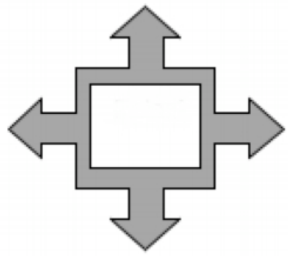
Use the Left or Right key again to return to the drawer contents.

Allow the scan line to return to the chest of drawers.

Questions?

8.28. Appendix: Test Model Instructions

TEST MODELS



The twelve movies in the three Test Models are all the same collection. The collection is of micro-documentaries of 2-3 minute durations, about some of the researchers and their research at the C&C Studios.

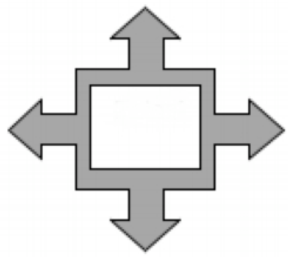
You will be asked to interact with each of the three Models, one at a time, in a specific order. The 4-way interaction principles encountered in the Practice Model will apply to the Test Models, though the Down, Left and Right keys will cause slightly different outcomes for each of the Models.

The Models will be characterised in their Title by a shape, or schema, to help in understanding the different navigational principles of each one. As with the Practice Model, **remembering where you 'find' the movies within the navigational schema**, is important for being able to complete the tasks.

The pattern of testing procedure will be the same for each Model and at the end you will be asked to complete a questionnaire and a short concluding interview.

8.29. Appendix: LINE Test Model instructions

MODEL **LINE : beach to rainforest**



The Up Arrow 🡅 makes the movie run forward.

The Down Arrow 🡇 turns the viewpoint through 180˚ and returns Back along the same route; **OR** runs the movie Backwards

The Left Arrow 🡄 Links to one of the twelve movies, according to where it is located in the landscape – each section of 'the walk' is linked to a different movie. Using the Left Arrow again returns you to the walk.

The Right Arrow ➔ Links to the <u>next location</u> (when on the walk) or the <u>next movie</u>, (when listening and watching to one of the speakers).

🡅 = FORWARD

🡇 = BACK / BACKWARDS

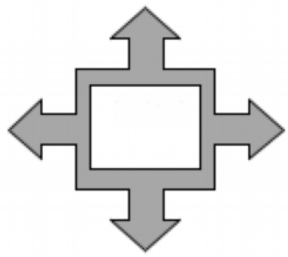
🡄 = MOVIE / RETURN

➔ = LOCATION / NEXT MOVIE

Please take your time

8.30. Appendix: CIRCLE Test Model Instructions

MODEL **Circular Loop : the Researchers**



The Up Arrow 🡅 makes the movie run Forward showing speeded-up copies of each of the twelve movies.

The Down Arrow 🡇 makes the movie run Backwards showing speeded-up copies of each of the twelve movies.

The Left Arrow 🡄 Links to one of the twelve movies, according to where it is located in the Circular Loop. Using the Left Arrow again returns you to the Loop.

The Right Arrow ➔ Links to the next movie.

🡅 = FORWARD

🡇 = BACKWARDS

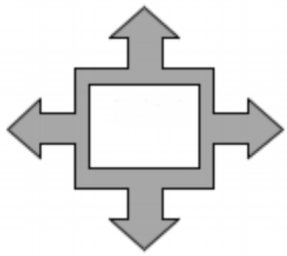
🡄 = MOVIE / RETURN

➔ = NEXT MOVIE

Please take your time

8.31. Appendix: GRID Test Model Instructions

MODEL **GRID : lanes and streets**



The Up Arrow 🡅 makes the movie run forward.

The Down Arrow 🡇 turns the viewpoint through 180˚ and returns Back along the same route; **OR** runs the movie Backwards

The Left Arrow 🡄 and Right Arrow ➔ Links have two outcomes:

When immediately adjacent to a street turning, the Arrow key on that side will turn you into that street.

When NOT immediately adjacent to a street turning, either Arrow will link to one of the twelve movies, according to where it is located within 'the grid'.

THEN:

The Left Arrow 🡄 returns to the walk.

The Right Arrow ➔ Links to the next movie.

🡅 = FORWARD

🡇 = BACK / BACKWARDS

Street Turning:

🡄 = TURN LEFT

➔ = TURN RIGHT

Walking or Viewing:

🡄 = MOVIE / RETURN

➔ = MOVIE / NEXT MOVIE

Please take your time

8.32. Appendix: Researcher Log Sheets (X4)

TITLE: MNEMOVIE PLAYER (UTS HREC 2006-304P)

TESTING QUESTIONS – RESEARCHER LOG SHEETS

Subject Name……………………………………..…………………….

Date:………………SESSION started:……..…FINISHED…………

INTRODUCTION

TIME FINISHED:…………..…

PRINCIPLES OF THE SYSTEM

Read out, then ask:

'Now, without looking, could you describe the interactive principles of the system.'

Observations:

Highly Confident Confident Comfortable Uncomfortable

TIME:…………………

TRAINING MODEL

Read out, then talk through each section as instruction. Respond to questions. Allow play and experimentation.

Observations:

Highly Confident Confident Comfortable Uncomfortable

Questions asked?

TIME:…………………

TEST MODELS

Record the Order each Model (Title) is encountered:

1…………………

2…………………

3…………………

NB Speak the Instructions for each Model for the Subject to repeat. Respond to only specific questions during the 2-5 min exploration period.

MODEL – LINE : beach to rainforest

Started TIME:…………………

Reading and repeating FINISHED TIME:…………

<u>Exploration</u>

Observations:

Highly Confident Confident ComfortableUncomfortable TIME:……

<u>Task 1:</u> find a movie seen during exploration: ID:……………………

Movies Seen ID………………………………………………………………..

Observations:

Highly Confident Confident ComfortableUncomfortable

Error finding count:……………………… TIME:…………………

<u>Task 2</u>: find a movie NOT seen during exploration: ID………………

Observations:

Highly Confident Confident Comfortable Uncomfortable

Error finding count:……………………… TIME:…………

<u>Overall Assessment</u>

Observations:

Highly Confident Confident Comfortable Uncomfortable

TOTAL TIME:…………………

NB Speak the Instructions for each Model for the Subject to repeat. Respond to only specific questions during the 2-5 min exploration period.

