Liquid Sensations: Evoking sensory experiences with interactive video installation art

by
Robin Petterd BFA(Hons)

Submitted in the fulfillment of the
requirements for the degree of
Doctor of Philosophy

Signed statement of originality

This Thesis contains no material which has been accepted for a degree or diploma by the University or any other institution. To the best of my knowledge and belief, it incorporates no material previously published or written by another person except where due acknowledgement is made in the text.

Robin Petterd

Signed statement of authority of access to copying

This Thesis may be made available for loan and limited copying in accordance with the Copyright Act 1968.

Robin Petterd

Abstract

This project has developed methodologies for evoking sensations using interactive video installation art. The research has resulted in three interrelated video installations about the experiences of entering the sea, shallow breath diving and floating under the surface of the water.

The installations have been developed through studio-based methods by a solo artist working on all aspects of the process. The project's methods have been focused on the imagery and sounds and the placement of these elements in the gallery, the development of a system where interaction is an integral part of the viewer's engagement with the works.

The exegesis and accompanying CD-rom summarise this process.

The physical sensations associated with water were chosen because they are immersive experiences that have a personal resonance for the investigator. Suggesting the sensory experience of submersion in water has many challenges. Interactive video installations can meet some of the these challenges.

Our bodies are more than ninety percent water; we wash in it; we play in it; we need it to survive. While our bodies are mostly water, it is an environment with which we have an uneasy physical relationship as there is always the risk of drowning. Humans find pleasure in this struggle with an alien

environment. The contrasting aspects of the experience are what this project seeks to suggest.

This project is part of the tradition of depicting water in the history of visual arts. Other contemporary artists use water as part of their practice. The exegesis examines some of these contemporary artists' works and related practices with time-based media that have informed the studio-based experiments.

New technology offers unprecedented means of making art. Technological development has been rapid and there exists a gap between the pioneering use of new technology and later detailed exploration. This has created a need for research to be undertaken. The approach this project has taken is to apply the well-tried technologies of interactive video and to explore the application of those technologies and related methods in detail. This has resulted in an exhibition of works that contribute to the area of interactive video installation art as a medium to evoke sensory experiences. The contribution this project has made is to create experiential art that evokes sensory experiences related to being in aquatic environments. It has enhanced the viewer's engagement with the works by using unobtrusive sensing and temporal sampling techniques and has developed methodologies for producing interactive video installations to evoke sensations.

Acknowledgements

A very special thank you to my supervisor Geoff Parr, associate supervisor Bill Hart for all their help and advice and to Kirsty Sharp for her support and assistance. Also thank you to Janice Bird and Andrea Sharp for their assistance with editing and proofreading and Ross and Anita Petterd for assistance with installation of the works.

Contents

Part One: The Central Argument

Liquid Sensations has investigated the use of interactive video installations to evoke the corporeal sensations related to being submerged in the water. This has been a studio-based research investigation that has resulted in three video installations for viewing in an art gallery. The research contributes to the area of interactive video installation art as a medium to evoke sensory experiences.

The primary reason I work with technology is not an interest in the process or possibilities it offers, but rather a curiosity about the final results that arise from applying this technology. Media technologies can create multi-sensory, dynamic, immersive environments that are radically different to what can be produced with other mediums of art-making[1]. Erik Davis when writing about materials being manipulated when using media technologies states:

---

[1] Before starting this research my recent commissions had included community arts and multimedia work as part of a collaborative theatre production. During the previous five years, my practice had evolved around the possibilities of new media and the effects that these have on our understanding of the world. During the mid 1990s I had started to work with low end virtual reality systems. The last work in this series was *Clouds Of* (http://www.otheredge.com.au/prj/cloudsof). As a reaction to the degree of technical complexity involved in this last virtual reality work, I developed the simpler web-based project *Archiving Imagination*. *Archiving Imagination* is an array of online projects exploring the process of collaboration between myself and writer/web-author Diane Caney. It is an assemblage of video segments, sound, images and words, all of which are traces of the boundaries operating across word-image interactions (http://www.archiving.com.au/). The intent in my past works has always been to create immersive sensory experiences, by subtle means. In the virtual reality work this was literal, in the web-based work it was attempted by constructing poetic works where the whole was greater than the sum of the parts.

> So as we survey the expanding and converging landscape of electronic, virtual and immersive production, we might ask ourselves: what material is being worked here? Is it simply new organisations of photons, sounds waves and haptic cues? Or does the "holistic" fusion of different media and the construction of more immersive technologies actually suggest another, perhaps more fundamental material? I'd wager that the new material is indeed rather fundamental: human experience itself.[2]

Davis goes on to say that the human experience is a 'vague and loaded concept' and he defines it 'as the phenomenal unfolding of awareness in real-time'. Davis is not alone in highlighting this aspect of media technologies[3].

There is a growing awareness of the experiential nature of media technologies. An artist working in this way does not manipulate experience, the experience exists in the mind of the viewer. An artist works with the elements the viewer sees, hears, feels, touches and manipulates. The sum of these elements evokes and suggests experiences for the viewer. The approach

---

[2]Davis, Erik, 'Experience Design.' *Archadia: Writing on Theology and Technology*, Samara Mitchell, ed., Australian Network for Art and Technology, Adelaide, 2001, p 27.

[3] Vibeke Sorenson and Mark Beam call it sensual media in the abstract of *From Rich Media to the Sensorium: How to Understand Pervasive Computing*. They see sensual media partly as a development out 'of the dream of technologists and science fiction writers' for environments 'that closely resemble physical experiences'. They define sensual media as

> a means of interacting with information through the use of and interconnection between many senses, the extension of the human body across time and space, and the new communication structures and processes that arise from the use of digital technology (available online at : http://www.store.yahoo.com/creativedisturbance/fromricmedto.html).

Joseph Pine and James Gilmore in *The Experience Economy* call experience the 'fourth economic offering'. They state 'offering of experiences occurs whenever a company intentionally uses services as the stage and goods as props to engage an individual'. Nathan Shedroff in *Information Interaction Design: A Unified Field of Design* and later in his book *Experience Design* uses the term 'experience design' in terms of multimedia design.

Liquid Sensations has taken is to work with elements of an environment, aiming to evoke felt sensory corporeal experiences for the viewer.

The chosen medium for this project is interactive video installed in the neutral space of an art gallery. Video is able to evoke the transitory, dynamic nature of sensory experiences. It has been installed in a gallery and used to surround the viewer visually and aurally. Interactivity is applied to increase the viewer's engagement with the work.

Bill Viola when writing about the nature of the moving image in his article *Video Black – The Morality of the Image* says 'the entire phenomenon began to resemble less the material objects depicted and more the process of the mind that was moving them.'[4] For Viola the moving image becomes less about representation and instead is a medium that, through its temporal qualities, has a connection to human consciousness and perceptual experience. Sensory experiences are perceptual, subjective and of the mind; video is an effective medium for suggesting these experiences.

Video is not just a visual medium, it has both visual and aural elements. Sean Cubitt when discussing sound design for the moving image states 'Sound is

---

[4]Viola, Bill, *Reasons for Knocking at an Empty House: Writings 1973-1994*, MIT Press, Cambridge, 1995, p 204.

physical: it can only be heard. It occupies, and in occupying it creates spaces.'[5] Later he goes on to say 'skin produces and receives sound; it is the intimacy of body on body.'[6] Hearing is a tactile sense and sounds are spatial. This means sound is a potent medium to evoke the experience of environments that have physical qualities.

Digital media technology means the process of producing and post-producing high quality video and sound is faster, simpler and cheaper. Time-based media become highly malleable, they can be layered, manipulated and highly controlled. They are not technically difficult to work with which means the focus can be concentrated on how they are being applied. I have used these possibilities in *Liquid Sensations* to be able to rapidly process and rework the recorded media so that they are manipulated to give an impression of the environment being evoked.

The viewers are not totally immersed in the media spaces created in *Liquid Sensations,* instead they are surrounded by the media. They are able to move around the spaces and look at the media from multiple viewpoints and they remain conscious of being in a gallery. *Liquid Sensations* does not attempt to totally transpose the perceptual experience of the viewer to

---

[5]Cubitt, Sean, 'Footprints in the Air: Mechanical Perception, the Media Arts, Diaspora and Sound', *Art & Design,* 11.7–8 (1996), 72–9, p 74.
[6]Ibid., p 78.

another location in the way technologies such as virtual reality do. Mine is an approach that accepts that humans are spatial and physical beings. The technologies of multi-channel video projection and stereo sound are a viable means for artists to be able to surround the viewer.

Interactive video is not a new area: during the 1980s it was pioneered by artists using computer-controlled video laser discs. Newer digital video technology allows for more flexibility and a greater level of control over the video segments. Interactive video helps to break video out of being a linear narrative medium, into being a spatial and active medium. It allows the media to change and vary depending on the viewer's responses and this creates an intimate level of engagement between the viewer and the works.

The sensations that have been chosen relate to being in and near the water because they can provide a corporeal experience that has a personal resonance for me and are difficult to evoke in a medium that does not involve multiple senses. Immersion in water is where I escape to find solace. This may be in, near or on the water; lap swimming or snorkelling, walking on the beach or sailing[7]. Roger Deakin writes of swimming:

---

[7] One of my first video works as an undergraduate student included images of water. These images and sounds have been an important element of my art practice since that time.

> You see and experience things when you're swimming in a way that is completely different from any other. You are in nature, part and parcel of it, in a far more complete and intense way than on dry land and your sense of the present is overwhelming[8].

When entering water the body seems to meld into the substance surrounding it. 'When you swim, you feel your body for what it mostly is, water' and your body 'begins to move with the water around it'. Swimming is not an activity where the surroundings disappear, it is an activity where the environment is the focus, the corporeal sensations of it all-encompassing. It is also an environment in which swimmers are isolated and alone. They are unable to communicate normally and are separated from people outside the water and other swimmers in the water. They alone must act and move to survive. Charles Sprawson in his book *Haunts of the Black Masseur: The Swimmer as Hero* suggests of a swimmer that 'so intense and concentrated are his conditions that he becomes prey to delusions and neuroses beyond the experiences of other athletes'[9].

Human bodies are mainly water, but are not ideally adapted to aquatic environments; there is a constant risk of drowning. We have an uncertain connection with submersion in water. Even for all my preoccupation with and pleasure derived from being

---

[8] Deakin, Roger, *Waterlog: a Swimmer's Journey through Britain*, Vintage, London, 2000, p 4.

[9] Sprawson, Charles, *Haunts of the Black Masseur: The Swimmer as Hero*, U of Minnesota Press, Minneapolis, 1992, p 7.

in, near or on the water, it is an environment in which I am always conscious of the inherent danger. Submersion in water is a strong bodily sensation and man's lack of adjustment to it can generate unusual states of mind[10]. These feelings are almost beyond language and exist in their own perceptual category. This odd unsettling experience is difficult to suggest with media that is not transitory, that does not surround and interact with the viewer.

Human bodily encounters with the aquatic world are broad-ranging and involve all five senses. Water has many associations and metaphorical meanings including its use as a medium of healing and our growing concern about humankind's impact on the natural environment. It creates tactile feelings of cold or warmth on our skin. It has a density and weight and has its own fragrance. The movement of water generates sounds; when submerged in it our hearing is

---

[10] Is this uncertainty a manifestation of the sublime? Jonathan Raban in *The Oxford Book of the Sea* quotes Edmund Burke's definition of the sublime from *On the Sublime and Beautiful*

> Whatever is fitted in any sort to excite the ideas of pain and danger, this it to say, whatever is in any sort of terrible, or is conversant about terrible objects, or operates in a manner analogous to terror, is a source of the *sublime;* that is, it is productive of the strongest emotion which the mind is capable of feeling. I say the strongest emotion, because I am satisfied the ideas of pain are much more powerful that those which enter on the part of pleasure. (p 8)

Raban states this definition evokes the 'tactility involved in the power of the ocean'. The sublime is an extreme state and this idea has influenced many artists and writers over time. Particularly in Burke's writing the term *sublime* has been applied to any endeavour attempting to find an extreme state. There are many experiences of the ocean and water in which these types of experiences might be found. As we start to understand the natural world by scientific and technical means the natural environment may no longer hold this same fear and danger. What this project seeks to evoke is an unusual state of physical experience related to being in the water. These are not the extreme mental states of fear and danger that Burke defines as the sublime.

altered. Water can be encountered in many varied forms and places including showers, baths, swimming pools, the sea, rivers and lakes and each of these can induce different sensory responses.

Liquid Sensations specifically deals with the sensations that are related to entering the water from the sea shore, shallow breath diving and floating under the surface of the water. The location is the sea because it has its own distinct range of sounds and imagery and is relatively untouched by human influence compared to aquatic environments such as swimming pools. This project concentrates on these bodily responses as first person subjective experiences and draws on personal experiences of aquatic environments throughout my life.

Liquid Sensations has been a studio-based project where I have worked on all aspects of the project. This is a different method from a project-based production methodology in which an idea is outlined, planned, developed and then implemented by a team of experts working collaboratively[11].

The studio-based methods used have included:

- a personal journal to track progress and to reflect on the process

[11] The interdisciplinary nature of art-making involving technology often demands a type of project-based collaborative work group.

- regular setting up and testing of the installations[12]
- video documentation of the outcomes at each stage

A parallel to this ‘hands-on’ method has been a focus on the viewing and studying first hand of other artists’ works. Working with new media technologies is an interdisciplinary activity, which can make issues of context complex, because influences and areas of interest are diverse. The field for this research is contemporary arts. This project has not developed new technologies or explored the effects new technology has on society and has not proven nor shown theoretical and technological possibilities. The research has focused on the challenges that develop from applying interactive video installations to the creation of evocative experiences.

The context for the research has been other artists’ practices that evoke experiences related to submersion in water and some related artists who have used video installation. Within the wider field of contemporary arts, there are artists who attempt to suggest some of the unsettling corporeal experiences of aquatic environments. One approach is to depict people involved in the aquatic environment. Other projects

[12] The media and scripts were developed in a computer laboratory situation and then refined while the works were in situ. The viewers that tested installations were largely other research students and academic staff. Where possible an ‘episodic first person narrative’ was used where viewers or myself would talk through their experience of the piece.

have used the sensual properties as a starting point for the interface for virtual reality works and for hybrid media and built environments. Video technology has been applied by other artists as a means to surround the viewer and interactivity used to add new levels of engagement to the viewer's experience of art. Progressively, technologies are being seen as a way to construct experiential art. These relevant art practices are discussed further in **Part Three: Related Art Practices**.

'Technical risk' is the term used to describe research fields which investigate novel applications of existing technologies. This project required alternative uses of much the technology involved. This aspect of the technical risk research is discussed in **Part Four: How the Project was Pursued** and in the details of the final solutions are provided in **Appendix Two and Three.**

During the evolution of this project the installations were constantly refined and reworked. My research evolved from seeing the potential for specific technologies, to an understanding of the types of experiences that the technologies help to produce. The case study focuses on the corporeal sensations that relate to the activity of being submerged in the water. The installations that have developed out of my research project are:

- *Wake*, which evokes the sensations of water wrapping around the body that occur when entering the water from a beach and the relative calm once past the surf.
- *Dropping*, which evokes the sensory experiences of shallow breath diving, which are to descend under the water, to experience a slowing down and then to surface again for air.
- *Under*, which suggests the bodily feelings of breathing out while looking up to the surface from under the water.

These installations are described in detail in **Part Two: A Description of the Works**.

During the development of these installations a number of challenges needed to be resolved. I have divided these challenges into three interrelated research questions:

- How can video installations be used to evoke sensory experience?
- How can unobtrusive interactivity be used to enhance the viewer's engagement with the works?
- What are the methods for a solo artist to develop interactive video installations?

The contribution *Liquid Sensations* makes to the field of interactive video installation art, as a medium to evoke experience, encompasses both the documented methodologies and the outcomes.

The Research Questions

How can video installations be used to evoke sensory experience?

The moving image is linked to both cinema and narrative. Two components of the cinematic experience are the emotive and corporeal effects of imagery and sound. Many cinematic devices exist for evoking emotional and physical responses related to narrative, but this project does not utilise narrative; it is instead an exploration specifically of the sensory realm. This leads to the question of how a medium based on recording and that is most often used to create a narrative can be utilised to go beyond the representation of an environment and, instead, be applied to evoking the physical feelings of being in that environment.

This project achieves the following:

- By using imagery and sound, it has suggested what the viewer might see and hear when immersed in the water. Subjective first person viewpoints of being hit by a wave, diving under the water and looking up at the surface of the water have been used.
- By digitally manipulating the imagery and sounds recorded from in, near and above the water the works have not just represented the aquatic environment. The media have been manipulated

through processes such as changes to the tonality and colours of the imagery, the pitch of the sounds and layering of these sounds and imagery. These manipulations mean that the recorded sounds and imagery suggest a bodily experience of the water.

- By using video projection and how the images have been positioned in the gallery, the bodily nature of submersion in water has been heightened. This has been accomplished by the use of projections that are not related to a cinematic style of viewing an image. The imagery has been placed on the floor or ceiling or is hanging in mid-air.

How can unobtrusive interactivity be used to enhance the viewer's engagement with the works?

In art the introduction of active interaction in the process of viewing artworks by utilising technology has been emerging for over thirty years. Interactivity can create another layer of dynamic engagement with artworks. The challenge with applying interactivity to create environments that aim to evoke sensual responses is the need for conscious interaction and any interface to be intuitive. Interfaces where the viewer uses gestures, touches or manipulates objects would reduce the seamless effect of installations in the context of a gallery. In order to interact with works that use this type of interface the viewer has to learn or modify their behaviour. What viewers commonly

do in a gallery is walk around, look, pause and then move again. These assumptions are based on my personal experience with other interactive works and observations of other viewers interacting with works. When in the water our connection with it is seamless; the way we interact with water is an integral component of submersion. Actions have an effect on our sensory perception of the environment. When dealing with the sensory feelings of submersion in water, the focus needs to be on actions in the environment that have a meaningful relationship to the activities of pausing and moving.

The following solutions were developed:

- The reactions of the installation are based on movement and stillness in the room, which is usually part of encountering an art work in a gallery. To be submerged in water is to move through the water. The activities of pausing in the surf, diving down under the water and breathing out are linked to the viewer's actions of moving or being still. These simple intuitive interactions are part of an encounter with the installation and add to the immersive intent of these works.
- A control system that takes into account how long a viewer has been moving or for how long they have been still was developed. The system then decides if a viewer's actions are unusual based on probability data. This system develops a memory

and understanding of past and present activity levels in the gallery. The media played reflect these levels of activity. The amount of movement in an aquatic environment affects the related experiences. In the case of *Wake* the waves that hit when the level of activity is less than normal are harder and when the level of activity is more than normal the images are softer. This reflects the experience where if swimmers stand still in the surf they are pushed over, but if they move and try to find a balance with the energy of the wave the experience of the environment is less turbulent. This technique of temporal interactivity increases the viewer's level of engagement with the work through an unobtrusive method.

- The project has resulted in three installations, each of which explores a different sensory aspect of submersion in water. The works have been orchestrated together using sound. The overlapping of the sound has been considered and the underwater sounds are controlled by a system that reacts to the current activity level in all three installations. This adds a layer of integration between all the works, creating an interrelated environment where the viewer has a subtle effect on all of the works and there exist multiple levels of connection between the works.

What are the methods for a solo artist to develop interactive video installations?

To construct these interactive video installation a number of different fields of specialised knowledge needed to be accessed. These include video and audio production; computer programming; electronics; architecture and audio visual installation. But within these areas there does not exist a methodology that could be applied successfully to the specific problems of how to develop interactive video installations. Out of this research project a production flow has been designed (see **Appendix One** for a detailed outline of this process). The final interrelated, holistic methodologies involve:

1. **Planning**
    - balancing of: technology available; expertise with that technology; and the exhibition space;
    - sensory experience to be evoked and the installation space; and actions that are involved and what interaction may evolve out of these actions.
2. **Prototype development**
    - recording and manipulation of media;
    - development of software;
    - 3D models and sketches of the gallery.
3. **Testing**
    - set up in a room or gallery;
    - attaining viewer feedback.

4. **Refinement**
    - looking at ways of working on only one aspect of the work;
    - re-recording of media.
5. **Completion**
    - The intended sensory experience may have been evoked or another experience may have arisen: if the latter is the case, Stage 1 needs to be revised.

The technologies used in the installations are relatively simple. The works have been developed using commonly available multimedia software (see **Appendix Two** for an outline of the final technical methodologies). Recorded video and sound have been manipulated and processed digitally as this allows detailed attention to be applied to the imagery and sounds and for them to be manipulated with a high degree of accuracy and control. The hardware, display technology and sound playback systems that have been used are becoming more prevalent and are relatively accessible compared to developing custom hardware. The cost of the technology employed is relatively low compared to many of the other solutions used to develop immersive environments.

The significance of the outcomes

Liquid Sensations is an exhibition of works that contributes to the area of interactive video installation art as a medium to evoke sensory experiences. The

use of technology is a developing area and one way in which this medium is being employed by artists and designers is to suggest experiences. *Liquid Sensations* has focused on suggesting elements of an environment. A series of experiential artworks that evoke sensory experiences related to being in aquatic environments has been developed. A number of the techniques and processes that have been used and developed in these artworks could be applied to evoke sensory experiences connected with other environments.

These techniques and processes include:

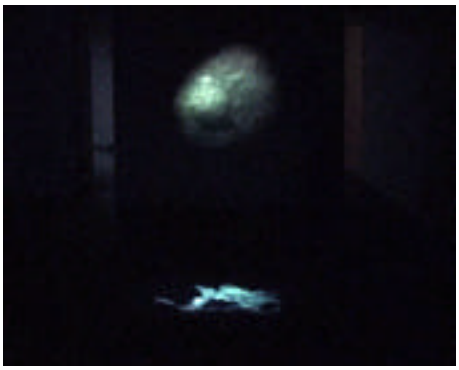
- The digital manipulation of the imagery and sounds so that they become evocative and suggestive;
- The use of imagery recorded from a first person viewpoint, rather than imagery of people experiencing an environment;
- How imagery and sounds have been positioned in a gallery to increase the sensory effect for the viewer;
- The use of seamless, indirect, physical interactions where moving and being still are part of the interaction;
- The integration of the viewer's engagement based on a system using temporal sampling techniques where the temporal aspects are an important facet of the interaction with it;

- The co-ordination of multiple works by sound and a network-based system for message passing where multiple installations are placed in a gallery;
- Using the process outlined in **Appendix One: The methodologies of interactive video installation** to develop interactive installations; and
- The use of commonly accessible technologies to develop multi-sensory environments.

If technologies are being utilised to create evocative experiences then ways to suggest, construct and apply these technologies need to be developed. *Liquid Sensations* has made a contribution to this understanding of how to evoke sensory experiences by developing new methods to suggest elements of an environment.

Part Two: A Description of the Works

The exhibition that has resulted from the investigation consists of three interactive video installations.



1. Robin Petterd, *Wake*, 2002, interactive video installation, dimensions variable.

Wake is the first installation the viewer encounters in the gallery; it seeks to evoke the sensations of water wrapping around the body that occur when entering the water from a beach and the relative calm once past the surf. Stopping and pausing in the surf causes swimmers to lose their balance with the environment. The force of the wave can push them under the water, or it can cause them to stumble. The surf swimmer needs to find balance with the energy of the waves breaking, to dive under the waves or swim against them. The sensation that *Wake* evokes is the opposite to surfing a wave and being in tune with the momentum of the sea.

In the gallery there is an image projected down onto a bed of sand and an image on the wall. When there is movement in the gallery the imagery on the floor

projection is of waves rolling to the shore, with accompanying sounds. When the system senses that the movement has ceased, an image of a wave breaking appears on a wall of the gallery and the sound of a wave envelops and fills the space. If there is a continual lack of movement, the image on the floor becomes a quiet, soft blue blurred image and the wall image disappears.

When the system[13] senses that recent activity in the gallery has been more than the historical average, the waves that appear on the wall are softer. In the opposite case, the waves that appear on the wall are harder. The less a viewer moves, the fiercer the wave; the more the viewer walks around the installation, the more softly the wave breaks.

2. Robin Petterd, *Dropping*, 2002, interactive video installation, dimensions variable.

Dropping is contained in a small space, in which two rear projection screens float. On these screens are

[13] This is explained in further detail in **Appendix Three**.

images of waves lapping as if the surface of the water was at the viewer's eye level. The light and colours from these screens reflect around the gallery. When the system senses that movement in the gallery has stopped, the viewpoint slips down beneath the water. Compared to the other imagery, these images are calm; the still green light of the imagery reflects around the walls of the gallery. By standing midway between the two screens a viewer can interrupt the beam from the projectors and become part of the images. When movement occurs again, the imagery erupts in a jolt as the viewer returns to the surface.

Dropping suggests the sensory experience of floating at the surface and then diving down to be fully submerged. Humans can react in the water like sea mammals such as whales, slowing down to a meditative state and using less oxygen. This allows some people to be able to dive to depths of more than fifty metres with only a lung full of air. The deaths and accidents that happen from this type of diving do not happen because of a lack of oxygen, rather on the way back up to the surface a diver can black out after a moment of ecstasy because of an excess of carbon dioxide in the blood. It is this physical reaction to submersion, of slowing down, and the contrast to floating on the surface and being pushed around by the water that is the focus of *Dropping*.

If recently sensed activity in the gallery indicates more movement than in the past, the descending sequence is only short and the imagery played is close to the surface while the viewer is still. If the system has sensed that the space is quiet compared to past events, the descent is longer and the footage played while the space is still comes from the bottom of the sea. The slower the movements of the viewer, the longer and deeper the descent is.

3. Robin Petterd, *Under*, 2002, interactive video installation, dimensions variable.

Under suggests the feelings and sensations that relate to looking up at the surface of the water while submerged beneath it. One of the most prominent aspects of this is an image of the bubbles ascending from breathing out. The work consists of a round image projected on a screen suspended from the ceiling. As the viewer is detected moving under the screen, a torrent of bubbles rising to the surface of the water erupts. Pausing causes the imagery to settle down to be a soft rippling image of the sky seen from under the water.

The bubbles are louder and longer if the sensed activity is greater than past detected events. When the sensed activity is less than that of past events the bubbles played are quiet and softer.

There are forty different sounds for the system to choose from when the space is still. These sounds are used by each of the installations. The number of sounds played, the panning of the sounds and the level of the sounds is controlled by a sine function and the average of the activity levels of all the installations.

Part Three: Related Art Practice

This section discusses a number of art practices related to this project. It focuses on works I have experienced first-hand[14]. These have been divided into four areas:

1) The tradition of evoking aquatic environments in the visual arts and its contemporary manifestations

M W Turner's painting *Snowstorm* is an example of the tradition of evoking the aquatic environment. The group show of *Sea Change* and photographs by Trent Parke and Narelle Autio are examples of the contemporary artists exploring experiences related to the sea.

2) Artists who have applied new technologies to exploring sensations relating to water

The two examples discussed here are the building *Water Pavilion* and Char Davies' virtual world *Osmose*.

3) Selected artists working with experiential video installations

In this section works by artists Bill Viola and Steina Vasulka are considered. The group show *Space*

[14] Over the period of this research project I have attempted to see first-hand as many interactive installation works as possible, with time spent at ZKM Center and Art and Media in Germany in 1998 and Siggraph in Los Angeles in 1999.

Odysseys: Sensation & Immersion curated by Victoria Lynn is discussed as an example of a group of works in which video installation, interactive technologies and evocation of sensual experiences meet.

4) Artists who use interactive video installation

David Rokeby's and Toni Dove's work with interactive video and motion sensing are discussed in this section.

1) The tradition of evoking aquatic environments in the visual arts and its contemporary manifestations

M W Turner – The tradition of evoking aquatic environments

4. M W Turner, *Snowstorm – Steam Boat off a Harbour's Mouth making Signals in Shallow Water, and going by the Lead*, 1842, oil on canvas, 91.5 x 122 cm.

M W Turner's painting *Snowstorm – Steam Boat off a Harbour's Mouth making Signals in Shallow Water, and going by the Lead* is one of the best known examples in the history of visual arts of a painting

representing an experience of the sea. The boat is nearly central in the painting, the steam from the boat merges into the sky and sea in atmospheric swirls of paint that have become known as ‘Turneresque’. The sky and sea merge together in a mass of grey-brown, thick paint. The boat is in a romantic pool of light from a gap in the storm clouds. The legend behind this painting is that, in the middle of the storm, Turner was on a fishing boat tied to the mast, half drowning but remaining at his post to continue his sketches. This is typical of Turner’s focus on his personal involvement in the drama he paints.[15]

The water Turner paints is ‘a sea of pure, unpent nature at its wildest and most magnificent’[16] that is larger than human scale. Turner illustrates the notion that humans need technology to overcome the violent environment that the sea can create[17], in Turners case this is steam. What Turner gives us is an impression of a boat in a storm and the atmosphere of that storm. He finds pleasure in the violence of the storm. Turner’s vision of the sea is a wide open space which during its violent moments surrounds him and dissolves the gaps between the sea and sky.

---

[15] Gage, John, *Turner: rain, steam and speed*, Penguin, London, 1972, p16.
[16] Raban, Johnathon, ed., *The Oxford Book of the Sea*, Oxford UP, Oxford,1992, p15.
[17] Gage, op cit.

Sea Change – the contemporary seascape

5. Stuart Klipper, *Southeastern Pacific Ocean, Southwest of Tierra del Feugo*, 1987, from Bearing South, 1987, incorporated colour coupler print, 30 x 95 cm.

Sea Change is a group show of seascape photography organised by the *Center for Creative Photography* at the University of Arizona, USA. My first reaction to this show was disappointment in the lack of variety and absence of the new. The works in the show seemed primarily concerned with horizons and were versions of well-worked themes. There was a problem with the venue[18]; the gallery was lined in dark wood panelling, in stark comparison to the minimalist, elegant nature of the show.

James Hamilton-Paterson in the show's catalogue essay 'The Cultural impact of Oceans'[19] points out that the seascape has had many different meanings over time. In the early eighteenth century the seas were viewed in religious terms, representing primordial chaos. Then, as our scientific understanding of the world developed, our perception

---

[18] During 1999 I saw *Sea Change* installed at the Museum of Photography in New York.
[19] Stack, Trudy Wilner, ed., *Sea Change: The Seascape in Contemporary Photography*, Center Creative Photography, n.p., 1999, p 9.

of the sea developed into a manifestation of the sublime. The view of the sea as a sensual element for him developed from medical theories that advocated sea bathing. Hamilton-Paterson states we have now mapped the depths of the sea, dive to its depths and freight travels across it without difficulty. He now sees our attitudes to the sea merging with other environmental concerns. He reads the images as humanity finally being able to see the sea simply and to understand its fragility. Although Hamilton-Paterson's discussion is elegant in terms of our relationship to the sea, I have trouble perceiving this fragility of the sea within the actual works in the shows.

Trudy Wilner Stacks in her catalogue essay for the show points out that the ocean covers seven-tenths of the world and that the seascape has become a tired, almost forgotten genre. Stacks states that the artists in the show 'do not have complex, theoretical underpinnings to their sea images' and that few of the artists can 'transform ocean waves and water substantially enough to markedly differentiate their sea imagery, from postcard to postmodern'[20].

[20] Ibid, p 15.

6. Michael O'Brien, *Untitled*, 1995 , incorporated colour coupler print, 117.5 x 75 cm.

The imagery in the show that breaks the format of horizon, that starts to express the motion of the sea is the imagery relevant to my project. Works such as Michael O'Brien's *Untitled 1995* capture the dynamic moment before a wave breaks and crashes. The strong diagonal line conveys the immense power and strength that the surf can have. At the same time it anticipates *the feeling of being 'cleaned out' by a collision with the force of a breaking wave.

The Seventh Wave – bodies in water

7. Trent Parke, *Untitled*, 1999, gelatin silver photograph, 24 x 36 cm.

The photographs of Trent Parke and Narelle Autio from their series, *The Seventh Wave*, are grainy black and white images, taken from underwater and just

near the water's surface. These images capture a moment of eerie calmness. The deathly yet serene facial expressions on the figures' faces are striking. There are momentary traces of movement, bubbles and bodies swirling in the weightless environment. The people float and move as if the surrounding water has trapped them. At the same time there is pleasure in the faces showing balance or an absence of fear of the surf, just the delight in diving down under a wave and waiting.

One of the pronounced aspects of Parke and Autio's[21] photographs is the populated nature of them. Never in my personal experience of a beach had I been in the water with so many people. In the synthetic environments of pools I have experienced crowds of people, but not in the surf. This is the opposite to Robert Drewe's first observation of the familiarity of the images in the catalogue essay.[22] The beach for Drewe is a place of people, a social place to parade, to see and to be seen.

Drewe sees in the people in the imagery 'the physical struggle against the elements, and the ambivalence to pleasure and pain. They also delight in dramatic moments'. Drewe states with some relish how in the surf 'each wave hurts, each one cuts like a whip'.[23] In

---

[21] Autio, Narelle and Trent Parke, *The Seventh Wave*, Hot Chilli Press, Kirribilli, 2000.
[22] Ibid, p 7.
[23] Ibid.

Parke and Autio's photographs these dramatic moments of struggle in the water are encapsulated.

2) Artists who have applied new technologies to exploring sensations relating to water

Water Pavilion – liquid building

Water Pavilion is a building installation designed jointly by architectural design firms NOX and Oosterhuis Associates which seeks to educate the visitors to the building about advances in interactive media and to celebrate the sensuous properties of water[24]. The Dutch Department of Roads and Waterways and the Ministry of Transport and Public Works commissioned the building. The building is a manifestation of Marcos Novak's theories of 'liquid architecture' that he coined while discussing cyberspace[25]. 'Liquid architecture' is 'the building conceived as a dynamic system within which there is a constant, computer-mediated interaction between users, environment and building.'[26] At the stage *Water Pavilion* was built, this mutability was achieved using media technology. Oosterhuis Associates' '*trans-ports'* for the 7th Venice Biennale International

---

[24] Van Cleef, Connie, 'Water Worlds: Design and Construction of an Exhibition Pavilion in Neeltje Jans, the Netherlands,' *The Architectural Review,* 204 (Dec 1998), 463.
[25] Novak, Marcos, 'Liquid Architectures in Cyberspace', *Cyberspace:First Steps*, Michael Benedikt, ed., MIT Press, Cambridge, 1991, 225-54.
[26] Schwartz, Ineke, *Testing Ground for Interactivity*, http://synworld.t0.or.at/level3/text_archive/testing_ground.htm, accessed on 2/8/2001.

Exhibition of Architecture in 2001 takes these concepts a step further in a work where the walls of the building are moved by pneumatic technology.[27]

The term ‘liquid’ to describe the capabilities of digital media is a term that encompasses many aspects of the digital environment. Liquid substances are changeable and exhibit complex behaviour. The applications of fluidity to the fixed built environment might seem practically impossible. Computers and digital methods have been adopted into the design process of the built environment. Liquid architecture goes a step further to the integration of the fluidity of computer processes to actual building structure. In *Water Pavilion* this creates a hybrid medium and built environment that is intelligent. In *trans-ports* this goes a step further where the actual physical structure of the building’s walls becomes malleable.

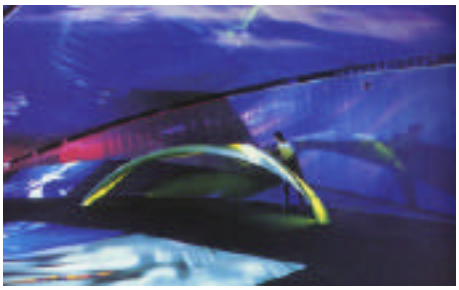
These descriptions of *Water Pavilion* are derived from other artists and designer’s writings, as I have not had first-hand experience of the pavilion. The building is divided into two halves. The freshwater pavilion was designed by Lars Spuybroek of NOX and the salt water pavilion by Kas Oosterhuis of Oosterhuis Associates. The building is about one hundred metres long and sits at the edge of a dam.