MODEL – GRID : lanes and streets

Started TIME:…………………

Reading and repeating FINISHED TIME:……………

<u>Exploration</u>

Observations:

Highly Confident Confident Comfortable Uncomfortable

TIME:…………………

<u>Task 1:</u> find a movie seen during exploration: ID:……………………

Movies Seen ID……………………………………………………………………..

Observations:

Highly Confident Confident Comfortable Uncomfortable

Error finding count:……………………… TIME:………

<u>Task 2</u>: find a movie NOT seen during exploration: ID………………

Observations:

Highly Confident Confident Comfortable Uncomfortable

Error finding count:……………………… TIME:…………

<u>Overall Assessment</u>

Observations:

Highly Confident Confident Comfortable Uncomfortable

TOTAL TIME:…………………

NB Speak the Instructions for each Model for the Subject to repeat. Respond to only specific questions during the 2-5 min exploration period.

MODEL – Circular Loop : the Researchers

Started TIME:...........

Reading and repeating FINISHED TIME:……………

Exploration

Observations:

Highly Confident Confident Comfortable Uncomfortable

TIME:..............

Task 1: find a movie seen during exploration: ID:……………………

Movies Seen ID………………………………………………………………..

Observations:

Highly Confident Confident Comfortable Uncomfortable

Error finding count:……………………… TIME:..............

Task 2: find a movie NOT seen during exploration: ID……………..

Observations:

Highly Confident Confident Comfortable Uncomfortable

Error finding count:……………………… TIME:....................

Overall Assessment

Observations:

Highly Confident Confident Comfortable Uncomfortable

TOTAL TIME:....................

8.33. Appendix: Second questionnaire – participant's responses

TITLE: MNEMOVIE PLAYER (UTS HREC 2006-304P)

Subject Name………………………………………………………

Date:……………………………

QUESTIONAIRRE ADDRESSING ALL TEST MODELS
Please rank the three Models against these characteristics
(use Test Model Title).

	High	**Moderate**	**Low**
Ease of use			
Opportunity for explorative interactivity			
Efficiency of search function			
Quality of the experience			
Your overall preference			

Could you describe the interactive principle of all the Models with a keyword, or short sentence?

Could you describe i) the strongest and ii) the weakest feature you encountered in the Models?

i)
ii)

FINAL BACKGROUND INFORMATION

Words and visual images, separately and together, convey much of how we comprehend the world and our environment. Do you agree with that statement? **YES / NO**

When you encounter written Words and visual Images in the following situations, how would you preportion your usage of them:

When seeking Information? **WORDS……………**

IMAGES……………

Total 100%

When experiencing Entertainment? **WORDS……………**

IMAGES……………

Total 100%

When receiving Pleasure? **WORDS……………**

IMAGES……………

Total 100%

When being Creative? **WORDS……………**

IMAGES……………

Total 100%

8.34. Appendix: Interview Questions

INTERVIEW

(NB Not conversation, asking the same questions exactly in the same flat voice. These will be ordered according to the subjects' experience with the Models.)

Start with '**Thank you'**

Responding to the first Profile questionnaire:

if the Subject DOES have a movie collection (DVD, computer / phone files, video, 16/8mm films etc) ask the following:

How is your collection storied and accessed?

Could you describe how you might be able to use this navigational approach for the kind of motion picture movies or movie collection you have?

Could you describe the kind of movie collection you would like to assemble to be able to use this navigational approach?

If the Subject DOES / DOES NOT have a movie collection ask the following:

Does this navigational approach to interacting with movies suggest to you the kind of movie or cinema experience that could be produced? YES, go to 5. / NO, go to 8.

If it was possible to construct the experience you have in mind using this navigational approach, how would you describe it? (Feel free to be imaginative and fantasise freely!)

Where would this be encountered?

Would it have a purpose?

Are there any closing thoughts or comments about the Models, the way they could be improved or extended?

Are there any closing thoughts or comments about the session, or the way in which the session has been conducted?

Thank you again!

8.35. Appendix – Evaluation Second Questionnaire

Table of Results

Part-icpant	Describe	Strong	Weak	Principle Comment in Interview
1	Memory and intuition	Intuitive sense of discovery (Grid and Line)	Predictability (Circle)	
2	Circle - responsive, Grid - exploratory; Line - exploratory guesswork	Circle was easiest to quickly scan		enjoying the challenge
3	Consistent dual exploration.	Going to same place to find the same movie.	nothing happened when trying to link to a movie ie. not knowing how close you are	really interesting from a performative aspect and means you'd start collecting filmic media that would respond to this model of interaction'
4	A visual cue (or metaphor?) acts as an entrance point (a portal?) into one of the movies.	where a movie was, without really consciously knowing.	slow and frustrating when you wanted to find something particular	'I was interested in how quickly I began to learn the association of image to content, almost without being consciously aware of it..I would seem to know that was where that piece was....it would be more efficient to have....hyperlinked image or text...... I enjoyed the mystery of it'
5	Navigation structure, links to content loops	Potential fun locating content in a terrain or structure based architecture.	Not enough associative links to enable content location from 'terrain'	the GRID has physical features that you know you can navigate.

6.	Flexible	Multiple ways to jump in and out of sections + to navigate	GRID was slow when travelling the street. Also LINE and GRID were a bit obscure re learning what the links represented.	'The one thing it would be useful for would be if you have a lot of maybe, small movies or small segments as it's great for jumping in between them.....if I had a big collection of TV commercials or short intresting films, it would be good...'
7	the interactivity of the videos gave greater attentiveness to the video than the computer operations.	Simplicity	More key functions, or else "me".	"I see it more as a personal tool, a navigational tool through my personal movie collection .... I would use alpha:- keywords, bubbles .... I use my stills digital camera as a multi-function recording device - video, sound as well as pix.
8	Directional triggered search functions	The search function seemed intuitive amd second nature using the keyboard arrows.	Sometimes be nice to find a central place to return to, to use as reference point.	'Don't need an extra process of retrieval, I just remember - the DRAWERS would be appropriate for my collection of feature films.'
9	Use directional arrows to navigate around a spatialised main menu and to view or search for discrete movies linked to the main menu.	Nice layering of space, ease of navigation once learned.	Content of main menu has a strong bearing on cognition of direction and connection to 'content'.	'It gave me lots of ideas too about the extent to which one can differentiate, or make similar, the menu and the content..... because it could be more exploratory....