---

[27] Oosterhuis Associates, *trans-ports website*, http://www.trans-ports.com/trans-ports.html, accessed on 22/6/2001.

8. Lars Spuybroek, *Freshwater section of the Water Pavilion*, 1997.

A visitor enters the building through Spuybroek's freshwater sections. None of the floors and walls in this section of the building are straight; they bend and melt around each other. Mist sprays, streams of water fill the room and an electronic sound track plays in the background. The building reacts to the movement of people through it and this triggers changes in the media.



9. Kas Oosterhuis, *Saltwater section of the Water Pavilion*, 1997.

Oosterhuis' saltwater pavilion is smaller, the building is less deformed and more media-based. While Spuybroek's section of the building incorporates physical elements of water, Oosterhuis' section merges media and the building together. Visitors are able to navigate a 3D simulated environment designed

by Oosterhuis. This virtual world is integrated into the environment around it by a weather station that measures aspects such as the tide movement and wind gust speeds. Oosterhuis' section eventually leads out to the only window in the building, through which a vista of the dam can be seen.

This building is one of the first permanent large-scale interactive media environments where the built environment and media merge. The *Water Pavilion* has added to our understanding of how the sensory properties of water can be evoked. It is a major contribution to the field of architecture. The introduction of mutability into buildings is a fundamentally new development. While Novak maps this as a theoretical possibility, Spuybroek and Oosterhuis have developed this as part of their practice. Their investigation has arisen out of the possibilities of digital media. Spuybroek and Oosterhuis have both gone on to develop more 'liquid architectures' but not buildings that evoke aquatic environments. The focus of their works is on the possibilities that new technology creates.

Osmose – floating as interface

10. Char Davies, *Osmose immersant wearing interface vest*, 1995, virtual reality.

Osmose is an ambitious immersive virtual reality work developed by Char Davies between 1994 and 1995[28]. The installation consists of two spaces: one is a waiting area that includes a display showing what the current user is seeing; in the other space the user, or immersant[29] as the artist prefers to call them, engages with the work. The immersant wears a head-mounted display and two sensors: one to measure the angle of the back and the other to measure the breath of the immersant. The virtual world the immersant enters has twelve different areas that are chiefly based on metaphorical aspects of nature. At the time this work was developed, most virtual reality worlds were dominated by a strong horizon line and hard edges;

---

[28]Davies' practice first came to my attention when I was working with low end 3D systems. The simple, soft interface was the attraction. Later at Invenção (Invenção in Sau Paulo, Brazil was a conference that sought to examine the convergence of art, science and technology) during Niranjan Rajah's talk he showed video footage of an immersant's journey through the virtual world. I was struck by the images. During Alessio Cavallaro's *Immersive Condition* art forum at the School of Art (Hobart) in 2000 he presented a video documentation of the work. I heard of the linkage between the breath interface and Davies' experiences of scuba diving. This led to revisiting and reviewing details of her achievements.

[29] Davies, Char, and John Harrison, *Osmose: Towards Broadening the Aesthetics of Virtual Reality*, http://www.immersence.com/os_notes02.htm, accessed on 2/7/2001.

Osmose by contrast has few hard edges and no horizon line. The objects are highly textured and semi-translucent. The immersants move around the world by breath; as they breath in they rise or float, as they breathe out they sink down. After fifteen minutes the virtual world slowly recedes and the immersant's session with the work comes to an end.

12. Char Davies, *Tree Pond Red*, 1995, real-time frame capture from Osmose.

Davies' works create a soft, subtle, textured world, within which semi-transparent yet richly coloured objects exist, seemingly merging with their surrounds. The immersant is able to float through these objects. Prior to working with 3D graphics, Davies' background was as a painter. Her visual aesthetic is full of ambiguities and tends to be evocative. The sounds are highly manipulated samples of both female and male voices. Different melodies are attached to different parts of the virtual environments and are dependant on the immersant's past actions.

With the interface and interaction Davies and her team[30] had three concerns:

- ‘To facilitate an experience of “being in the world” rather than “doing.” That is, we wanted to encourage immersants to calm their minds and contemplate the virtual world – rather than rushing around grabbing or destroying things.’
- ‘We wanted to create a strong sense of full body immersion in a fully enveloping space. We wanted participants to feel centred in their physical bodies during immersion, in a way that is similar to the effect of practicing tai-chi or meditation.’
- ‘As well, we wanted to enable a sensation of floating - with emphasis on vertical movements rather than horizontal or frontal movements.’

As a result they developed an interface that focused on balance and breath. ‘This technique was inspired by Davies’ scuba diving experiences, by how members of the team moved in their dreams and by writings on the phenomenology of the body and various meditation traditions.’

This interface is radical: rather than a virtual experience where the user moves directly through a virtual world, the user enters a virtual world that has

[30] Georges Mauro created the models and animations in collaboration with Davies. The sounds were developed by Rick Bidlack and Dorota Blaszczak and John Harrison developed the custom software for the work.

an extremely physical and direct connection to the body's state. It creates an artwork where the viewer is led to concentrate on subtle bodily responses.

Davies when talking of *Osmose* quotes Gaston Bachelard from *The Poetics of Space* 'by changing space, by leaving the space of one's usual sensibilities, one enters into communication with a space that is psychically innovating. For we do not change place, we change our nature.' In *Osmose* Davies attempts to create mystical transcendental experience. She hopes that by the focus that *Osmose* has on the body, it will lead the immersant to new experiences of being in the world. Often when Davies writes about the work she includes information about viewer numbers and viewer responses. These responses have been profound emotional experiences, where the immersants feel part of the world and understand their position in the world in a new way.

While many artists working with technology open up new possibilities for ways of making art, few works go as far as *Osmose* at realising the potential of a medium. This may be because of Davies' past as a painter. Her masterly level of expertise with technology came from being Director of Visual Research at Softimage and having access to technologies that artists are rarely able to access, especially for developing large works. Davies sets high aims for her works. She does not go as far as to

call them mystical, although she is clearly in search of the transcendental. Many viewers do experience these states, however this could be to do with the shrine-like setting for the work and also the considerable amount of time spent concentrating on one artwork and focusing on breathing. To try and evoke the same type of response from each immersant can be seen as an almost impossible aim, as perhaps not all immersants will be interested in having these types of experience and will share Davies' own intense contact with nature.

3) Other artists working with experiential video installations

Bill Viola – transitory experiences

Bill Viola, along with Gary Hill, is one of few artists who the contemporary art world equates with video art. His work is seen as part of the second wave of video art after Nam June Paik and Bruce Nauman. A facet of the integration of new technology into art practice is the terminology that develops from this. Often works involving any form of technology are termed 'new media', while other organisations and critics make a distinction between terms such as screen media and video art[31]. Technology is one way

[31] Jennings, Pamela, *New Media Arts: New Funding Models*, 2000, The Rockefeller Foundation, http://www.digital-bauhaus.com/html/mediaArtReport/New_Media_Arts_New_Funding_Models.pdf, accessed on 5/1/2001.

in which new possibilities for art making can be discovered. Artists' use of technology can spark new applications and sometimes support the further development of that technology. Video art is one art form that was initially classified as 'new media' but has now been superseded by newer digital technologies, therefore it is no longer 'new media' in the classic sense of that term. Peter Lunenfeld in *Snap to grid: a user's guide to digital arts, media and cultures* sees this as a 'shift from the technology of production (video as art) to the overall concerns of reception (art as art).'[32] Viola's installations are exemplars of this change.

Viola's work has had a strong influence on my project. Discussed below are two of his works I viewed in the early stages of my research.

The Stopping Mind – paused time

All I wanted to do was to go home, I was suffering from a chronic lack of sleep after four hectic weeks in Lapland in the midnight sun, at Polar Circuit 2[33]. I had six hours in Frankfurt before the plane left so I headed to the Contemporary Art Museum. It was here that I experienced Bill Viola's *The Stopping Mind*.

---

[32] Lunenfeld, Peter, *Snap to Grid: A User's Guide to Digital Arts, Media and Cultures*, MIT Press, Cambridge, 2000, p 146.
[33] Polar Circuit is an event where a group of international new media artists and writers gather over a period of one month to work together.

13. Bill Viola, *The Stopping Mind*, 1991, multiple channel video installation, dimensions variable.

The Stopping Mind is installed in a large darkened room, with four large video screens. The room is quiet, the imagery is still. Then it hits, the crash, the explosion of movement and sound. The sound is one of the loudest that I have ever heard. The sounds rupture and the imagery plays again. The imagery is hard to define, blurred images of what could be a table set for dinner, everyday images. One thing I did not hear in the middle of the room was the voice chanting about 'the progressive loss of bodily sensation in an unknown black space.'[34]

After the crashing sounds the silent imagery returned. I prepared for the next time the roar would occur, knowing that would it come, thinking this time I would not jump, I would not let it throw me like that. Again the work erupted; I could not find a comfortable safe balance with the work. I became lost in its violence to time; I was lost in my own desire to

---

[34] Viola, Bill, *The Stopping Mind*, http://www.sfmoma.org/espace/viola/dhtml/content/viola_gallery/BV02.html, accessed on 19/7/2001.

know it and understand it. Afterwards I found out the abrupt changes in installation are triggered at random.

Viola's summary of the intent of the work is:

> The Stopping Mind is a video installation for projected images and sound based on the age-old human desire to stop time. It deals with the paradox of thought (memory) and experience—the underlying propensity of the mind to retain or arrest experience and the dynamic nature of both the experience and the perpetual movement of consciousness itself.[35]

Viola is in search of an experience of time that is transitory and ephemeral and that can only be manifested as video. Viola, as part of an interview for his retrospective at the San Francisco Museum of Modern Art in 1999, says that it is not just about time but also the process of 'waking'[36]. I interpret this as being the act of becoming aware. Time in *The Stopping Mind* is the fleeting moment, paused and controlled and at the same time chaotic and violent. In the history of video art, time is the one significant aspect of the medium that differentiates video from other media. Often the only way artists deal with time in video is through the use of slow motion, as a way of revealing the subtleties of its flow.[37] Viola has used slow motion in other works such as *The Greeting* and

---

[35] Viola, Bill, *Reasons for Knocking at an Empty House: Writings 1973-1994*, MIT Press, Cambridge, 1995, p 213.
[36] Viola, Bill, *Viola on Waking Up*, http://www.sfmoma.org/espace/viola/noqthtml/content/inter04i.html, accessed on 13/5/2001.
[37] Cappellazzo, Amy, Adriano Pedrosa and Peter Wollen, eds., *Making Time: Considering Time as a Material*, Palm Beach Institute of Contemporary Art, Lake Worth, 2002.

Passage. *The Stopping Mind* is not about the continuous flow of time. It is concerned with the interruption of time, which is closer to an experience of consciousness.

The power of the installation did not arise from the imagery but the sounds: the way in which the loudness penetrates the viewers' bodies, reaches out, touches us and shudders violently through the body. This is in contrast to the silence of the paused imagery. The installation of the imagery and sound affects the presence of the work, the imagery surrounds the viewer. In the space I felt small compared to the almost architectural scale of the images. For Viola:

> Installation is related to sculpture. Videotape's related to cinema. Installation's also related to architecture. It's also related to music, to acoustics and sound and music. And it's also related to the human body and the ability to perceive, because in my works, especially when a person comes inside, the person becomes part of the piece. They become included in the piece. It's like as if you could walk inside a painting, and go inside.[38]

Installation for Viola is another way to expand the work, to involve the viewer in the work at another level. The viewing of Viola's work becomes sensual and of the body. The works have an experiential effect and often explore mental states of mind that are

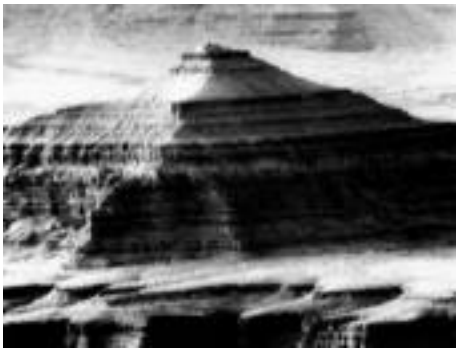
---

[38] Bill Viola, *The Relationship between Video and Installation*, Available: http://www.sfmoma.org/espace/viola/noqthtml/content/inter02.html, accessed on 13/5/2001.

triggered by bodily sensations or processes of life and the body.[39]

The Passing – Circular time

Recurring themes in Voila's works are of birth and death. *The Passing* explores the death of Viola's mother and the birth of his son, a circular temporal period of grief and joy. There are two moments that are still resonant for me: the desert images and the underwater imagery. Viola has often used imagery of figures floating in the water. As a child he nearly drowned and this traumatic experience is one he often refers to in his work.[40]



14. Bill Viola, *The Passing*, 1991, video-tape.

The Passing is a slow constantly moving contemplation of change. Objects floating weightlessly in pools and the stillness of a desert night give the video a feeling of slow change or flux, an

---

[39] Duncan, Michael, 'Bill Viola: Altered Perceptions.' *Art in America,* 3.3 (1998), 63–9.
[40] In Viola's installation *Five Angels for the Millennium 2001,* this experience is the central concern of the work. I have not seen this work so I have not chosen to discuss it. More information about it can be found online at http://www.bbc.co.uk/arts/news_comment/artistsinprofile/viola2.shtml

attempt to find a balance in time. The central figure is of a body in the water, which seems at the same time to be a state of being born and of dying. In searching for a balance, Viola attempts to find meaning in the death of his mother and the birth of his son, using primal elements in his work, and the traditional symbolism that relates to these elements. *The Passing* manages to go well beyond being a solely intellectual manipulation of these symbols. The work has a strong emotive impact. *The Passing* signifies a change in Viola's works. After this work he moved away from single channel video work to focus on installation.

Viola's work stands out amongst media arts and art that incorporates even basic technology, for its tangible and emotive impact. The linkages between his medium and content are multi-layered, as is the use of themes such as birth and death. These are all experiences that are primarily transitory and physical.

Viola is a master of the manipulation of video and its ability to evoke sensations. In his works the viewer often watches someone go through a highly personal and sometimes traumatic period. The viewer has an empathic reaction to the person in the middle of these activities. The power of the works arises from this empathy.

Viola has a long history of working with video. His control over the medium comes from a deep

understanding of the technology involved. He is able to work without technical assistance most of the time; one of his first jobs was as a technical assistant in Florence[41]. This command of detail allows for all aspects of a medium to be explored and exploited, it gives him the ability to transcend his medium.

Steina Vasulka – spaces of light

15. Steina Vasulka, *Borealis,* 1993, multiple channel video installation, dimensions variable.

Borealis is a three-channel video installation. In a darkened, black-painted room hang three translucent rear projection screens. The screens are slightly less than human scale[42]. The imagery on the screens is of streams, water and mist from Steina Vasulka's birthplace, Iceland. Over time the images are largely the same. The screens and multiple projections are arranged in a way to encourage the viewer to walk around the room and walk through the projections, becoming part of the projection surface. This creates the feeling of a cascading torrent of water, flowing in

---

[41] London, Barbara, *Bill Viola: Installations and Videotapes*, Museum of Modern Art, New York, 1987, p12.
[42] This description is based on the layout of the installation I saw at ZKM in Karlsruhe in 1998.

all directions, enveloping the viewer's body and filling the whole field of vision.

Steina Vasulka is one of the pioneers of video and she has often worked with her husband Woody Vasulka. *Borealis* was the first of her solo works that I had encountered.

Borealis surrounds the viewer in gray pools of light. The movement in the imagery flows in such a way as to dislocate the viewer, creating a liquid environment that does not wash away and heal. It suggests the harshness and contrasts of extreme places such as Iceland with a powerful immersive effect on the viewer. This was in contrast to many of the works I viewed while at ZKM which were immersive by using the technologies of virtual reality and simulation. With *Borealis* the technology is simple but still succeeds in immersing the viewer in a spatial mode. It shifts from watching an image, to being in and part of an environment. Video is not used to construct narrative, it is a way of activating a space. *Borealis* is not unique in this aspect.

Space Odysseys – journeys into space

Space Odysseys: Sensation & Immersion was curated by Victoria Lynn for the Art Gallery of New South

Wales[43] and will form part of The Australian Centre for the Moving Image's future program. The artists in the show are László Moholy-Nagy, Joyce Hinterding and David Haines, James Turrell, Lynette Wallworth, Bruce Nauman, Moriko Mori, Luc Corchesne and Gary Hill. To enter the show the viewer descended stairs past the quote 'don't try to understand – just believe' from Jean Cocteau's film *Orpheé*. Nearly all of the works were contained in separate rooms. Lynn says 'These are environments, chambers if you like, for the visitor to participate in an all encompassing aesthetic experience.'[44]

The first work the viewer encountered was Moholy-Nagy's *Lightplay Black White Grey*. This is an abstract film of the light and movement generated by Moholy-Nagy's kinetic work *Light Source Modulator*. The image was a pulsing field of flickering light. The next work was Joyce Hinterding and David Haines' *The Blinds and the Shutters.* This was in a stark, bright room. Each of the four walls were filled with large video projections and accompanied by a multi-channel sound track. The imagery was a weird fictional world where gravity was deformed. On one of the screens a modernist house floated in a landscape, with domestic objects

---

[43] I attended this show and the accompanying conference at the Art Gallery of New South Wales in August 2001. The speakers at the conference were Erik Davis, Victoria Lynn, Ann Finegan, Scott McQuire and Ross Gibson.

[44] Lynn, Victoria, ed., *Space Odysseys: Sensation & Immersion*, Art Gallery of New South Wales, Sydney, 2001, p17.

flying through the spaces under the control of the distorted system of gravity.

16. James Turrell, *Between that seen*, 1991, light, wood, paint, room, 3 x 8 x 12 m.

Entering Turrell's work *Between that seen* is an odd experience. The viewer perceives a blue-green square on the wall in a perfectly silent room. Moving around the space immerses the viewer in a field of blue-green light. Slowly it becomes evident that the field is not an image or a light on the wall, there is a opening in the wall to another space. Looking into this space it's impossible to see the edges of it. The viewer falls into a perplexing void of blue-green light that is a sensory experience that is not easy to understand.

Wallworth's installation *Hold Vessel #1* is an intimate work of distorted scale. It consists of three projections from the ceiling. The viewer holds a cup-like vessel in the beam of light from one of the projectors. This picks up the imagery of microscopic underwater creatures and imagery of outer space, places that cannot be seen by the naked eye. The effect of this is a

feeling of almost being able to hold and contain these unseen places.

Bruce Nauman's *Triangle Room* sits in the middle of a space that branches off to two of the other works. The outside of the *Triangle Room* is raw plywood. The space is entered through one of two low doors. The inside walls are painted in an unsettling red glossy paint and yellow lights sit above the doors. Peter Schjeldaja says that this 'room proves conclusively that it is impossible to stand anywhere in a triangular space without feeling cornered.'[45]

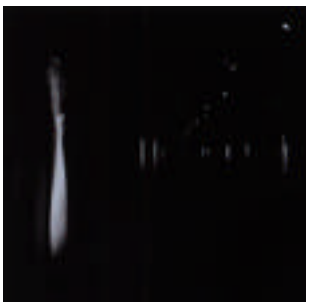
To enter Moriko Mori's work *Link,* viewers wait in a room: every ten minutes a group of people is ushered into a room defined by a wrap-around curved rear projection screen. The video played on the screen is documentation of Mori performances where she is encased in a bubble-like object, in public places around the world. The distance and differences between these places collapse as Mori's performance travels to different locations.

To experience Luc Corchesne's installation *The Visitor: Living by Number* viewers again have to wait. The viewer stands in the middle of an apparatus where a panoramic image is projected down onto a curved mirror that surrounds the viewer's field of vision.

---

[45] Quoted by Rhys Graham in Lynn, ed., *Space Odysseys: Sensation & Immersion,* p 49.

Numbers appear on the imagery and when a viewer says one of the numbers the video ‘navigates’ in the corresponding direction. The imagery is mostly of landscapes that Corchesne collected in Japan.



17. Gary Hill, *Tall Ships*, 1992, interactive video installation, 350 x 2073 x 610 cm.

Gary Hill’s work *Tall Ships* was installed in a darkened corridor that has fifteen projections on the walls. The images of people are soft and indistinct so that the figures seem to float in front of the viewer. The figures stare out into the corridor. As the viewer walks past, these figures walk towards the viewer. Encountering one of the figures is unsettling, their subtle movements seem to reflect movement and gestures of the viewers in the corridor. The sensors used are motion sensors that sense movement in the gallery as a binary event. The apparent reflexiveness of gestures is because the footage played is of people engaged in a similar act of looking. These simple methods result in an indirect non-verbal dialogue between the viewer and the figures in the work.

Lynn says in the catalogue ‘This exhibition offers the visitor a memorable and transformative experience, a

"space odyssey" of being immersed in the kinaesthetic, visual, aural and informational totality of the artworks.'[46] Lynn bases the title for the show on Stanley Kubrick and Arthur C. Clarke's film *2001: A Space Odyssey.* Steve Meacham likens the experience to a series of 'Dr Who's Tardis – a means of travelling through time and/or space'[47]. Lynn, when selecting the works, has not just curated a show about technologies and spaces, it is a show of works that are tactile and hard to comprehend intellectually. The resulting works are often beyond words and the felt experience is hard to articulate simply.

To move through the exhibition is to be challenged by the works. Lynn states 'To move in and through space, whether physically or virtually, is to take a journey. Even if that journey is revolving, dynamic, non-directional, it is composed of a set of experiences that will in some form affect the sensations of the person taking it'[48]. Shiralee Saul observes in her review, 'the viewer is forced to adjust themselves to the demands of the media'[49]. Most of the works do not adjust to the viewers, they demand the active participation of the viewer. Hill's work *Tall Ships* is

---

[46] Lynn, ed., op cit., p 17.
[47] Meacham, Steve, 'Imagination blasts off as artists find their personal space' *The Sydney Morning Herald,* 18/8/2001.
[48] Lynn, ed., op cit., p 11.
[49] Saul, Shiralee, *Round Trip Ticket*, http://www.abc.net.au/arts/digital/stories/s368114.htm, accessed on 1/10/2001.

different, the simple interaction is an element of viewing and engaging with the work.

4) Artists who use interactive video installation

David Rokeby – Reflecting Mirrors

David Rokeby is an artist, writer and technologist. This discussion focuses on his *Transforming Mirrors* essay and his recent reworking of *Silicon Remembers Carbon* for the Lowry Centre in Manchester. In the early 1980s Rokeby developed a machine vision[50] system called VNS. He has used this system widely and it has been utilised by other artists. As a result, he is one of the pioneers of spatial interaction and his writing reflects an understanding of interactivity that is based upon practice.

In his essay *Transforming Mirrors* Rokeby starts by pointing out that all art to some extent is interactive. He quotes Itsuo Sakane: 'all arts can be called interactive in a deep sense if we consider viewing and interpreting a work of art as a kind of participation.'[51] and connects this to Marcel Duchamp's famous declaration, 'The spectator makes the picture'[52]. What

---

[50]Machine vision is a technology which uses video cameras and computer algorithms to allow a computer to able to see and recognise. Another pioneer of machine vision systems for artistic use is Myron Krueger.

[51] Rokeby, David, *Transforming Mirrors:Subjectivity and Control in Interactive Media*, http://www.interlog.com/~drokeby/mirrors.html, accessed on 5/6/2000.

[52] Ibid.

an artist does, in Rokeby's words, is organise 'elements into the work so that their significance is transformed by the shifting perceptions of the viewer.'[53] Interactive work responds to a viewer, from within a system of limited possibilities that the artist has chosen. This system includes the images, sounds, the viewer's actions and the system's reactions.

Rokeby goes on later to observe that interactive works are often viewed with some scepticism and that the audience requires some proof that they are interacting and the viewer of the work has some direct control over events. He states that 'interaction is about encounter rather than control' within the context of artworks. Most of our interactions with computers are direct and give us control over the manipulation of elements. If we come with the expectation that we should have a similar level of control over interactive installations, this requires learning new methods of experiencing artworks. Rather than requiring viewers to modify their behaviour another approach is to create works that react using the behaviour people commonly exhibit when viewing artworks.

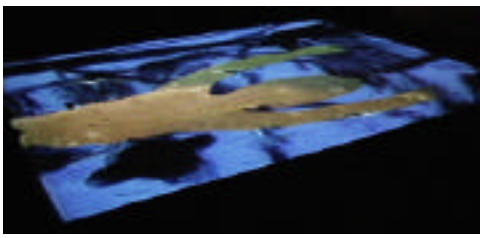
In his essay *Transforming Mirrors* Rokeby discusses interactive art in terms of four categories:

- Navigable Structures – hypertext systems or virtual worlds within which the user can move;

[53] Ibid.

- The Invention of Media – systems that allow the viewer to create;
- Transforming Mirror – systems that reflect back the actions of the viewer;
- Automata – systems that grow and have behaviours of their own.[54]

Rokeby's work over the last twenty years has explored many aspects of interaction and the use of machine vision. This exploration has been in depth and is evolving; his most recent use of machine vision is the application of surveillance systems that can track and recognise individuals. One of his latest works, *Guardian Angel* deals with the use of this technology. Works such as *Silicon Remembers Carbon* can been seen within the context of 'transforming mirrors'. Rokeby points out that the works reflect the viewers back to themselves; in many works the idea of the mirror is explicitly invoked. *Silicon Remembers Carbon (2000)* is one of these works.



18. David Rokeby, *Silicon Remembers Carbon*, 2000, interactive video installation, dimensions variable.

[54] Ibid.

Silicon Remembers Carbon[55] is a video projection from above onto a bed of sand. There is a half-metre-wide walkway around the work for the viewer. The viewer's movements subtly affect the mixing and dissolving of the imagery and sounds. Each viewer's movement leaves traces and affects the experience for later viewers. When the viewer first enters the most likely image is of water (beach waves, water under a bridge in Toronto, passers-by reflected in the canals of Hamburg, shadows and reflections in street puddles) when the viewer moves. In the first version of this work in 1993, when the viewer moved a new image was displayed which 'usually contains shadows or reflections of people along the edge of the clip that is visible'. People interpreted these shadows as their own. In the 2000 version, instead of the shadow imagery being pre-recorded video from laser discs, the images that fade up into the image on the floor are taken by cameras positioned around the gallery. The silhouettes that appear in the sand are the actual images of people in the gallery.

The differences between the two installations represent the opportunities that have developed for interactive video because of the growth of faster computer systems and software to manipulate and

---

[55] Rokeby, David, *Silicon Remembers Carbon 1993-2000*, http://www.interlog.com/~drokeby/src.html, accessed on 5/6/2000.

control video in real-time. In the first version in 1993 computers were not capable of storing and manipulating video easily. The video had to be pre-recorded and played back as linear segments from laser discs. There now exists software[56] that allows artists to manipulate video through a flexible, malleable method in real-time. One of the problems with past interactive video work was that it broke one of the rules for interactive design that Chris Crawford set in the *Art of Computer Game Design*, which was that good interactive design should 'store less and process more.'[57] Using methods that involve storing media reduces interactive possibilities while systems that can process and create media in real-time increase the options for interactivity. Real-time digital video is now a medium that is both stored and processed.

---

[56] Many of the artists using these types of real-time video processing applications congregate online on the *Live Experimental Video* mailing list (http://shoko.calarts.edu/~cchaplin/lev/lev.html) which currently has around five hundred subscribers. At this stage, one of the most common usages of these applications is in performances where imagery is synced with the audio. Some of the artists active in this area are John DeKam (http://www.node.net/), René Beekman (http://www.xs4all.nl/~rbeekman/) and Jeremy Bernstein (http://www.bootsquad.com/).

[57] Crawford, Chris, *Art of Computer Game Design*, 1982, http://www.vancouver.wsu.edu/fac/peabody/game-book/Coverpage.html, accessed on 28/4/1999.

Toni Dove - Cinema in space

19. Toni Dove, *Artificial Changelings*, 1998, interactive video installation, dimensions variable.

My curiosity about interactive video installation evolved from a description of Dove's *Artificial Changelings*[58] installation which was first exhibited in 1998. I have not personally interacted with any of Dove's works. Dove's overview of the work is:

> The installation consists of a large curved rear projection screen suspended in a room with four zones delineated on the floor in front and some chairs for a small audience. Non-interactive narrative sequences frame the experience at beginning and end. The body of the piece contains multiple segments that offer the audience an opportunity to have a responsive experience with the characters and environment. [59]

The narrative for the work is a romance thriller about shopping. The floor zones are delineated by circles of light. When the viewer is closer to the screen the images are of the inside of the character's head; when the viewer moves away from the screen different

---

[58] Zvonar, Richard, 'Case Study, Artificial Changelings by Toni Dove with Alex Noyles' *Interactivity*, 2.14 (1996), 62.
[59] Dove, Toni, *Artificial Changelings — Overview*, http://www.funnygarbage.com/dove/overview.html, accessed on 13/7/2001.

sequences are triggered until the viewer enters a time tunnel and travels to another century. Body movements within each one of these zones trigger behavioural changes in the imagery and sound.

Dove's work is firmly fixed in storytelling, she terms them 'interactive movies'[60]. The narratives that operate in Dove's work are not those of linear story telling. Dove sees these as a narrative 'building on the environment details'[61] that surround the story-lines. An example she cites of 'environment details' as narrative is the movie *Blade Runner*. These narrative environments and the interactivity allow Dove to engage the viewer in a tactile unstable mode. The viewer develops a bodily connection to the narrative. While being interviewed by Brian Massumi, Dove stated:

> What's interesting is that people get this kind of whoosh when they've connected. They lock into the character and it's physical sensation. It can't be rationally predicted or reproduced, but it's there and it will come back.[62]

Massumi, in the same interview, talks of the way in which:

---

[60] 'Interactive movies' are an area of active research for artists, as they cross over areas that relate to hypertext research, narrative and interface. One of the most active research programs is Glorianna Davenport Interactive Cinema's research program at the MIT media lab. (http://ic.www.media.mit.edu/groups/ic/).

[61] Dove, Toni, 'Theater without Actors - Immersion and Response in Installation' *Leonardo,* 27. 4 (1994), 281–7,p 283.

[62] Jones, Bill, and Brian Massumi, 'The Interface and I: A Conversation Between Toni Dove and Brian Massumi', *Artbyte,*1.6 (1999), 30–7, p 33.

> Cinema addresses other senses through vision, but privileges the visual identification. The effect you achieve depends on a certain distancing or uncanniness. The in-between space takes on a thickness of experience

Dove's work, by the combination of elements of video, sound and interactivity, collapses the separation between the viewer and screen and affects more than just a visual sense. Dove's work stands out in the area of interactive movies because of this expansion into the physical space and the closure of the gap between the viewer and the narrative.

Locating the project relative to these art practices

The works that have resulted from the *Liquid Sensations* investigation relate to the above works and practices in a multi-layered fashion and these relationships are discussed below.

Sea Change is a contemporary representation of the seascape through photography. My project explores an experience that is close to our bodies, when they are submerged in and surrounded by water. This is a transitory multi-sensory experience that is dynamic and intimate compared to the experiences of the sea suggested by the imagery in *Sea Change*. The perception of the sea as expansive and static that the photographs in *Sea Change* depict is a different perception to that which my project seeks to evoke.

Parke and Autio's haunting photographs depict people involved in dramatic moments in the water. These are times when water becomes an intense, brutal environment. *Liquid Sensations* likewise is inquiring into the pleasures of these unsettling aspects of water. Parke and Autio's approach is to document people involved in these activities; *Liquid Sensations* aims to suggest the bodily experiences of these moments to the viewer.

The *Water Pavilion* represented an opportunity for Spuybroek and Oosterhuis to design and construct a form of building that had never been built before. They focused on the sensual aspects of water and the exploration of these aspects using media technologies is similar to my research. The success of the *Water Pavilion* is hard to assess without having visited the building. They have worked within the context of the built environment, which has different possibilities, and vast budgets compared to this studio-based investigation.

Davies takes the physical experience of floating in the water and integrates it into her interface. Her works relate to this research project by drawing on the act of floating in water to create art that is experiential and evocative. My project uses simpler technologies, in developing an approach to interaction that is naturally part of engaging with and viewing art in a gallery setting. *Liquid Sensations* explores alternatives to

virtual reality technologies for developing immersive artwork. Davies was able to work with expensive technologies in ways that are inaccessible for most artists. The technologies and methodologies used in *Liquid Sensation* are readily available and easier to apply as part of extended experimentation.

Video projection is the medium chosen to surround the viewer in Vasulka's work *Borealis*. The use of video projection has the capacity to enlarge the image; Vasulka employs it to fill the space, so that the imagery encompasses the viewer. Projection becomes a medium in its own right in installations such as *Borealis*. My research has worked with video projection in a similar way to *Borealis,* where projection is used as a means to surround the viewer.

Viola's works explore aspects of the human condition that are often physical and involve the passage of time. Engaging with his works is a powerful emotional encounter. This research project relates to his practice by being an investigation of transitory, lived bodily experiences that are not easily expressed or described. Imagery of people submerged in water is common in his installations. Like Viola my choice has been to be involved in the technical details of my practice. The effect of Viola's works often arises from the empathic relationship the viewer develops with the figures he depicts. My installations instead evoke bodily feelings by the use of ambiguous manipulated

recordings and spatial interactivity. Viola's, Vasulka's and the works in my project use installation as a method to enhance the viewers' engagement with the subject. My research has also used interactivity as an additional method of engaging the viewer.

The group of works most closely related to *Liquid Sensations* was the show *Space Odysseys: Sensation & Immersion.* As a collection of works, it represents a paradigm of art practice where the use of light, image, sound, space, objects and interactive technologies merged together resulting in powerful experiential art. Unlike many of the pieces in *Space Odysseys*, my research has resulted in works that respond to viewers in a seamless manner. Viewers do not need to change the way in which they commonly view art in order to engage with my works.

Rokeby's declares that the viewing of interactive art installations is an act of encountering, not controlling the work. He sees the viewers as having always been involved in art, both static and interactive. These observations start to explain and articulate the nature of interaction in art. They acknowledge an approach to interactive installations where interactivity is only one part of the whole. My research has been informed by this approach. The use of simple actions and indirect interaction has meant the viewer's engagement with the works is part of their holistic encounter with the installation. The interaction in

Liquid Sensations is what Rokeby outlines as ‘Transforming Mirror-systems that reflect back the actions of the viewer’. *Liquid Sensations* in the early stages explored use of real-time processing of video as part of the control system in a similar manner to the second version of *Silicon Remembers Carbon*. The final works use refined pre-computed high quality imagery and sound, instead of using real-time effects with lower quality media.

Dove’s work similarly focuses on interaction as part of the encounter with artworks. The interactivity in her installations revolves around simple, subtle movements that might happen by accident as part of viewing the work. Interactivity is not the primary focus of the work; it is a combination of the interactivity, the layout of the gallery and sound and, in the case of Dove, the narrative. This relates to the approach I have taken in concentrating on subtle interactions. The way in which the viewer develops a physical connection to the imagery also connects our practices. Unlike Dove’s work my project centres around sensory experiences, she focuses on narrative and cinema.

Part Four: How the Project was Pursued

The next chapter documents the eight stages of this research project. These have been divided into two major sections: the preliminary stages during which the research topic and research questions were developed and; the main stages of the project in which the final works were developed.