10	Discovery-based and immersive	The slow accretion of knowledge attained by 'mooching' around.	Urgent achievements within a tight time schedule are not the system's strong suit (but I didn't care about that.)	"Rich and complex immersive environments which are explored .... [requiring] growing reward for continuing to explore .... [beyond] which Cinema has conventionally done."
11	Navigation and association with place.	Learnability and location - I felt that with a little more time and experience I would work out where videos were and this is a strength over time.	Tempo - I wanted to move faster along streets in GRID and the speed of the others was something a bit overstimulatin g!	'GRID could have comedy in one house, dark movies in the garage - then use the R-key to flip through the titles...' 'Mood metaphor, using possibly colour...... LINE could reflect mood .....'
12	CIRCLE: too fast, but makes sense; LINE: similar to circle really; GRID: difficult, challenging but [...?....] fun	CIRCLE: strong metaphor, quick; GRID:Interesti ng; LINE: straight forward (pun not intended)	CIRCLE: not as intriguing; GRID: confusion at times - felt ill at times; LINE: not that intriguing.	" I couldn't remember/learn...rand om keys...eventually learnt what would happen..."
13	Navigation	Capacity to quickly tab through many movies with only simple key commands.	Navigation with the LINE and GRID models seemed too slow such that search / scanning became cumbersome.	

8.36. Appendix: ArtLab proposal

MNEMOVE

Mike Leggett, Sue Healey and Louise Curham

Research Summary

Movement is the essence of two of the 20th century's most dynamic artforms: dance and cinema. Emerging from the latter part of that period, the computer and the micro-processor introduce creative possibilities for new technology to introduce fresh approaches to cultural innovation in performance. The *MNEMOVE* project proposes to develop initial research between technology and arts practitioners, as a collaborative interdisciplinary (and intergenerational) team.

Our research will explore discipline specialisms – dance, film, computing - using MneMovie, a novel computer system, custom designed to retrieve from computer memory (a database), motion pictures ('movies'), using the principle of hyperlinking. As a beginning, this will enable interaction with a collection of prepared movies, linked through principles we refer to as 'material and relational semantics'. In the context of live performance, the MneMovie system thus affords the precision, flexibility and presence of a musical instrument, embedding the computer in the physically embodied human world of past and present.

Creative Rationale

We begin by linking movement and memory, both integral to the development of dance - as the choreography develops it relies upon memory of movement, both cognitively and in the phenomena of systemic (muscle) memory. Movement in the motion picture extends beyond recorded movement and the physical boundaries of the screen surface into the images of locations and temporal dimensions that trigger and contain short-term (live), and long-term (retrospective), memory.

Video and film material, both archive footage and new footage generated in the research process, will be collected as discrete movies into the database. Editorial and authoring processes will prepare and locate the collection in relation to the choreographic development of physical movement. A key aspect here is the innovation in the MneMovie system design to respond frame accurately to specific cues or to programmatic sections in live performance.

From the outset, we will be experimenting with 3D space and time, a risky but rigorous engagement with the points where humans collide with the structuring possibilities of the computer brought into the performance space. Arising from these convergences, memory as a material feature of the act of observing will be presented through a combination of screen-based and live performance. Generating this material will form the key creative development of this project. Exploring the plastic aspects of computer technology will allow a greater sensitivity in Human Computer Interaction (HCI) by using structure based upon and arising from human memory.

The Company

The core discipline specialists – dance, film, computing – will at specific points within the project consult a layer of practitioners. The collaborative team spans three decades in age range, each representative of generational histories – Mike

Leggett involved in material and media art since the 70s, Sue Healey in postmodern and contemporary dance from the 80s, and Louise Curham in artist-led networks of the past decade.

Mike Leggett has been making art with film and video since the early 70s and is currently completing a PhD at the Creativity & Cognition Studios in the Faculty of Information Technology at UTS. His research topic is visual mnemonics for the retrieval of digital media in the creative management of video files by specific communities of users, using schemas of gesture navigation and non text-based relational linking in the video file database. Prior to the full-time three year period of research in this multidisciplinary area of Human Computer Interaction, he has received research funding from the Australian Film Commission: to curate the 1996 exhibition, *Burning the Interface<International Artists’ CD-ROM>* at the Museum of Contemporary Art and a national tour; and in 1999, seed funding for the interactive multimedia prototype, *PathScape*. He writes regularly for RealTime, Leonardo and contributes articles to many journals, conferences and books.

The choreographer Sue Healey has an established national and international reputation in live dance and dance on film, delivering funded projects on an annual basis, since the early 1990’s and receiving a Dance Board Fellowship in 1999. Her works have been described as masterful in their handling of organic human stories, space and time. Her focus is on the kinaesthetic – an investigation and creation of a highly-detailed physical language and its rendering within various sites and media. Healey, a part-time lecturer at UNSW since 2003, has also been a Research Associate with three ARC funded projects - *Unspoken Knowledges(2002/03), Conceiving Connections(2004/06)* and *The Dancing Brain(2006/07)*, groundbreaking collaborations between dance researchers, choreographers and cognitive scientists.

Healey and film-maker Louise Curham developed an intimate image language in a dance film collaboration from 1992-2002, work based on a theatrical screen space – using rear projection to create choreographies between screen image and real-time performers. With their extended investigation over many years, highlights in innovation include the camera as a highly-detailed choreographed partner and film projection as a dynamic light source and narrative framing for movement. Their collaboration places them as significant early innovators in Australian screen dance. The proposed collaboration with Leggett will expand their work through the articulation of novel spaces for movement and the relationships between the organic human experience and technology.