Preliminary Stages

1) Moving from online media to a medium of sensations

2) Methods for developing ideas with time-based media

3) A move to interactive images

4) Interactive spaces in place of interactive images

The Main Project

5) Experimentation in physical spaces

6) The works as a whole

7) The sound re-mix

8) The final versions

This material is summarised from personal journals. The accompanying hypertext version of the exegesis on the CD-rom contains video documentation of the installations in progress.

Stage One: Moving from online media to a media of sensations

When this research project was commenced, the main area of my practice was collaborative internet-based

work. The project was started with the working title ‘Order and Chaos in a digital world’. The intent of this topic was to explore the desire to control and order information and its fluid uncontrollable nature when approaching information overload. The plan was to continue working with web-based media and to integrate streaming media. One of the first activities was attending the Polar Circuit 2 media arts workshop in Finland[63]. The purpose of attending this event was to be influenced and to open up new directions. One of the last projects I had completed prior to starting this research was a collaborative theatre production and I felt that theatre had many possibilities for and influences on digital media. I took part in the Kalevala Moo workshop which was a text-based multi-user environment and performance loosely based around the Finnish myths of the Kalevala[64]. I was able to attend workshops by Ken Gregory[65] and Daniel Jolliffe on sensors and electronics for artists which created new possibilities for working with interactive installations.

---

[63] Polar Circuit is an event where a group of international new media artists and writers gather over a period of one month to work together, to show work to each other and to take part in workshops. The focus of the event is developing collaboration and having longer periods of time than are commonly available in conferences to develop contacts and projects.
[64] The workshop was run by Adrianne Wortzel. The Kalevala is an epic collection of poetic stories based on songs and oral stories handed down from generation to generation of Finnish people which represents an important part of their identity and culture.
[65] http://www.gatewest.net/~kgregory

After attending this event I spent five days at ZKM Centre for Art and Media[66] in Karlsrühe Germany, researching interactive artworks in the collections, watching how people moved around and interacted with the works and viewing ZKM's extensive collection of video art. Over the previous five years my practice had moved away from using video; this time was an opportunity to once again engage with the medium.

On returning to Hobart I was planning two works, both interactive installations. One was a video projection where the closer the viewer moved to the screen the more chaotic the imagery on the screen became. The other was an installation where there would be three rock-like objects in different parts of the world. When viewers put their hands over the rock an image of their hand would appear on the rock in front of them as well as on the rocks in the other parts of the world. This would allow for a new class of non-verbal tele-presence between people. Time was spent researching the possible technology to achieve these works, eg how to sense distance and use of machine vision systems to be able to realise the rock piece.

Evaluation of this stage

New directions and possibilities had been opened up, important international connections had been made

[66] http://www.zkm.de/

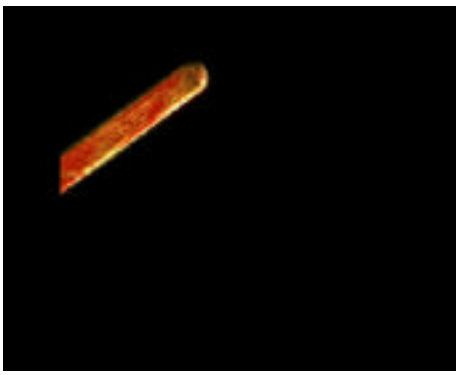
and a number of international works had been evaluated. The possibilities of having control over alternative means of sensing user interactions suggested new directions. Many significant artworks in the area had been viewed and some of these later informed the central argument of the research. Studio practice was minimal at this stage. The reason for this became a major area of my research project, that is, what are the methods for a solo artist to develop interactive video installations? There were ideas but not concrete spaces, technologies or research rationales for evaluating and developing these works. What was needed was a method of working that developed out of studio-based experimentation, instead of developing ideas from the possibilities of applying specific technologies.

Stage Two: Methods for developing ideas with time-based media

This stage was marked by the development of a new methodology. The planning and development of interactive artworks is a complex activity. One of the main hurdles was the initial phase when there might be a clear conceptual idea of the finished project, but there might also be many technical hurdles to overcome before a prototype could be developed. This can be a time-consuming and convoluted phase. The possible production models that exist in software, film or game development, or other areas such as set design or interior design, do not transfer readily to a

comparatively low-budget studio-based research project. Parts of the process can be related to film production, others to game development and others still to a more traditional studio practice. To spend time away from some these complex problems a number of video sketches were developed. The intent of these sketches was to work with a non-narrative moving image and to develop a number of possibilities.

The first of these was an attempt to explore the concept of a sudden fracture in a rhythm.

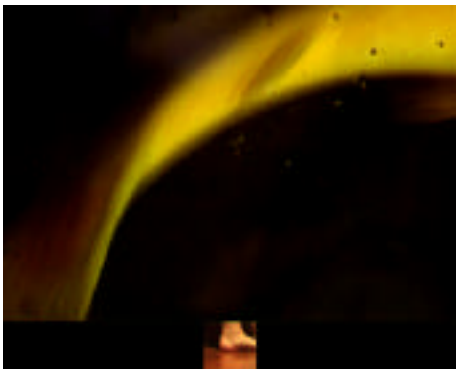


20. Robin Petterd, *Hit*, 1999, video loop.

This evolved into a video loop consisting of a red stick-like image seeming to hit the surface of the screen in a tight binary rhythmical way, like a metronome. Then a large smashing sound is heard and the screen goes black and. The sequence then repeats itself. The next step could have been to include the smashing sections at random times. However at this time the focus was not on using interactive media. The concerns I had with the video loop were:

- the binary nature of the hit and smash was too literal;
- it became a narrative and part of the intent was to start to explore the notion of non-narrative moving images.

The next sketch was a more subtle way of working with tension and the relationship between two images and sounds within a frame, instead of across time.



21. Robin Petterd, *Fish loop*, 1999, video loop.

This was a video loop of a fish swimming around the frame and at the centre bottom an image of a foot stepping in and out of the frame. The image of the fish is fluid and smooth, while the sound associated with the foot provides contrast with a mechanical organised sound.

The next development was an interactive interpretation of the sketch. This was attempted by allowing the user to alter the speed and the rhythm of the two different sections of the image by moving the foot image left to right and clicking on the fish

section. This was completed with online streaming media[67], using Apple QuickTime wired sprites. The video and sound for both of these was edited using After Effects[68].

At this stage a preliminary draft of the research proposal was prepared. It was:

> The project will explore the cyclic harmonies that exist in the relationships between what is structured and highly controlled and what is fluid and changeable. As part of these cyclic harmonies the act of contemplation will be introduced in the process of viewing and interacting with new media. The project will be completed using emerging interactive video technologies and will use images and sounds of repetitive actions, movements and environmental images and sound.

Evaluation of this stage

At the completion of this stage the contrast of elements over time, the use of repetition and of violent interruptions to the flow of events had been adopted. These formal aspects were more fully developed in later stages of the project. The use of After Effects allowed the imagery and audio to be highly malleable, allowing for an almost painterly fashion of working. The linear version of the fish loop was more successful than the interactive version. The interactivity did not have a clear interface and lacked

---

[67] During this time I was working on a collaborative online project with writer Diane Caney, so I had not completely abandoned the use of simpler web-based interactive works. The image of the fish developed out of this collaborative process. This work can be seen at http://www.archiving.com.au/

[68] Adobe After Effects is an application used for video effects and animation. It allows for precise control of the visual aspects of a video image.

a strong linkage to the image. This type of interface may have been more successful if it had been combined with more media elements and the users had greater control over their effect on the media. The type of interactions that were being explored were simple and subtle and would have been more successful as physical interfaces.

The imagery and sounds were leading into a method of working that focused on the expressive nature of the moving image over the importance of narrative. The lack of success in transferring this to an interactive vision highlighted the issue that the methods of planning and developing a project define the outcome of the work. In the later stages of the research the imagery, sounds, spaces and interaction were worked on in conjunction, instead of attempting to place interactive or spatial interfaces onto the imagery or sounds after they had been finalised. The use of video for its expressive sensory qualities developed into the question of ‘How can video installations be used to evoke sensory experience?’

The first draft of the research proposal began to define the intent of my research. There was confusion between attempting to explore a corporeal sensation and the aim of providing a contemplative experience. While this started to develop experience design as a core part of the research area, it did not define what those experiences should be and how they were going to be evoked. The plan to explore contemplative

moments evolved into an interest in experiences that have a powerful effect on the viewer.

Stage Three: A move to interactive images

At this stage I needed to return to the possibilities of physical interfaces as the workshops completed at Polar Circuit were only introductions. I wanted a system that would be simple to set up and would give me the ability to work with aspects of the viewer's motion and positions. One of the common ways of achieving this at this stage was with ultrasonic sensors which, for someone new to the area of electronics, are relatively complex to construct. The resulting sensing technology used was a machine vision[69] Xtra[70] for Macromedia Director[71] developed by Danny Rozin[72]

---

[69] Machine vision is a technology which uses video cameras and computer algorithms to allow a computer to see and recognise. The most common machine vision solution used by artists is a piece of software called *BigEye* produced by Steim (http://www.steim.nl/) in the Netherlands. It uses midi signals to communicate with other programs. I investigated the use of Steim's *Image/ine* effects program, but chose not to use it and other midi-based systems such as Nato 242+55 (http://www.eusocial.com/) because of the need to introduce even more new technologies such as MAX (http://www.cycling74.com/) into the process whereas Director was an application that I had previously used extensively. This meant the working versions of installations could be developed relatively quickly without the need to learn new applications. The use of Nato 242+55 had become widespread in the area of interactive video during the later stages of the project and new software to work with video with other applications such as jmax (http://www.ircam.fr/equipes/temps-reel/jmax/en/index.php3) and Pure Data (http://www-crca.ucsd.edu/~msp/) have been developed. But at this early stage of the project these video plug-ins had not yet been developed. They were largely developed out of a recognised need for this type of software.

[70] Xtra is a piece of software that is added to Director to expand the functionality of the program.

[71] Director is an application for developing interactive multimedia content. It uses the metaphor of a theatre production for its interface. It includes Lingo which is a scripting language that can control all aspects of the application and allows for rapid development of interactive multimedia.

[72] See http://www.smoothware.com/.

an artist/programmer working at New York University.

I then attended Siggraph[73] in Los Angeles, where part of the *Archiving Imagination* project was being shown, and Invenção in Brazil where I presented a paper[74]. At Siggraph there were a number of interactive artworks exhibited and the artists were often available and willing to talk about how they had realised their works. I discovered that most artists working with motion sensing were using machine vision and they were solving the lack of processor speed by networking two or more computers together. Another significant observation was that the works which used simpler interactivity were often the most successful at an exhibition-style event like Siggraph. When I returned to Hobart, some time was spent working on building a flexible system to network computers together using the multi-user compatibilities[75] of Director. Each computer was able

---

[73] A report on these events was published in *Australian Network for Art and Technology News*, Dec 99 Feb 2000, Issue 39.

[74] Invenção (http://www.itaucultural.org.br/invencao/invencao.html) in Sau Paulo, Brazil was a conference organised by Itaú Cultural Institute in collaboration with the Inter-Society for the Electronic Art, Arts Leonardo/ ISAST Centre for Advanced Inquiry in the Interactive Arts, University of Wales College, Newport and the Centre for Science Technology and Art Research, University of Plymouth. It sought to examine the convergence of art, science and technology. At Invenção I delivered a joint paper that explored some of the work and ideas that came out of the text based virtual world work that I completed while in Finland. The conference paper was titled 'Rewrapping the real world: using hyper-narrative in virtual spaces to create un-common realities' Dr David Casacuberta, Robin Petterd, Adrianne Wortzel, for INVENÇÃO in Brazil 25th-29th August online via http://www.itaucultural.org.br/invencao/invencao.html.

[75] Director's multi-user compatibilities are designed to allow messages to be sent between applications developed with Director. The most common uses are online chat systems and multi- user games.

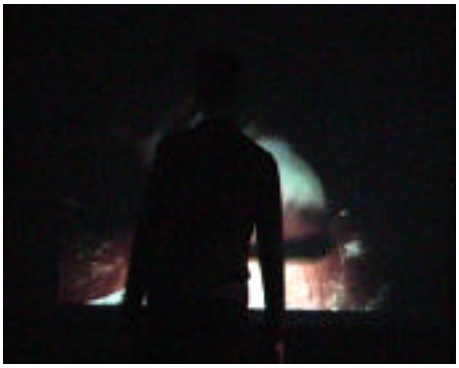
to send messages to other machines on the network. This system was more complex than was needed at that stage but allowed for flexibility. One computer was used for the machine vision system and another for the playback and processing of video. This message passing system was later used to prototype some of the multi screen systems. The control software which integrates all of the final installations is based on these scripts.

The next installation work I developed went through a number of variations. The three most significant stages are outlined below.

22. Robin Petterd, *Untitled*, 1999, interactive video installation, dimensions variable.

The starting point emerged from the previous video sketches. The initial idea was to contrast two images to explore the relationship between a fluid ephemeral steam image and rhythmic image of someone kneading dough. The layout of the installation consisted of a rear-projected image floating in the gallery with a pool of light in front of it. The movement of a viewer in the gallery triggered the

fading-in of the kneading image. This was not pre-computed, which meant the fading in and out was computed in real-time. The focus was on the types of movements people naturally do in an art gallery: walking in and stopping, observing and then walking out. One of the problems was that it was too complex and people did not perceive that they were influencing the projected image. The work need to be more focused, both in terms of the images and sounds and in the character of the interactions.



23. Robin Petterd, *Untitled*, 1999, interactive video installation, dimensions variable.

The second version focused on the movement of the imagery reflecting the movement of the viewer, ie when the viewer moved the imagery moved. This opened up new possibilities for the research. There was a strong, direct relationship between what the viewer did and how the imagery responded. Some viewers tried to be as still as possible, to control it. Others were very active so they could watch the video in full.

Different aspects of this interaction explored were:

- If the viewer moved towards the left, the hands moved towards the left, which was a basic form of gesture recognition.
- As the viewer moved more, the sound got louder.
- Multiple images were trialled; these included those that reflected the viewer's position.

24. Robin Petterd, *Unsteady Motions*, 2000, interactive video installation, dimensions variable.

The next stage applied the same interactive situation to a different type of imagery. An image of a tree being blown around in a storm was utilised. It responded to the viewer's motion but did not respond to a lack of motion. What become apparent was the interaction did not start a fluid dialogue between the viewer and work. The interaction was only a simplistic binary reaction that did not behave in the more complex manners that are possible with interactive technology.

In the final version of this work the viewer paused in front of the screen to contemplate the image. The imagery froze if movement in the gallery stopped as in the other versions. As the viewer starts to ponder

the still image and the silence in contrast to the turbulence of the storm, the imagery slowly faded to black. When the viewer moved the image erupted again. The addition of the fade created a dialogue between the viewer and the work. The focus of the work became the tension between the desire to contemplate a moment in time and the states of change that are part of stillness. The piece was titled *Unsteady Motions*. The opposite to this interaction was trialled. The imagery moved when the viewer was static and the imagery paused and faded out when movement was sensed.

Evaluation of this stage

This installation started to move towards a simplified solution to the problems of contemplation by action as outlined in the research proposal. The viewers became conscious of their actions and these actions were reflected in a manner where there was a direct response to both action and inaction.

A number of concerns that I had with this installation could not be solved or refined within its parameters.

- The goal was to engage the viewer in a physical spatial way, but the layout centred around an image-based viewing situation.
- The viewers' actions and experiences of the installation were broad: some people lept around the room like a storm tossed tree, other people did nothing.

- Some people did not realise the work was interactive. It was necessary to consider whether or not the intent of the research project meant that the viewers needed to realise they were affecting the installation.
- An interrelated set of imagery or types of imagery needed to be developed. While imagery and sounds such as of hands or steam were interesting, the most successful aspect of them was the movement and the fluid nature of the imagery. The imagery of the natural environment held more possibilities for this project than the figurative imagery of the body.
- What happened when there was more than one person in the room? If the focus of the project is on reflecting the movement of the viewer, when there is more than one person in the room then the works cannot function as a personal dialogue.

From this stage the question of ‘How can unobtrusive interactivity be used to enhance the viewer’s engagement with the works?’ developed. The focus on the movement and being still as common viewer behaviour in a gallery grew out of this stage and was based on observations of works at Siggraph and viewers’ engagement with my installations.

Stage Four: Interactive spaces instead of interactive images

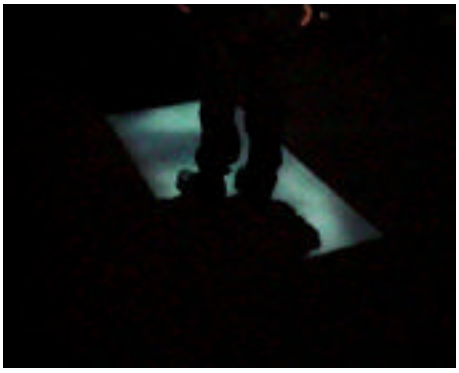
The next two installations were started as a reaction to the above observations and have evolved into the works in the final exhibition. Around this time I took an extended family holiday travelling and camping in the north-east of Tasmania. The weather in late autumn can be changeable. At times the wind speeds were around forty knots, it became hard to sleep at night, the trees turned into roaring noise machines above the tent. While I was at Eddystone Point, the wind died down enough for it to be safe to enter the water. Submersion in water is unlike other activities. This time the contrast was heightened because of the recent experience of the tent, wind and rain. The environment was a soft blue-green blurred space, which induced an eerie calm. The strong physical experience of this contrast helped to change the direction of the research. The focus of the imagery and sounds was on aquatic environments from this stage onwards.