Louise Curham is a professional film archivist and an artist who works with the material properties of film, developing its plastic qualities in live projection performance. Curham’s key artistic contributions have been collaborative: early dance film with choreographer Healey; foundation member of interdisciplinary arts group Aphids; co-convenor of artist run space the Teaching and Learning Cinema (previously the Sydney Moving Image Coalition); performed films with improvising musicians in regular collaborations at Sydney’s NowNow and ongoing collaborations with Loop Orchestra, Chris Abrahams and Mike Cooper, Natasha Anderson and Amanda Stewart. “Curham’s work is virtually unique among contemporary abstract filmmaking due to its foregrounding of the fragility of the medium: the delicate poetry of her celluloid effacements has a discretion that is rare among artists exploring this variety of terminal cinema.”(Jim Knox, Senses of Cinema, July 2006.)

We will be working with several practitioners at specific points in the project, selected for their particular skill sets: the Brisbane-based composer and musician Dr Erik Griswold, lecturer at Queensland Conservatorium who is currently involved with Sichuan Opera; the Perth-based performer Shone Erskine, currently a PhD Student in the School of Psychology, University of Melbourne and undeniably, one of Australia's most elite contemporary dancers - her contribution to his project will be invaluable as performer and researcher; Keir Smith, a creative programmer completing a PhD in the iCinema research institute of Computer Science and Engineering at UNSW; Paul Tibbles a highly experienced general technician. Consultants we will work with include Professor Ernest Edmonds, who has long history as an artist, a mathematician and computer scientist and will be consulting on creative computing and evaluation; and Michael Hill, the CEO of Lightwell, a foremost media exhibition company, who will consult on spatial design.

Venue Partners

We have negotiated three core research venues that reflect the multi-disciplinary character of the project. Across the period of the research, each venue will bring to the project, materially and creatively, a different emphasis. The Creativity & Cognition Studios at UTS have promised $17,700 in-kind through access to the state-of-the-art laboratory with human-scale digital back projection, G5 computers, various kinds of interface technology and the services of the research team on a consultancy basis. This will be invaluable for room-sized experimentation with interaction between figure and MneMovie system.

http://www.creativityandcognition.com/

UNSW is the second venue and has a larger space more suited to physical developments within the research. UNSW iO Myers Production unit is a venue that has become a critical nexus for many independent dance artists in Sydney. It is a flexible space with excellent lighting and projection resources and will provide $10,000 of in-kind support.

http://media.arts.unsw.edu.au/production/index.html

The Performance Space at Carriageworks will complete the venue partners providing access to the large rehearsal studio, projectors, computers and lighting rig, office facilities and assistance in facilitating feedback and peer group responses, to the in-kind value of $16,000.

http://www.performancespace.com.au/

Methodology

Our research will be practice-based. This places emphasis on the creation of an artefact rather than increasing our knowledge of practice itself (practice-led), though it is in the nature of the inter-disciplinary research we propose that new forms of practice will emerge. The scholar Steve Scrivener has argued that this approach aims to 'generate culturally novel apprehensions' that go beyond the responses of the individual creator or observer.

In bringing together a set of core discipline specialists, we plan as the research develops to broaden the base to include a secondary level of contributing artists and assisting specialists and interns. With 'movement' as the key linking factor, the established collaborative experience of Healey, Leggett and Curham will provide the artistic thread.

Through the processes of experiment, observation and reflection the company will record summaries at specific milestones, around which can be formulated planning for further investigation in subsequent sessions. At each of these points in the process of development, we propose to use evaluation sampling from informed peers and focus groups to formally gather feedback.

The five milestones we propose will be spread over nine months, a total of ten weeks of fortnightly periods. This pattern has the specific purpose of enabling the researchers to reflect upon the emerging events and the ideas represented, thus maximising the value of working together in the same physical space. The discourse around the development of the research will then occur off-site in a space conducive to reflective analysis.

Each period will be characterised by a different level of engagement with one another and with the secondary participants. Initially developing some basic movement investigation between human and computer, machine and operator, temporal triggers, kinaesthesia, novel spaces and navigation, our research will integrate the dance and cinema of the relational (as distinct from the sequential), as a spatial analysis tool leading towards live performance.

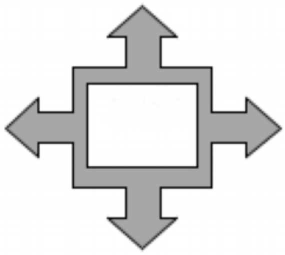
Memory in performance will be observed from the aesthetic perspectives of dance, film and multimedia computing informed by the academic knowledge base of philosophy, psychology and cognitive science. A website containing working materials will begin the process of extending the knowledge to other practitioners, educationalists, critics and theorists, nationally and internationally, in anticipation of delivering a series of live performances using contemporary technology to synthesise cinema and dance.

8.37. Appendix: Sketches – Interactive Gestural Scenarios

Initial investigation of existing means for ‘hands free’ interaction commenced this research project. Other researchers with the required technical skills have been developing a variety of sensing devices using cameras and segmentation methods, infra-red and ultra-sound detection etc. Outputs from such devices provide data to adjunct or incorporated systems able to interpret the data and trigger outcomes specified by the artist and designer.

The following sketches summarise several approaches to an essentially unobtrusive interactive interface, one in which the participant is able to concentrate on the large projected image before them, without the distraction of using their eyes to watch the process of physical interaction. Gamers using their controllers do not watch what they are doing with their fingers. Another example would be driving a car with a manual gearbox, without looking at the gears when effecting a change.

The principle of interaction is summed up with the diagram:



The design options for the physical interface, between participant and system, divide between:

- Physical or non-physical contact between the interface and participant;
- An interface orientated in the horizontal or vertical axis.

Whilst the touch-pad or touch-screen method is a widely used and tested technology for privately used personal computers, it may not be suited in a public setting. The physical presence of the interaction surface might also distract from the motion picture image on the large screen, whether in vertical or horizontal orientation. The ‘door-handle’ column of metal may be more appropriate and acceptable. Shaped like a joystick may encourage some but intimidate others.

An ‘air space’ interface, though technically more challenging, could provide a level of interaction functioning purely with the shape of gesture, based on the principle above. In a darkened space, an infra-red light sensitive camera would be able to ‘see’ physical gesture, but how would the participant be able to know where the interface created by the camera’s viewpoint was sited?

Based on a column of light, the first is small, illuminating the participant’s hand when placed into the beam. Movement to top and bottom, left and right, would cause interaction with the system to occur. Ambiguities in movement could be solved by providing two separate beams, operated by co-operating partners. The second column of light illuminates a larger area requiring full-body movement out of the beam to effect changes in the image. (This could also work with floor sensors, so might be appropriate for a ‘physically related’ movie collection).

These approaches, like the desktop models operated using only the arrow keys, emphasis minimal need to reflect on the physicality of interaction, but require further research.

8.38. Appendix: Mnemovie Cascading Menu Development

The concept of the ‘cascading menu’ paradigm employed in hypertext theory and practice (Fig.8.1), though less evident to the general user, was the principle behind the interaction design.

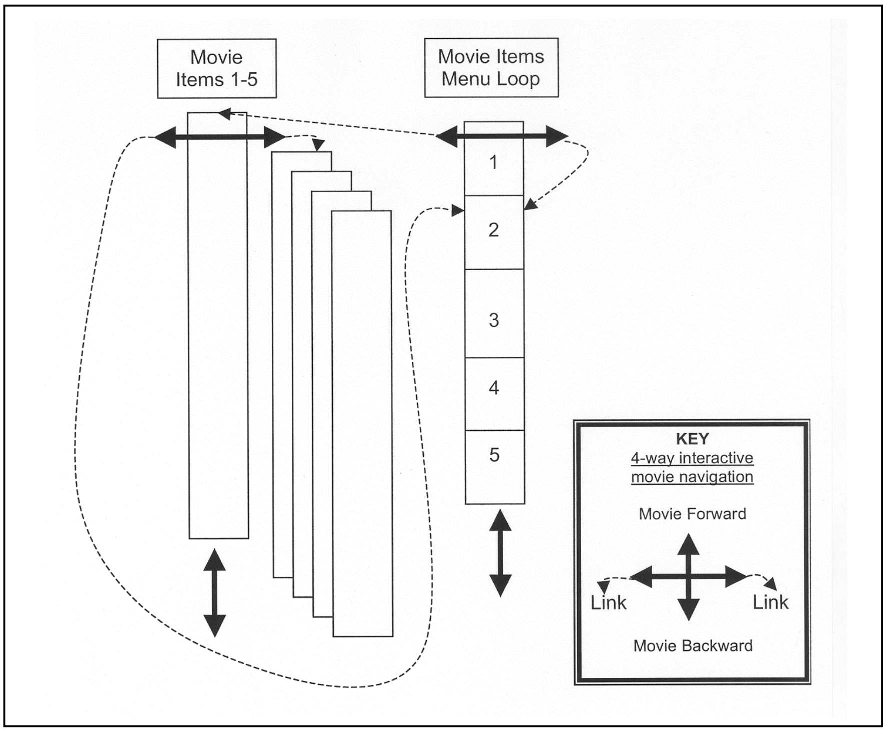


Figure 8.26: Schema of interaction CIRCLE Model.

The thick lines represent physical gesture. The five movies are compressed (1:18 ratio, see Fig 5.25), before being assembled in the Movie Items Menu Loop. Each Menu Item links to its complete 3-minute version, Movie Items 1-5. The dotted lines indicate the linking options 1-5, to and from the Loop, to and from the movie(s).

Interaction design for the Circle Model is a novel development of the WYSIWYG principle that we have become accustomed where applied to two-dimensional static documents. Further refinements can be proposed for this approach as has been demonstrated applied to motion picture documents. As a tool with the central purpose of being able to rapidly image-sample the movie collection before retrieving individual items of apparent interest, authoring capability and the ability to store items, lies not with the general audience but with the owner of the collection.

Using this approach to video items being sampled to become the indexing layer – an ‘abstract’ version of the ‘detail-on-demand’ principle – makes the method attractive as a simple and quick relational solution, quicker than editing a special sequence by hand. Purveying the collection, making it available as an interactive Knowledge Management System (KMS), can be achieved on a production-line basis, a machine-based authoring system, Fig. 7.2.

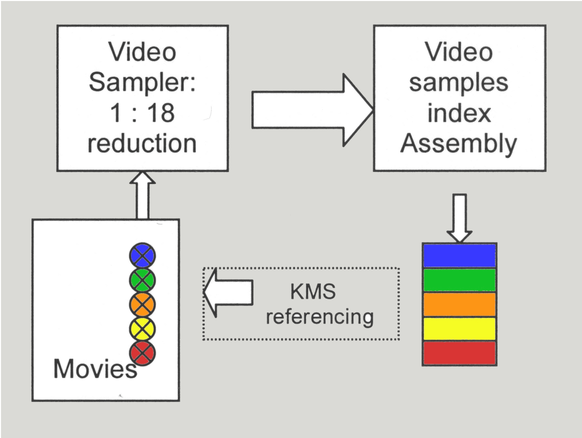


Figure 8.27: KMS approach to fully automating the sampling process.

(Clockwise, beginning bottom left), the collection of movie files are processed through a sampler (1:18 or higher), the sampled files being assembled as a motion picture index and addressed using each files meta-data, back through the KMS to the original collection of movie files.

The principle can be extended: from the 'skimmed' 'Menu Loop' to the 3-minute version as an 'abstract' of a longer 30 or 50-minute version, with detail provided 'on-demand', at a third level. The longer and fuller presentation, by extending the linking protocols – see Fig 7.3, is a development of the CIRCLE Model. (The theme of the collection in the diagram is the researchers in the Creativity & Cognition Studios, 2006).