25. Robin Petterd, *Wake – in progress*, 2000, interactive video installation, dimensions variable.

From this, the first version of *Wake* was developed. An image of turbulent shallow water mixing and hitting a rock edge is projected onto the floor of a room. To the left is a small walkway across which viewers walk. When viewers stop, the image stops moving. Then, as they pause for long enough to start to become comfortable a larger wave comes towards the walkway. If they choose to step off the walkway into the projections, the images and sounds erupt into a flow of white water that slowly disappears or continues depending on the viewer's motion. There was a change from processing aspects of the imagery in real-time to displaying and delivering different imagery to the viewer as part of the interaction.

The intention was to evoke the environment close to water: where water is rushing by, near rocks or being on board a boat and watching the water slip by beneath. Time was spent determining how to best use the machine vision system to sense what was happening, eg where the viewer was and whether or not there was movement. It was decided a more suitable technique to do this was to use a simple motion sensor and contact sensors made from non-conducting foam between plates of metal mounted inside the walkway. These were interfaced to a computer via a modified keyboard.

The installation was complex and needed to be refined. While the walkway was meant to be a clue to the interaction, viewers did not naturally walk across the board. This was due to the scale of the walkway compared to the imagery and the space around the projection. People's reaction was to walk around the edge of the image.



26. Robin Petterd, *Wake – in progress*, 2000, interactive video installation, dimensions variable.

In the second stage of this installation the walkway was removed. When viewers moved the imagery quickly flicked past the viewer. When they paused, the sound of a roaring wave played; as it approached the maximum volume the imagery changed to a soft blurred image and the sounds became gentler. When the viewer moved again, the image of water rushing by returned.

Another new work was started, which evolved into *Dropping.* This was the first experiment with using a waterproof housing for a video camera. The casing was weighed down with lead weights and lowered from the side of a boat. While the experience of being

in the water is normally a peaceful, calm experience, combining it with technology that is fragile and could be destroyed by water means that shooting the imagery for these installations has never been a relaxing contemplative experience.

27. Robin Petterd, *Dropping – in progress*, 2000, interactive video installation, dimensions variable.

In the first version of this work the image was projected into a corner of a room. When the viewer moved, the image was of the surface of the water; when the viewer paused, the image dropped down to the bottom of the water to show a barren muddy bottom with almost no movement. When the viewer moved again, the imagery and sounds erupted as the image and the camera viewpoint rushed to the surface.

The intent from the early stages of *Dropping* was to evoke the experience of slowing down in the water and the contrast between being at the surface, then diving down and rushing back up to the surface. As a child I would attempt to sit at the bottom of the pool for as long as I could and then when I could no longer hold my breath I would push off the bottom of the

pool with all my strength to burst back to the surface of the water.

This work was experimenting with using the projector as a source of light and shadow as well as a source for forming the imagery. Viewers were meant to enter the lighted space and become surrounded by the image and merge into the projection. The optimal position was close up to the wall, inside the triangle of the projection. The viewers did not approach the image very closely; they stood back and did not enter the beam of the projector.

Evaluation of this stage

These early versions of *Wake* and *Dropping* represented a shift from previous works. The move away from the configuration of the space as simple cinema-like layouts represented a major development in the investigation. It became evident that there was a difference between how people moved around the space and what the intended movement through the space was. A problem was that most people did not like to enter the light beam from the projection because of a fear of interrupting the image and affecting the viewing experience for other viewers in the room at the same time. The quality of the sound compared to the quality of the image was also a problem.

The issue of how the viewer interacts had been resolved by simplifying the interaction to the binary

detection of movement. Simpler technology to sense this was used. As a result of this simplification of technology and interaction, options for more subtle interactions, in terms of how long someone has been moving or stationary, became practical. This represented a move from spatial sampling to temporal sampling techniques. While the interaction at one level is a binary event those binary events, when combined with statistical temporal sampling techniques, open up the possibility of more complex interactions[76].

This stage brought into the open many new directions which called for a refinement and rewriting of the research proposal. This finalised the preliminary stages of the project.

The start of the main project

The investigation to this point had clarified the aims of the research and it was time to redraft the topic to reflect this intent. The research topic was redrafted to:

> What are the new aesthetic and technical issues involved in evoking corporeal sensations related to

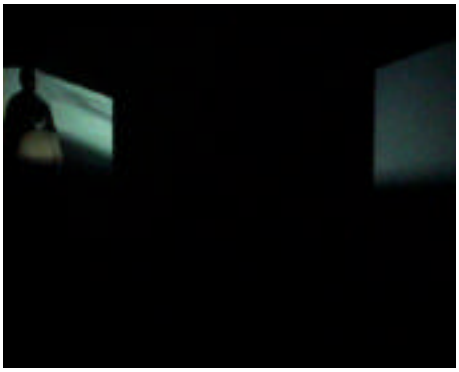
---

[76] Jim Campbell in his article *Delusions of Dialogue: Control and Choice in Interactive Art* discusses interaction systems as a spectrum that ranges from controllable systems to responsive systems. For Campbell binary interactions are a characteristic of simple controllable systems and systems where the viewer's actions are interpreted as complex responsive systems. He states that the use of controllable systems is one reason why interactive art often does create rich engaging viewing experiences. The area he sees as having undeveloped potential is the use of systems where software develops a memory of the environment it is installed in and reacts in both a short-term and long-term manner. The use of statistical temporal sampling techniques in my installations means the software is interpreting events in the room and becomes responsive to the viewer.

being submerged in water with interactive video installations?

This concentrated the project on the creation and evocation of elements that then create a potent sensory experience. From the preliminary investigation three questions concerned with the challenges of working with interactive video installations had developed. Many of the final solutions to these problems had started to evolve.

Stage Five: Experimentation in physical spaces



28. Robin Petterd, *Dropping – in progress*, 2000, interactive video installation, dimensions variable.

Dropping was developed in a desktop situation for a period of four months. The room in which it was next trialled was eight metres long and four metres wide. The layout consisted of an image projected into two corners of the room. There were six sound sources: one below and above each of the projections, and two speakers in the middle of the room at the sides. The sounds panned left to right and up and down in the space. Each projector had its own sensor placed so

that it sensed the viewer's movement at that end of the room.

The first version of the temporal sampling technique was tested. This allowed for logging of the duration of movement and stillness in the room. The data was divided into thirds, one third being more than the average activity, another the average activity and the final third was less than average activity. When the installation was running, the average of the last eight events was compared with values gained from previous interactions to determine the level of current activity. Depending upon the current level of activity one of three different groups of media was played.

As each projector was controlled by a separate sensor, when viewers were in only one area of the space, this could lead to the situation whereby one end of the space could be at the surface and the other at the sea floor. The two sensors were used to allow for multiple viewers in the room at the same time. However, this conflicted with the sensations *Dropping* was attempting to suggest. The use of the multiple sound sources was the most successful component of this layout. The panning of the sounds up and down was hardly noticeable. The layering effect of the multiple channels was exciting. The system to achieve this used the multiple computer message software, which was a cheap way of making multiple channel sound, but it did not give control of the positions of the

sounds and required the use of multiple computers just to play the sounds. This led to the use of surround sound in the next version of *Wake*.

The next stage of *Dropping* involved the extensive testing of different spatial configurations of the work, exploration of screen types, size of room and size of the projected imagery. The use of multiple sensors in a single installation was abandoned for the reasons mentioned above.

In a larger room that was eight by four metres, the following configurations were trialled:

- Two large projected images approximately five metres wide and three metres high at either end of the room projected on the walls by projectors placed on the floor;
- Smaller projected images approximately one and a half metres wide and one metre high, side by side in a corner of the room.

The use of interactivity in a large room means that more people can be in the same room at the same time, however this makes it harder to create an easily recognisable link between each of viewer's actions and the installation's reaction.

The installation was moved to a smaller room approximately four metres wide and five metres long, with an entrance at each end of the room.

The first stage of experimentation in this room was with projecting the images onto different parts of the wall, in both high and low positions.

29. Robin Petterd, *Dropping – in progress*, 2001, interactive video installation, dimensions variable.

Custom-made rear projection screens were introduced. These were placed facing each other and the projectors were then placed under the screens. There was one metre as a walkway between the screens and the end walls of the room. The walkway between the screens and the side walls was half a metre. This forced the viewer to be physically closer to the image, while not interrupting the projection. It allowed other viewers to walk through the central walkway of the room and interrupt the projections. The rear projection screens created a sense of more sources of imagery than there actually were in the room and the light from the projections reflected around the room.

30. Robin Petterd, *Dropping – in progress*, 2001, interactive video installation, dimensions variable.

The next stage was to experiment with three projectors and it was quickly discovered that working with three projectors in a small room was problematic. The room became constricted by the technology, the viewer was not able to pass through the space comfortably without colliding with equipment.

The work was then moved into a room that was eight metres wide, nine metres long and three metres high.

A number of layouts were trialled in this room:

- all three projections alongside each other on a wall to form a panoramic image;
- one projection on three of the walls in the room;
- The use of three rear projections in a U-shaped arrangement in the middle of the room. This allowed the viewer to walk around the images (on the outside) or to stand in the middle of the images.

The most successful of all these version were the two parallel rear projection screens in the smaller room

The combination of the size of the room and the placement of the rear projection screens created a suggestion of being surrounded by and close to the image. The large projections became a spectacle. The physical feelings being evoked in *Dropping* are intimate and close to the body. The spectacle aspect of the large projections contradicted the closeness of this experience. The use of screens that could be walked around created a feeling of being in an environment, instead of viewing cinematic narrative, the screens giving a structure to the space.

The intention of *Wake* was refined to focus on the experience of water engulfing the swimmer that happens when entering the water from a beach and the calm once past the surf.

31. Robin Petterd, *Wake – in progress*, 2001, interactive video installation, dimensions variable.

The room was eight metres long, five metres wide and three metres high. In this version the imagery was projected on to the floor of the room. When there was movement in the room the image was of water lapping at the shore/beach. When the movement ceased the

image froze and a roar started. When it reaches its peak an image was projected onto the wall at the end of the room. The sound was encoded as surround sound[77]. When there was an image of the wave coming towards the viewer, there was a corresponding diagonal panning of the sound through the room. When there was an image of water lapping around the viewer's feet the sound was placed in the middle of the room.

The problems included the dullness of the projection on the floor. This was due to the projector needing a new globe and the dark textured carpet of the gallery not making an ideal surface for projecting onto. The loud rushing sound gave the installation a strong violent presence, at times it was too loud and harsh.

Evaluation of this stage

At the end of this stage the spatial layout of the works started to evolve towards the final configuration. The use of surround sound added a presence and physicality to the imagery. The other development was the recognition of the importance of time spent working in the gallery with the works set up, to be able to test and modify aspects of media and scripts rapidly. Testing on a desktop and the sketching of plans for the works is different to being able to trial,

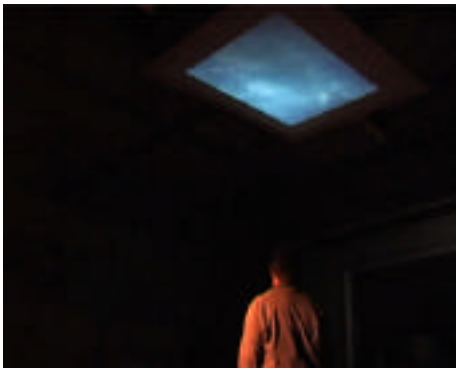
[77] This was encoded as Pro Logic Surround sound, using PanHandler, which is a sound plug-in for Adobe Premiere. Surround sound systems involve the use of multiple sound sources, normally arranged with three speakers at the front of the room near the screen and two speaker at the rear of the room behind the viewing position.

compare and make alterations to the layout with projectors and other equipment in a gallery space.

The two projects developed at this point represented three types of sensations of being in the water: floating and sinking and attempting to remain stationary in the surf. The resulting installations have a physical presence but at times they are uncharacteristically violent. Future developments addressed this by constructing softer and smoother media for the work. In addition, only the floor projection started to move away from the paradigm of an image on a wall or vertical surface. These issues needed to be addressed by developing another installation.

Stage Six: The works as a whole

The piece that was developed out of this need for a ‘soft’ experience is *Under*. One of the most pronounced aspects of being in the water is the consciousness of our breath. This is because we are unable to breathe under water and breathing out creates odd feelings and sounds from this relatively simple bodily act.



32. Robin Petterd, *Under – in progress*, 2001, interactive video installation, dimensions variable.

The installation *Under* is a projection onto the ceiling of a room. When no activity is detected in the room the image is just under the surface of the water. When movement occurs bubbles float to the surface. This was the first time the still state was conceived as the main condition for an installation. When there was no-one in the room for a period of time the work timed out to a still state. In the previous two installations the timeout state was a moving state. A new version of the activity sampling system was a feature of this installation. The system now mapped the current activity state to a number between one and twenty. This was based on a standard deviation[78]. If the measured duration for which viewers in the gallery were still deviated for longer than the standard deviation, the activity state decreased. The activity state was increased if the deviation of the duration of movement was greater than the standard deviation of movement. In the case of this installation, it was then mapped to twenty different segments of bubble

[78] Standard deviation is a measure of where data is clustered around the mean of a set of data.

footage that were sorted so the soft, slow bubbles played when the activity state was low and the faster, larger, louder bubbles played when the activity state was higher.

In the first version the shape of the projection was a square. This was changed to a circle, evoking the sensation of restricted vision through a face mask.

33. Robin Petterd, *Under – in progress*, 2001, interactive video installation, dimensions variable.

A breathing sound was triggered when movement stopped in the room, in an attempt to suggest the moment when a breath is taken before diving down under the water. Unlike the other sounds, this was recorded out of the water. This crisp sound was odd when combined with the other sounds.

Under was installed with *Dropping* and the next progression of *Wake.* This was the first time that more than one installation had been tested in a room at a time. This room was twelve metres long by six metres wide.

34. Robin Petterd, *Dropping – in progress*, 2001, interactive video installation, dimensions variable.

This next development of *Dropping* tested a different type of screen material. The problem with the screen material was its shiny surface and tendency to develop creases easily.

35. Robin Petterd, *Wake – in progress*, 2001, interactive video installation, dimensions variable.

The next version of *Wake* incorporated the feedback of twenty different sections of footage based on the activity state. The issue of the projection's darkness versus brightness on the floor was explored by projecting onto a thin layer of sand on the floor. This created a richer almost tactile projection. The use of a screen on the ground meant there was a separation between the projection and the surrounding floor.

Only one viewer walked on the sand into the projection. The conclusion was reached that most people will not step onto or into an image. They are trained in a protocol when watching video to view the image from a single viewpoint and not spoil the viewing experience of others by interrupting the light beam of the projector. It proved practically impossible to tempt viewers to break out of this pattern.

Evaluation of this stage

This was the first time multiple installations had been set up in a single room, so new problems and possibilities of how the works could interrelate were introduced. These included the issues of sounds overlapping and whether or not the installations should be in discrete areas. *Wake* and *Under* had been planned to be in the same room, separated by a wall. But the large roaring sound and the hit of wave were in contrast to the soft, rippling bubble imagery and forced a reconsideration of this plan.

The lack of sound quality from the microphone in the waterproof casing was in stark contrast to the quality of the imagery. One of the challenges of underwater sound recording is that there is a difference between how sounds are perceived underwater and the sounds that result from underwater recordings. Diving into the water, it seems the sounds that are heard are slow and have a relaxed heavy character. This adds to the sensation of time slowing down that occurs when

to air and sounds are often sharper and harsher when recorded, or there is complete silence.

This problem with the sound created an opportunity to rework the sounds and at the same time investigate using the sounds as a method to integrate the three works.

Stage Seven: The sound remix

The purpose of this stage was to rework the sounds as a means of orchestrating the totality of the works and to start developing the spatial configuration of the works.

The first step was re-recording many of the sounds. There are few choices of techniques for underwater sound recording; these include the use of hydrophones and microphones inside plastic casings. The sounds recorded by a hydrophone are very different to the sounds that a person actually hears in the water. Much of what we expect to hear underwater can only be heard at the surface. *Liquid Sensations* only deals with experiences that are near the surface and do have an audible component. After research into sound design for underwater film productions and watching films that used underwater footage, it was found that most sound production for these is completed in pools and streams. The sounds recorded in synchronicity with the imagery do not give the impression of the environment that filmmakers are trying to create.

The sounds in the installations can be divided into groups: the surface sounds, the underwater sounds and the sounds that are played when activity is sensed in the room. Many of the sounds such as the breaking wave were not completely rerecorded but were processed further, mixed and overlaid with new sound recordings. It is common to associate a roaring sound with breaking waves. Close to the wave the sound is different to this. The roar of a wave breaking was mixed and overlaid with the actual sound of the wave hitting the camera casing. The underwater sounds were recordings taken in streams and pools and were recorded with a mono microphone encased in plastic covering.

The sounds were then developed as a linear mix. The use of surround sound was replaced by a complex stereo sound mix. With three installations in one gallery, using surround sound would mean fifteen sound sources close together. Some of the immersive effect of surround sound would be lost. What was adopted was a method of working where the six sound sources from the installations become a combined multi-channel sound mix. During the reworking of the sounds I changed from using the built-in sound features of After Effects to using Pro Tools Free[79]. A number of versions of the linear mix were developed.

[79] Pro Tools Free is a limited capabilities version of DigiDesign Pro Tools software. It is an application that is used for multi-track sound editing, mixing and midi sequencing.

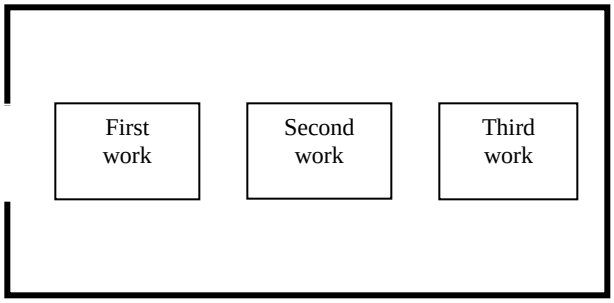
One common aspect that developed was a return to a similar base sound, with a strong cyclic rhythm. This was based on the sounds and type of sensations experienced when swimming through the water. It became a form of sound that strokes the viewer's body. There was a change in focus from the sounds that exist in water, to the sounds that I hear in my head whilst in the water.