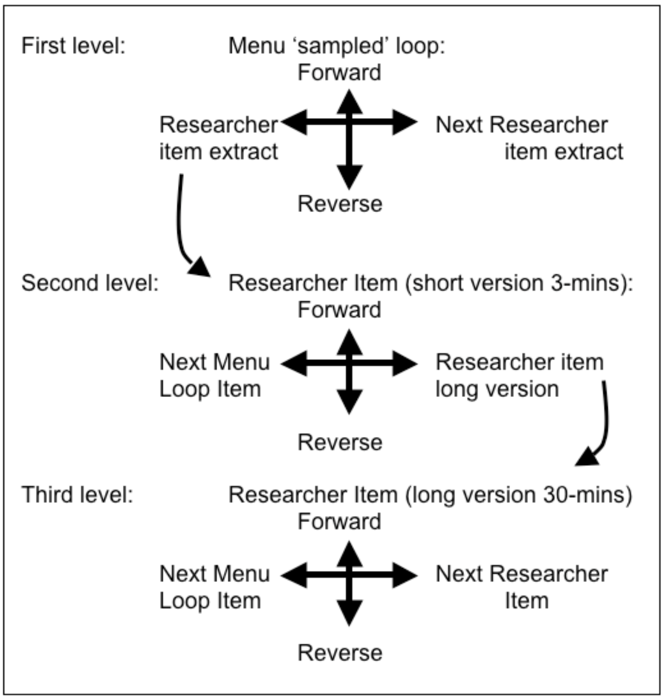


Figure 8-18: CIRCLE Model development: schema for 3rd level of hyperlinking (propositional).

On launch, the movie seen is at the First level (top left) with linking options then cascading between all three levels.

8.39. Appendix – Mnemovie Online Development

The networked community contributes or modifies content by uploading short video files from a range of digital motion picture devices to a website. The system is able to recognize each file type and store them centrally. The interface includes a map of the uploaded files represented as thumbnails. The contributor assigns the order in which the group of shots (clips) are linked. So five shots may be assigned for example as:

	Shot No	Left Link shot No.	Right link shot No.
Video shot collection	1	5	3
	2	1	5
	3	1	4
	4	2	1
	5	4	2

Figure 8.29 : Online Mnemovie interface: video files, assigned links.

Thus if a viewer is running shot number 3, at any time during its duration – say 30 seconds – by keying the left arrow causes the image to be replaced with shot number 1. Should the participant then key the left arrow again, the shot will be replaced with number 5; the right arrow, the shot will be replaced by shot number 3 (again).

The participant makes two contributions: the five video shots uploaded, and the assigned relations between them. Initially a visitor to the site will probably test to see how the system works with whatever is to hand in the way of video clips. Assigning could be by using a table like the one above with the thumbnails visible, or by dragging a thread, etc. The important moment is when the system they have made is launched and they experience their shots as ‘instant montage’, where the order and duration of shots is determined using one finger on the arrow keys (or mousing gestures in the picture area).

After exploring the result of their initial foray, (if things are clicking in more than one place), then the option is to upload specific shots to be linked in a specific way, or to create a specific linking strategy for which special material is shot and then uploaded.

A further option within the system allows contributors to browse other contributor’s shots and create further linked groupings from them. These are accessed in a different part of the gallery, where can also be found a larger artwork linking a larger number of files made: a) by the designer of the system, or artist-in-residence; b) by ‘licensed’ collaborators; c) by a generative system specified by the designer.

8.40. Appendix – Notes for Generic Navigational Strategies

A navigation strategy able to produce an image change for every linking gesture requires the close integration of the shooting procedures and the preparation of the coded XML-file. In the kind of camera deployment indicated in Fig 7-6, where each pan has six neighbouring pans, simple geometry determines that each 60˚ of arc are coded into the system, commencing at 30˚. Thus panning left to right, the first link will occur between 30˚ and 90˚, the next between 90˚ and 120˚, and so on until the final 330˚ to 30˚. Each segment will have the duration of approximately 10-seconds, based on 60-second pans. As in the earlier version, the link would be between the corresponding values of arc in each of the neighbouring files.

Variations of the shooting/coding procedures – larger numbers of pans in the environment; greater numbers of segments in the arcs – would increase the ‘granularity’ of the knowledge contained in the system. With the coding established as a template library, different collections of movies shot using exactly the same procedures for each strategy, (including filenames), could be swapped in and out of the system. A further variation would simply deliver different collections of movies with the complying duration and filename structure, to be addressed by the system generatively. with conjunctions occurring, knowledge emergent.

Another durational shape not previously considered was noted (Fig 8.26).

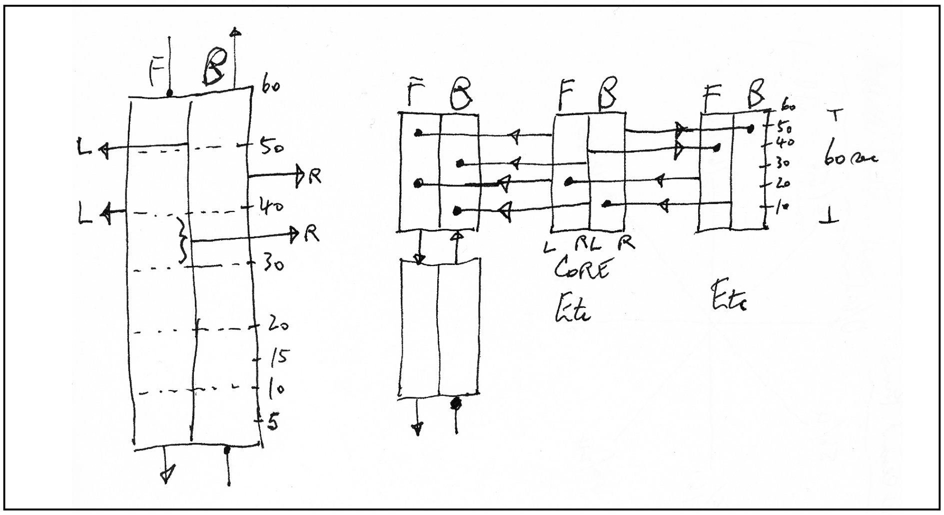


Figure 8-30: Matrix durational schema sketch.

Arrows indicate Mnemovie paradigm interactive options: F=Forward; B=Backward; L=Left; R=Right; numeric durations indicated.

This is based on a series of loops linked according to visual mnemonics, but with counting as a means of measuring duration to cue the changes. Counting is externally aided – a flash in the picture area or in the sound design - or voiced as numbers with a metronome-type sound. Each durational interval contains an image mnemonic ‘related’ by semantic, or by material appearance, or sound, to the interval that precedes or follows it. The series of intervals are precisely aligned in the Forward and Backward movies and loop (or return) as a continuous system.

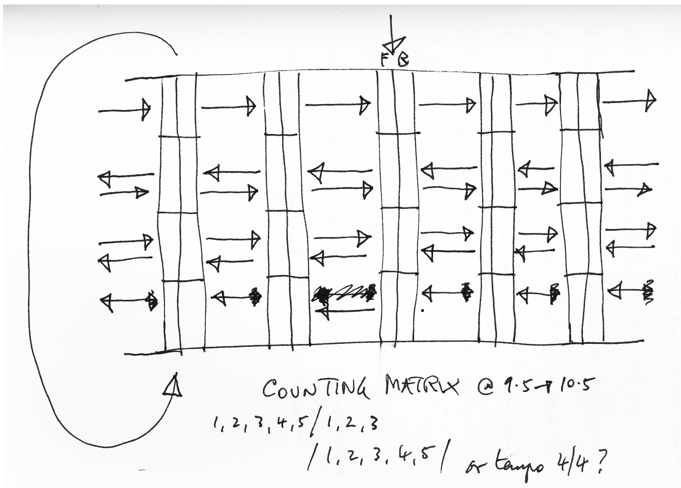


Figure 8-31: Counting matrix sketch

As with other iterations of the Mnemovie system, the Left or Right gesture will have a relational link to other movies in the collection. These movies, whilst having precisely the same durational intervals, do not necessarily have an equal continuos overall duration.

8.41. Evidence and Documentation for PhD Thesis contained in attached DVD-ROM

The DVD-ROM attached to this thesis contains Items 1 - 11 that illustrate, document and extend the written word.

The contents are in three folder/directories:

- EVALUATION MODELS;
- ILLUSTRATIONS;
- MORE.

(NB. The Evaluation Models will play ONLY on an Apple Macintosh computer).

<u>EVALUATION MODELS folder (reference Chapter 6, sections 3 & 4)</u>

The fully working copies of the Practice and Test Models need to be copied to the desktop of an Apple Macintosh computer as separate folders. (To be able to fit all this material onto the DVD, all movies have been further compressed resulting in reduced image quality.)

There is a ReadMe file for each Model containing instructions for interaction (reproduced on the next page).

Practice Model	**(Item 1)**:	01Practice folder.
Test Models:	**(Item 2a):**	02aCIRCLE folder;
	(Item 2b):	02bLINE folder;
	(Item 2c):	02cGRID folder.

NB The Movies folder will need to be moved to the folder of the Test Model before launching. (This is necessary to reduce the amount of data on the disc.)

<u>ILLUSTRATIONS folder contains:</u>

Chapters 4.4.2-4, **Item 3**:

03PathscapeDemo.mov (5 min talk-through demo of year 2000 prototype: requires Quicktime Player)

Chapter 5.6, **Item 4**:

04NewWorkData.pdf: raw data from the investigative and experimental stage of the development of the prototype models, later adapted for test purposes.

Chapter 6.5.2, **Item 5**:

05TestParticipant.mov (60 min session as sample view of a typical test session, with permission from one of the evaluation participants: requires Quicktime Player)

<u>MORE folder contains</u>:

Chapters 1 – 9, **Item 6**:

06PhD_PDFs (All the contents of this thesis as PDFs, in colour)

Chapters 1 – 9, **Item 7**:

07PhDvivaSmR.ppt (Powerpoint slides used for a presentation in 2008 about the PhD.)

Chapters 1 – 9, **Item 8**:

08LeggettDA.mov (A research statement made in 2005 for the Creativity & Cognition Studios website: Quicktime Player required)

Chapter 4.4.2, **Item 9**:

09MFA_PDFs (For reference only the MFA Thesis (2000): Pages 1-54 + pages 55-124).

NAVIGATION INSTRUCTIONS

Mnemovie PRACTICE Model

To prepare for use, copy the whole of folder 01Practice onto the desktop of your Macintosh computer. (NB This Model has its own Movie folder collection that are not shared with the Test Models, 02a, 02b and 02c)

For interactive guidance, follow the brief notes below, or use the instructions contained in the thesis (see also PDFs in the MORE folder, 08 Appendices 8.24-25).

To launch, double click the Mnemovie application file.

Navigate the collection using Arrow keys or Mouse:

• with cursor at TOP of screen, the movie runs FORWARD;

• with cursor in BOTTOM, the movie runs BACKWARDS;

• with cursor to LEFT or RIGHT of screen, a link is made to movie files in the collection. NB Only drawer number 11 (top right) is fully interactive - see Appendix 8.25.

• when the cursor is in the centre of the screen - mouse gesture or spacebar - the movies will stop, until an Arrow key or the mouse is activated.

ESC key to Exit.

NB This is a thesis only version with fixed 25fps and image size reduced.

Mnemovie CIRCLE Test Model.

To prepare for use, copy the whole of folder 02aCIRCLE onto the desktop of your Macintosh computer. Ensure the MOVIES folder is one of the five items present (by dragging and dropping from 02b or 02c if necessary)

For interactive guidance, follow the brief notes below, or use the instructions contained in the thesis (see also PDFs in the MORE folder, 08 Appendices 8.24-29).

To launch, double click the Mnemovie application file.

Navigate using Arrow keys or Mouse:

• with cursor at TOP of screen, the movie runs FORWARD;

• with cursor in BOTTOM, the movie runs BACKWARDS;

• with cursor to LEFT of screen, a link is made to either the Moving Menu (fast speed) or the micro-doco (normal speed); by default, at the end of a micro-doco, the next micro-doc will play. (In this way the entire collection will keep playing).

• with cursor to RIGHT of screen, a link is made to the next micro-doco on the Menu, when either the Menu or the micro-doco is running.

• when the cursor is in the centre of the screen - mouse gesture or spacebar - the movies will stop, until an Arrow key or the mouse is activated.