This stroking effect and the remixed sounds were then incorporated into the control system for the installations. The stroking sounds were incorporated in a script where the current activity state of the three installations was averaged and then this was used based on a sine function to control the timing, volume and panning of the sounds[80]. The number of sounds played in the underwater mix was dependent on this average activity value. The actual sounds played were chosen randomly from a set of forty sounds.

The works were then set up just as a sound installation without imagery. This was tested to determine if the interactive versions were viable using sound alone. The louder, more violent sounds of *Wake* were still a concern compared to the softness of the sounds of the other works. The room used was eight metres long and four metres wide; the sound sources were closer together than they would have been with imagery. If

[80] thevalue = sin(the current time * averaged activity for all the installations)

the works were going to function as an orchestrated whole, the relative success or failure would be evident when they were placed close together. The installations were set up in a linear sequence. The viewer walked into the room, into one work, and then moved another two metres forward to the next.



36. Plan of possible positions for the works when they were set up as sound-only installations.

A number of options were tried to test *Wake* in different places, relative to the other pieces. These include:

- *Wake* as the first work that the viewer encountered;
- *Wake* as the second installation in the sequence;
- *Wake* as the final work experienced;
- The sounds from just one of the installations in all three positions in the room was also trialled.

These were documented by a stereo microphone being moved around the room.

What became evident from this experimentation was that while the aural experience of *Wake* was different from the other components, the contrast that it brought

to the whole was important. When *Wake* was removed from the sequence a sameness developed across the works. Where *Wake* was not at the beginning of the sequence, it had a jarring effect on the overall works. The wave sounds in *Wake* were synced to the imagery and there was a total of twenty sequences to reflect all of the possible activity states in the system. Some of these were short and the shorter ones meant the sounds quickly cut out. After testing, this led to the conclusion that the sequences with the wave hitting needed to be reworked and extended. It became evident that the activity states calculated needed to be more responsive to changes in the room.

Evaluation of this stage

The reworking and remixing of all the sounds for the installation became a large undertaking, which was successful. The sound-only experiences were possibly the most tactile, fluid and liquid environments that had been developed. The overlapping sounds from the multiple sources created a physical presence that was co-ordinated. The interaction became a side effect of the viewer being in the room, it was a reflection of activity in the room instead of a direct relationship with a single viewer.

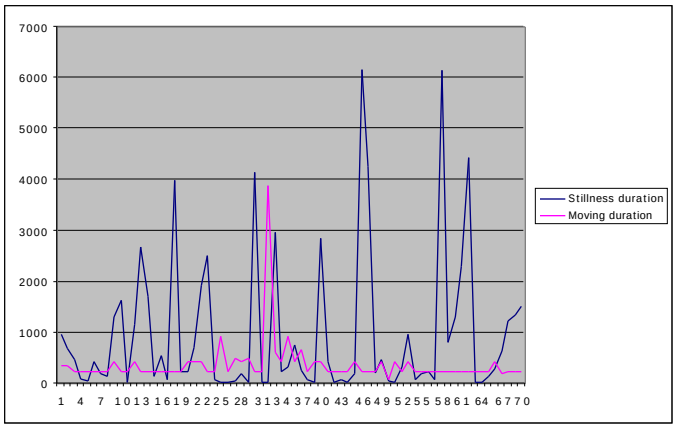
The general spatial sequence of the works had been resolved. *Wake* was to be the first installation viewed, then *Dropping* and finally *Under*. There was a need to rework and extend the wave-hitting sounds in *Wake*. Likewise *Dropping* only had three states and needed

to be reworked to reflect all of the possible activity states. The sound-only versions of the installations were suggestive of an aquatic environment. Previously the imagery had possibly been too literal. The reworking of the imagery would allow more ambiguous qualities to be developed in the imagery.

Removing one aspect from the installations for a period of time allowed a global approach to the project to be developed. It reduced the complexity of the installations for a period allowing refinements to be made to the works as a whole.

Stage Eight : The final versions

The data used to calculate the activity values was exported from the installation control software and imported into Excel[81].



37. Plot of stillness durations and moving durations.

[81] Excel is a spreadsheet program.

Once this data was plotted in a graph, it was discovered that occasionally there were values that were larger compared to the balance of the distribution of data and this occurred most often when inactivity was detected. The Lingo[82] code was checked to make sure this was not an error in the algorithm. A statistical measure such as standard deviation would be skewed by these unusual values.

A number of options were trialled to solve this problem. The first thing that was tested was reducing the time before the system went into a timeout mode. Then new data was collected with one of the installations set up. The lower timeout value did not result in higher values skewing the standard deviation. The optimal time of two and a half minutes was decided based on the plotted data. The use of smoothing algorithms to flatten the spikes was investigated. A median[83] filter was tested. This is a filter where a value is replaced by the median value of a range of nearby values. Ignoring these spikes, by changing the values that are close to the maximum to the median of the data, was tested. This last solution was found to give the best overall results.

The use of standard deviations still was not giving an accurate reflection of what was occurring in the

[82] Director's built-in scripting language.
[83] The median is the value that occurs most often in a data set. This is less likely to be affected by an unusually large or small number in a set of data than the mean.

gallery relative to past events. Because the data was in Excel a number of different solutions could be applied quickly to the data. Probability[84] was found to be most successful in this context of comparing the current events to past events. A type of 'model' of the space developed. Over time the system settled to calculating similar values if the events were close to normal activity but if an event was unusual the system would reflect this.

The sections where the waves hit and the underwater sections of *Wake* were re-shot. The descending, bottom and going back up footage of *Dropping* were re-shot. This allowed many of the successful aspects of the sounds-only version to be integrated into the visual components of the work. One example of this was making the edges of the images softer by a method using sections of footage as masks. The imagery was collaged and layered together more than in previous versions. The media displayed when the extreme activity states occur were created to have a greater contrast to the 'normal' states.

Out of the sound-only experiments, a general outline of the gallery layout had been developed. This needed to be finalised. A number of sketches were completed of possible configurations and views from different

[84] Probability is a measure of the likelihood a number will occur. It is calculated by dividing how many times a number has occurred in a data set by the total number of values in the data set.

positions in the gallery. The problem was that these did not always reflect the correct scale of the projections or where it was possible to place temporary walls in the gallery. A three-dimensional scale model of the gallery and installation was developed to allow for greater accuracy in planning.

Using this 3D model a number of variations were evaluated. These included:

- different positions for temporary walls between *Wake* and *Dropping*;
- the use of fewer temporary walls between the works;
- different positions for *Wake* in the first area of the gallery;
- *Wake* and *Under* both in the taller section of the gallery;
- the addition of more projections on the floor in *Wake* and more projections on the ceiling in *Under*;
- the use of a temporary wall to define a small foyer in the gallery;
- not blacking out all of the gallery ceiling near *Under*.

The final option was then tested in the gallery.

Evaluation of this stage

Exporting the data from Director allowed it to be examined in a different way so that an understanding of what the sensor data was showing could be

developed. Working with a program such as Excel allowed algorithms to be prototyped and the results to be plotted more quickly than working with Lingo allowed. The use of a three-dimensional model of the gallery allowed options to be checked rapidly. But this did not allow for the fully integrated experience of the multiple sounds and interactivity to be simulated. The reworking of the imagery to reflect the ambiguous effect of the sounds allowed the works to evoke the sensory experience of submersion in water more successfully than with images alone.

Summary of how the project was pursued

During the preliminary stages of the project the research questions were formulated. These developed from studio experimentation and observation of other interactive installations. The main stages of the project involved extensive testing and evaluation of solutions to the research questions while resolving the works. From the successful aspects of this process the methodologies outlined in **Appendix One** were developed.

Part Five: Conclusion

Liquid Sensations aimed to investigate the aesthetic and technical issues involved in evoking corporeal sensations with interactive video installations. The outcomes of the studio-based investigation are three new inter-related video installations.

- *Wake,* which evokes the sensations of water wrapping around the body that occur when entering the water from a beach and the relative calm once past the surf.
- *Dropping,* which evokes the sensory experiences of shallow breath diving, which are to descend under the water, to experience a feeling of the environment slowing down and then to surface again for air.
- *Under,* which suggests the bodily feelings of breathing out while looking up to the surface from under the water.

The aim of these installations is to suggest to the viewer the sensory experiences of submersion in water. During the development of these installations three questions were researched and solutions developed.

1) How can video installations be used to evoke sensory experience?

The works have used first person viewpoints. Sounds and imagery have been digitally manipulated and

processed to enhance the suggestive qualities of the media. The three video installations have been positioned in the gallery spaces in a manner which facilitates the experience, building to a powerful impact. The sounds have been orchestrated mindful of the juxtaposition of the works. The overall effect enhances the suggestion of submersion in water.

2) How can unobtrusive interactivity be used to enhance the viewer's engagement with the works?

Sensing techniques that are intuitive in the context of the gallery have been used. The control system is based on probability and has a memory and understanding of past and present action in the gallery. The control system averages the current activity levels of all the installations to orchestrate them together. These methods result in an unobtrusive integration of the viewer's engagement with the works.

3) What are the methods for a solo artist to develop interactive video installations?

A methodology for producing interactive video installations was developed (as documented in Appendix One). Commonly-used software and hardware have been used to achieve the immersive surround effect of the final installations.

These solutions and the final installations are the results of my investigation into 'what are the aesthetic and technical issues involved in evoking corporeal sensations of submersion in water?'

During the investigation a number of methods were developed that were successful and some which I would change in hindsight. The audio in the final works is one of the most successful aspects in terms of how it adds to the evocative, immersive effect of the installations. If greater emphasis was placed on the sound in the early stages of the project it may have developed differently. In addition, earlier adoption of 3D models of the gallery space may have made some of the experimentation with the works in the gallery unnecessary.

The methodologies developed here update previous attempts to evoke subjective sensory experiences. In a rapidly changing field the approach employed in this studio-based investigation will provide a model for other artists seeking to employ interactive video installations for their evocative potential as a medium.

Future directions

Future directions include the combination of some these successful aspects of the project and investigation of the possibilities of tactility. One project will develop prototype interactive objects that will evoke what might be found near the water. As children most people have listened to the sea in a shell at the beach. What I plan to do is explore this type of

experience with found objects on a beach to create an almost magical object that is made alive by technology. This has been supported by a development grant from the New Media Arts Fund of The Australia Council for the Arts. Expertise in building interactive objects which merge electronics, sensing and media technologies together will be developed by attending an orientation residency at Steim[85] in the Netherlands and the development of three prototype objects over a period of two months following the residency.

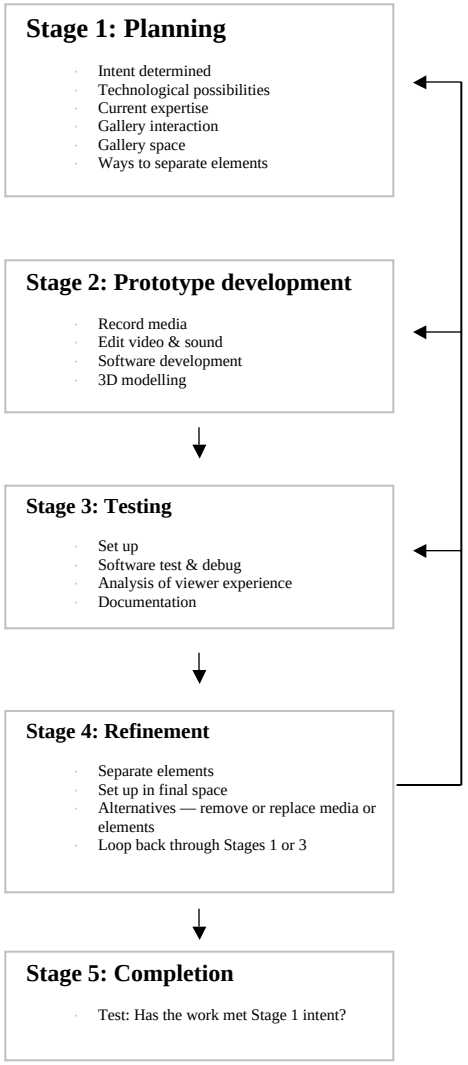
Liquid Sensations has been restricted to the use of video and sound technologies to evoke sensations. The next development will be to investigate whether removing video from the process and replacing it with interactive light systems would be successful. Other possibilities include the exploration of the tactile sensation of cold on the skin in the water by the use of air conditioning systems to change the room's temperature. The focus of these installations would be on the use of sound. Algorithmic numerical methods such as using probability to calculate the activity states and the use of sine functions to control the

[85] http://www.steim.nl steim (the Studio for Electro-Instrumental Music) is the only independent live electronic music centre in the world that is exclusively dedicated to the performing arts. Steim promotes the idea that touch is crucial in communicating with the new electronic performance art technologies. Steim produces software and technologies to aid performing artists to merge together performances, electronics and computer media. They run programs where artists visit for short residencies to develop projects, in both the early stages and the production phases.

underwater sounds in this research project will be explored further.

Appendix One: The methodologies of interactive video installation

The methodology outlined below was developed in the context of this research project and has relevance to developing other projects based on interactive video installation. The method has four sections. The overall methodology has been documented in a journal both by writing and drawing to aid in planning, recording and reflective thinking about the process.



38. Diagram of 'Methodologies of interactive video installation' process.

Stage 1: Planning

During this stage the sensory experience intended to be evoked is outlined. The senses, physical environment and activities involved in that experience are considered. What is sought is an integration of the media, human interaction and the configuration of these elements in the gallery space.

This is then examined in relation to:

- what is possible in terms of the technology available;
- the current expertise of the person developing the work;
- interactivity in the context of a gallery;
- the space in which the work will be shown.

An analysis to determine how different aspects of the works can be isolated is then performed, eg ways to develop algorithms separate from the media. If one aspect has more significance, this could be prototyped prior to the other elements.

Stage 2: Prototype development

1. Recording of the media.
2. Editing and manipulation of sound and video.
3. Development of the software, dividing into re-useable components where possible.
4. 3D models and sketches of the spatial layout of the work.

Stage 3: Testing

1. Setting up of the prototype in a room, preferably the gallery in which the work will be shown.
2. Software testing and debugging.

3. Analysis of work by episodic first-person narrative form and third-party observation.
4. Documentation of the prototype.

An episodic first-person narrative involves the viewer talking through their experience of the work following their actions in the gallery, describing their visual, aural and tactile observations.

Stage 4: Refinement and further development

Based on testing, the refinement of the works is undertaken. This is partly a return to Stage 2, taking into account the following aspects:

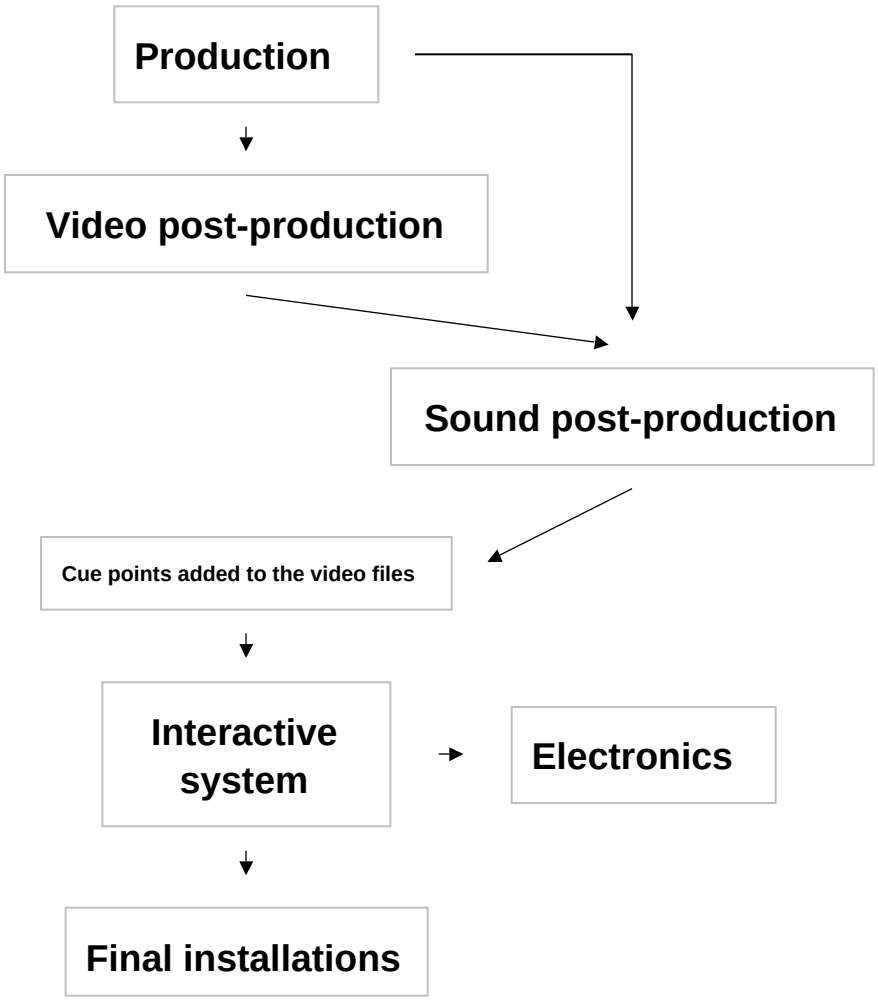
- Examining possible ways to work with just one aspect of the system, eg sound only.
- Re-recording of media as a solution to problems instead of the continual manipulation of the material.
- Where possible working in a room or the gallery in which the work will be installed, with the display technology and sensors. This allows the final physical effect to be tested rapidly.
- As the work develops, aspects of Stage 1 may need to be reviewed. Whether or not the intent was clear is examined. It may be found that the intent needs to be further refined.
- Examination of alternatives to the current prototype which may involve the removal of one aspect of the work, or other simpler ways of achieving the planned outcome.

This stage loops back to Stage 2 and it may take a number of prototypes before the most successful version is discovered.