ESC key to Exit.

NB This is a thesis only version with fixed 25fps and image size reduced. The Menu soundtrack has been attenuated.

Mnemovie LINE Test Model.

To prepare for use, copy the whole of folder 02bLine onto the desktop of your Macintosh computer. Ensure the MOVIES folder is one of the five items present (by dragging and dropping from 02a or 02c if necessary).

For interactive guidance, follow the brief notes below, or use the instructions contained in the thesis (see also PDFs in the MORE folder, 08 Appendices 8.24-29).

To launch, double click the Mnemovie application file.

Navigate using Arrow keys or Mouse:

• with cursor at TOP of screen, the movie runs FORWARD;

• with cursor in BOTTOM, the movie runs turns the viewpoint through 180 ˚ and returns Back along the same route; OR runs the micro-doc movie Backwards.

With cursor to LEFT of screen, a link is made to one of the twelve micro-doc movies, according to where it is located in the landscape – each section of 'the walk' is linked to a different movie. Using the Left Arrow again returns you to the walk.

With cursor to RIGHT of screen, a link is made to the next location (when on the walk) or the next movie, (when listening and watching to one of the micro-doc speakers).

•When the cursor is in the centre of the screen - mouse gesture or spacebar - the movies will stop, until an Arrow key or the mouse is activated.

ESC key to Exit.

NB This is a thesis only version with fixed 25fps and image size reduced.

Mnemovie GRID Test Model.

To prepare for use, copy the whole of folder 02bLine onto the desktop of your Macintosh computer. Ensure the MOVIES folder is one of the five items present (by dragging and dropping from 02a or 02b if necessary).

For interactive guidance, follow the brief notes below, or use the instructions contained in the thesis (see also PDFs in the MORE folder, 08 Appendices 8.24-29).

To launch, double click the Mnemovie application file.

Navigate using Arrow keys or Mouse:

• with cursor at TOP of screen, the movie runs FORWARD;

• with cursor in BOTTOM, the movie runs turns the viewpoint through 180 ˚ and returns Back along the same route; OR runs the micro-doc movie Backwards.

With cursor to LEFT of screen, a link is made with two outcomes: when immediately adjacent to a street turning, the Arrow key on that side will turn you into that street. When NOT immediately adjacent to a street turning, either Arrow will link to one of the twelve movies, according to where it is located within 'the grid'.

THEN: with cursor to LEFT of screen, returns to the walk. With cursor to RIGHT of screen, links to the next movie.

• when the cursor is in the centre of the screen - mouse gesture or spacebar - the movies will stop, until an Arrow key or the mouse is activated.

ESC key to Exit.

NB This is a thesis only version with fixed 25fps and image size
reduced.

8.42. Notes to the Appendices

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i CBVR can also mean Context-based Video Retrieval.

ii "The on-line video server is composed of our speech-based search and retrieval system, a multimedia streaming server (Real Networks, IBM's VideoCharger and/or Apple's Quicktime), and query processing and a process that compose and deliver the retrieved results back to the user. The search and browse system includes an Internet-based Graphical User Interface (GUI) that can be run by any browser, on different platforms, using standard plug-ins. The GUI includes a text query box and associated advanced searching options, and allows easy navigation between the different views that blend together into an advanced video browser. … The results further show that there is no difference between speed assessment of video, MSB and audio only. This means that in many cases of remote education we can replace the video with a moving storyboard, which is much smaller in size and can be streamed across low bandwidth networks. … The results also vary between people. Among the 24 subjects we have some prefer to watch the full video, some prefer to watch the MSB, and others prefer audio only. The main lesson from this diversity in preferences is not to "optimise" the system for an "average" user, but to leave him/her to decide which media and what speed to use for a given task."AMIR, A. P., D. BLANCHARD, B. PETKOVIC, D. SRINIVASAN, S. COHEN G. (2000.) Using Audio Time Scale Modification for Video Browsing,. *Proceedings of the 33rd Hawaii International Conference on System Sciences.*

iii Originally the Motion Picture EDITORS Group before Experts emerged from the woodwork.

iv MPEG1 was the first standard and used in the production of VideoCDs (layer 3 becoming .mp3 audio files), MPEG2 in the production of DVDs and digital television. MPEG4 was an upgrade of 1, with MPEG4 version 10 becoming known as H264, a highly efficient Internet streaming standard. All of these standards required the user of the compressed video file to devise their own system for the naming, storage and retrieval of the file. Most used some form of database established as an application separate from the movie collection requiring manual keying of data about the data.

v The academic, Sadie Plant has observed that tactility is very closely related to the word 'contact'. "The computer itself for example is in a sense a 'touching machine' in as much as it is simply composed of contacts or switches, continual contacts being made and broken. … So the computer itself functions as a complex, tactile system." (Plant 1996). This echoes similar comments made by the Australian artist and interactive pioneer, Linda Dement.

vi James Turrell (USA b.1943) work was seen in the exhibition "Space Odysseys – sensation and immersion', curator Victoria Lynn, Art Gallery of NSW 2001.

vii Written from notes made by the author following a visit to the exhibition.

viii The *EMMA* project involved a series of experiments synthesising emotional states by means of 'mood devices', employing a range of approaches and technologies. Outcomes go beyond measurement of emotional states to be able to "reach a higher number of people suffering from psychological problems." ALCANIZ, M. B., R. BOTELLA, C. REY, B. (2003) The EMMA Project: Emotions as a Determinant of Presence. *PsychNology Journal,* 1.

ix Roya Jakoby, a visual artist, in discussing with others the word 'aura' describes it thus: "..maybe it's better to call aura the atmosphere or presence of something ….. You know it when you see it/experience it. Sure, there is also the physicality aspect of all things, but that alone doesn't create a strong presence. It is an emotional, somewhat transcendent quality inherent in a being, an object, a piece of art (no matter what medium). Some people call it also the energy of something or *charisma*. Digital artefacts have of course presence. Some have more of it, some have less. There are various parameters that determine such a presence, or the lack of it" (Jacoby 2003). This discussion doesn't go on to explore these parameters in the way that various researchers have actively pursued the topic in a telematic context.

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