Stage 5: Completion

The work is completed when it has met the intent defined in Stage 1. As works progress, the intent of the works may have evolved and a different sensory experience may have developed. This is part of the nature of studio-based practice. Also to some extent work always has possibilities for further development and the completion of an installation often has other factors involved such as deadlines for the exhibition of the work.

Appendix Two: Technical processes and methods



39. Flow diagram of the technical processes and methods.

The purpose of this appendix is to give a short summary and outline of the technology and methodology used to develop the works in the final exhibition. Over the period of my project these methods have evolved and developed and other solutions have been used at different stages.

Production

The video was recorded using a DCR TRV900 Sony camera in a Sony SPK-TRB sports casing. The underwater sounds were recorded using the built-in microphone of this casing. Additional sounds were recorded with a shotgun microphone encased in a balloon and wrapped with waterproof self-fusing tape.

Video post-production

The video was transferred to a G4 Macintosh computer using Firewire and Apple's Final Cut Pro software. The video was imported into Adobe After Effects version 5. The most common manipulations were scaling to crop imagery, masking the edges of images and layering of imagery. The sections that needed to have seamless loops were looped by a combination of frame matching and reversing the direction of the video. Changes were made to the colour balance and saturation. Brightness and contrast were adjusted using the levels filter.

Sound post-production

Low resolution proxy files of the imagery were rendered, with higher quality 16-bit at 48khz sound tracks. These were imported into Pro Tools Free. The sounds from the video footage were mixed with sounds recorded separately. The most common filters used were:

- noise reduction to remove background noise;
- pitch shifting to lower the pitch of the sounds;
- a filter to limit the peak of and to maximize the sound level;
- 4-band equalization of the sound.

With some of the sounds a bass enhancement filter was used which added harmonics to trick the ear into perceiving low bass frequencies that are not in the actual recording. The underwater sounds that were not synced to the video footage were treated in a similar way.

Adding of cue points to video files

The sounds were then exported from Pro Tools into After Effects and combined with the visual footage. All these sounds and video footage are then put together into a final composition which includes a QuickTime text track containing cue points, at the beginning and end of each section of footage. Once these are rendered via After Effects the cue points are not readable by Director. The cue points track is exported to a text file and reincorporated with the footage using QuickTime Pro. This results in one large movie file for each of the installations.

Interactive system

These video and sound files are imported into Macromedia Director. An outline of this system is in Appendix Five. In the final exhibition *Wake* runs on a Macintosh G3 running at 400 Mhz with two ATI Rage 128 display cards fitted, *Dropping* on a Macintosh G3 i-mac running at 733Mhz, and *Under* on a Macintosh G4 running at 733 Mhz. The video files for *Wake* are compressed with the Sorenson 2 codec, The video files for *Dropping* and *Under* are compressed with the QuickTime 5 DV codec and play at 12 frames a second. The computers are networked together on a 10Mb ethernet network using standard internet protocol.

Electronics

The sensors used are passive infra-red motion sensors that are designed for use in alarm systems. The relays in these are normally connected, which means that when they sense movement they turn a current off. This is reversed using another relay circuit. This is then wired into a button of a mouse. This results in a system that presses the mouse button when movement is sensed in the room.

3D Models of spaces

The 3D models of the spaces made during the last stage of the research were completed using the 3D capabilities of version five of Adobe After Effects.

Appendix Three: The software that controls the installations

This appendix is an explanation and summary of the scripts that control the interactive systems of the works.

The scripts are written in Lingo, Director's built-in scripting language. All three of the installations share the same library of scripts. Director's standard interface metaphor is a theatre. Items are placed on a 'stage' and these are controlled by a 'score' which is a sequence of frames. Rather than working with this metaphor I have created 'managers' to control certain aspects of the work. Each time a frame is played a selection of managers will step in to execute a section of the script[86]. These include scripts where states are checked and updated. This has been put in place to control the flow of events. Video and sound playback is smoother and faster when this type of looping system is used. The 'managers' have been divided into three classifications:

1. State managers
2. Managers to update the media
3. Custom methods for cue control and the inter-installation message system.

1) State managers

This type of script has two main components:

1. one updates the states based on what is sensed in the room;
2. the states are then logged in a text file which is read when the scripts are called.

Both of these scripts have sections related to calculating the activity state.

---

[86] A script refers to a series of interpretive text-based commands controlling the behaviour of the installation.

Updating the activity state

This updates a variable that holds whether or not there is currently movement in the room. It compensates for the fact that the sensors only update every second. It calculates the duration of the last sensed movement or how long since the last movement was detected. If there has been no movement in the room for two and a half minutes, the state is set to a timeout state and the system acts as if the installation is unpopulated. The activity state is then updated.

Logging of these states

This script controls the logging of events. Each time an event is sensed or the system switches to a timeout mode, this is saved to a text file. From this raw data of times when the events occurred, a list of the duration of movement and no activity in the work is calculated. Statistics such as the median, minimum and maximum are calculated for the duration values. The occurrence of each data value is counted. For each value a probability of that value recurring is calculated. These calculations are detailed further below.

When the works are first started these text files are read and the timeout states are ignored. The data relating to the starting and closing down of the installations is also ignored.

The calculation of the activity state

The procedure outlined below happens to both the movement and the stillness durations.

-- The value is first “flattened”
If theduration > (max_past_durations *.7) then theduration = median_ past_durations

-- The value is scaled so it falls between 1 and 1000
range_of_duration = max_past_durations - min_past_durations
scalevalue = 1000/range
theduration = theduration * scalevalue

-- This scaled value is added to a list containing the number of occurrences of each value.
-- This results in the number of times this duration has occurred being increased by one.

count_of_occurences_list[theduration] = count_of_occurences_list[theduration] + 1

-- The probability is calculated by dividing the number of times this current level has occurred by the total number of events that have been recorded.
durations_probability = count_of_occurences_list[theduration]/total_number_of_past_events
past_probabilities = add(durations_probability)

-- The new minimum and maximum of the probabilities range is then re-calculated.
past_probabilities_max = past_probabilities.max()
past_probabilities_min = past_probabilities.max()

-- This probability is then scaled to be a value between 1 and 20. This is taken away from 20. A value is returned where the higher the value, the more unlikely that event is.

range_of_probabilities = past_probabilities_max - past_probabilities_min
scalevalue = 1000/20
durations_probability = durations_probability * scalevalue

-- Then the activity state is calculated by a combination of the moving and stillness activity values. The last stillness activity value is taken away from the last moving activity value. This is then divided by 2 and has 10 added to it and the result is a positive number. The result of this is that a higher moving activity value returns in a final higher value and a lower stillness activity value returns in a lower activity value.

activity_state = ((Moving_durations_probability - Stillness_ durations_probability)/2) +10

-- If this activity value is equal to the last activity value, it is increased by one if the moving activity value was higher than the stillness activity value, and decreased by one if it was lower than the stillness activity value.

```
If activity_state = last_ activity_state then
        If Moving_durations_probability > Stillness_ durations_probability then
                activity_state + activity_state +1
        else
                activity_state + activity_state – 1
        end if
end if
```

2) Updating the media

The scripts in this section relate to controlling the video and sound. The main behaviour of each of the installations is controlled by the script that updates the imagery. This script is different for each of the installations.

Image updating

This script manages which section of the video file is being played. This depends on previous events and the current state of the installation. It also calls another script that checks which cue points have recently been passed.

Sound manager

Attached to most of the video images are corresponding sounds. The sounds that are played while an installation is in the still state and underwater are controlled by the sound manager. This script checks to see if there is currently no movement in the room. If this is true the sound object described below is added to the ‘actor list’. If the installation has sensed there is movement in the space it removes these sound objects. The number of sounds that are played is dependent on the activity state. The activity state is divided by 4, the maximum number of sounds played at a time is 5.

Each of these sound objects is chosen at random from 40 possible sounds. The sounds are looped and the time between the sounds is controlled by a value that is proportional to the activity value. The panning of the sounds between the left and right speakers and the sound level are controlled by a sine function. This sine function calculates a value based on the current time and current activity value. The raw values from these sine functions are scaled to the range of values that the sound level and panning functions handles.

3) Custom methods for cue management and the inter-installation message system

As well as the above core scripts there are several scripts to support them.

Cue point manager

This has two core uses: it sets the beginning and end points for the video loops and checks whether or not a cue point has been passed.

There exists a function in Director to do this but it was found to be quicker and more accurate to bypass this by comparing cue point times with the current time of the video using Lingo.

Network related scripts

A series of scripts to control the management and distribution of the activity states across the network. The activity states are sent from each individual computer to the computer running the installation named *Wake.* These are then averaged and sent back across the network. If the installation is not set up in a networked mode, this global activity state is replaced with the current activity state of the installation.

Appendix Four: List of illustrations

22. Robin Petterd, *Untitled*, 1999, interactive video installation, dimensions variable.

23. Robin Petterd, *Untitled*, 1999, interactive video installation, dimensions variable.

24. Robin Petterd, *Unsteady Motions,* 2000, interactive video installation, dimensions variable.

25. Robin Petterd, *Wake – in progress,* 2000, interactive video installation, dimensions variable.

26. Robin Petterd, *Wake – in progress*, 2000, interactive video installation, dimensions variable.

27. Robin Petterd, *Dropping – in progress*, 2000, interactive video installation, dimensions variable.

28. Robin Petterd, *Dropping – in progress*, 2000, interactive video installation, dimensions variable

29. Robin Petterd, *Dropping – in progress*, 2001, interactive video installation, dimensions variable.

30. Robin Petterd, *Dropping – in progress*, 2001, interactive video installation, dimensions variable.

31. Robin Petterd, *Wake – in progress*, 2001, interactive video installation, dimensions variable.

32. Robin Petterd, *Under – in progress*, 2001, interactive video installation, dimensions variable.

33. Robin Petterd, *Under – in progress*, 2001, interactive video installation, dimensions variable.

34. Robin Petterd, *Dropping – in progress*, 2001, interactive video installation, dimensions variable.

35. Robin Petterd, *Wake – in progress,* 2001, interactive video installation, dimensions variable.

36. Plan of possible positions for the works when they were set up as sound-only installations.

Appendix Five: Bibliography

Armes, Roy, *On Video*, Studies in Communication, Routledge, London, 1988.

Autio, N. and Parke, T., *The Seventh Wave*, Hot Chilli Press, Kirribilli , 2000.

Bachelard, Gaston, *Water and Dreams: An Essay on the Imagination of Matter*, Edith R Farrell, trans., The Pegasus Foundation, Dallas, 1942.

Ball, Philip, *H_20 a Biography of Water*, Orion Books, London, 1999.

Beam, M and Sorenson,V., *From Rich Media to the Sensorium: How to Understand Pervasive Computing*, http://www.store.yahoo.com/creativedisturbance/fromricmedto.html, accessed on 22/11/2001.

Beckmann, John, ed., *The Virtual Dimension: Architecture, Representation and Crash Culture*, Princeton Architectural Press, New York, 1998.

Bolter, J. and Grusin, J., *Remediation*, MIT Press, Cambridge, 1999.

Bosma, Josephine, et al., eds., *Readme! Filtered by Nettime, Ascii Culture and the Revenge of Knowledge*, Autonomedia, New York, 1999.

Campbell, J., 'Delusions of Dialogue: Control and Choice in Interactive Art.' *Leonardo*, 33.2 (2000): 133–36.

Cappellazzo, A, Pedrosa, A. and Wollen, P., eds., *Making Time: Considering Time as a Material*, Palm Beach Institute of Contemporary Art, Lake Worth, 2002.

Conlon, J., 'From the Back of the Eyelids - Public and Private Space in an Interactive Installation.' *Leonardo*, 32.5 (1999), 379–82.

Crawford, Chris, *Art of Computer Game Design*, 1982, http://www.vancouver.wsu.edu/fac/peabody/game-book/Coverpage.html, accessed on 28/4/1999.

Cubitt, Sean, 'Footprints in the Air: Mechanical Perception, the Media Arts, Diaspora and Sound', *Art & Design*, 11.7–8 (1996), 72–9.

D'Angour, Steven Shaw, *The Art of Swimming*, Ashgrove Publishing, Bath, 1996.

Daubner, Ernestine, *Interactive Strategies & Dialogical Allegories: Encountering David Rokeby's Transforming Mirrors*, http://www.itaucultural.org.br/invencao/papers/Daubner.htm accessed on 30/5/2001.

Davies C. and Harrison J., *Osmose: Towards Broadening the Aesthetics of Virtual Reality*, http://www.immersence.com/os_notes02.htm, accessed on 2/7/2001.

Davis, Erik, 'Experience Design.' *Archadia: Writing on Theology and Technology*, Samara Mitchell, ed., Australian Network for Art and Technology, Adelaide, 2001.

De Oliveira, N., Oxley, N., Petry, M., Archer, M., eds., *Installation Art*, Thames & Hudson, London, 1994.

Deakin, Roger, *Waterlog: a Swimmer's Journey through Britain*, Vintage, London, 2000.

Dove, Toni, 'Theater without Actors - Immersion and Response in Installation.' *Leonardo*, 27. 4 (1994), 281–7.

Dove, Toni, *Artificial Changelings — Overview*, http://www.funnygarbage.com/dove/overview.html, accessed on 13/7/2001.

Droege, Peter, ed., *Intelligent Environments - Spatial Aspects of the Information Revolution*, Elsevier Science B.V., Amsterdam, 1997.

Duncan, Michael, 'Bill Viola: Altered Perceptions.' *Art in America*, 3.3 (1998), 63–9.

Gage, John, *J.M.W. Turner 'a Wonderful Range of Mind'*, Yale UP, New Haven, 1987.

Gage, John, *Turner: rain, steam and speed*, Penguin, London, 1972.

Gilmore, J. and Pine, J., *The Experience Economy*, Harvard Business School Press, Boston, 1999.

Grau, Oliver, 'Into the Belly of the Image - Historical Aspects of Virtual Reality.' *Leonardo*, 32.5 (1999), 365–71.

Grusin, R. and Bolter, J., *Remediation*, MIT Press, Cambridge, 1998.

Hans Christian, A. and Dobyns, S., *Swimmers: Seventy International Photographers*, Aperture, New York, 1988.

Harris, Craig, ed., *Art and Innovation the Xerox Parc Artist-in-Residence Program*, MIT Press, Cambridge, 1999.

Huhtamo, Erkki, *Silicon Remembers Ideology, or David Rokeby's Meta-Interactive Art*, http://www.interlog.com/~drokeby/erkki.html, accessed on 21/6/2001.

Jennings, Pamela, *New Media Arts: New Funding Models*, 2000, The Rockefeller Foundation, http://www.digital-bauhaus.com/html/mediaArtReport/New_Media_Arts_New_Funding_Models.pdf, accessed on 5/1/2001.

Jones, B. and Massumi, B., 'The Interface and I: A Conversation Between Toni Dove and Brian Massumi', *Artbyte,*1.6 (1999), 30–7.

Kahn, Douglas, *Noise, Water, Meat: A History of Sound in the Arts*, MIT Press, Cambridge, 1999.

King, Mike, *Osmose Review*, http://web.ukonline.co.uk/mr.king/writings/earts/download/Osreview.rtf, accessed on 12/7/2001.

Krueger, Myron, *Artificial Reality*, 2nd ed., n.p., Addison-Wesley, 1991.

Kuspit, Donald, 'Deep TV: Bill Viola's Via Negativa', *Artforum*, 33.9 (1995), 86.

Laurel, Brenda, ed., *The Art of Human-Computer Interface Design*, Addison-Wesley, Massachusetts, 1990.

London, Barbara, *Bill Viola: Installations and Videotapes*, Museum of Modern Art, New York, 1987.

London, Barbara, *Video Spaces: Eight Installations*, Museum of Modern Art, New York, 1995.

Lunenfeld, Peter, ed., *The Digital Dialectic: New Essays on New Media*, MIT Press, Cambridge, 1999.

Lunenfeld, Peter, *Snap to Grid: A User's Guide to Digital Arts, Media and Cultures*, MIT Press, Cambridge, 2000.

Lynn, Victoria, ed., *Space Odysseys: Sensation & Immersion*, Art Gallery of New South Wales, Sydney, 2001.

Meacham, Steve, 'Imagination blasts off as artists find their personal space' *The Sydney Morning Herald*, 18/8/2001.

Metz, Tracy, 'Oosterhuis Associates and NOX' *Architectural Record*, 187 (1999), 202–11.

Meyer, Marc, *Being & Time: The Emergence of Video Projection*, Buffalo Fine Arts Academy, Buffalo, 1996.

Novak, Marcos, 'Liquid Architectures in Cyberspace', *Cyberspace:First Steps*, Michael Benedikt, ed., MIT Press, Cambridge, 1991, 225-54.

Oosterhuis Associates, *trans-ports website*, http://www.trans-ports.com/trans-ports.html, accessed on 22/6/2001.

Packer, R. and Jordan, K., eds., *Multimedia: From Wagner to Virtual Reality*, W.W. Norton, New York, 2001.

Parks, John, 'Capturing Moments of Danger: Painting Pools by Lorraine Shemesh' *American Artist*, 59.637 (1995), 44–9.

Pease, Alan, *Body Language*, Camel Publishing, Sydney, 1981.

Penny, Simon, ed., *Critical Issues in Electronic Media*, State University of New York Press, New York, 1995 .

Picard, Rosalind W., *Affective Computing*, MIT Press, Cambridge, 1997.

Raban, Johnathon, ed., *The Oxford Book of the Sea*, Oxford UP, Oxford, 1992.

Rokeby, David, *Silicon Remembers Carbon 1993-2000*, http://www.interlog.com/~drokeby/src.html, accessed on 5/6/2000.

Rokeby, David, *The Construction of Experience: Interface as Content*, http://www.interlog.com/~drokeby/experience.html accessed on 21/6/2001.

Rokeby, David, *Transforming Mirrors:Subjectivity and Control in Interactive Media*, http://www.interlog.com/~drokeby/mirrors.html, accessed on 5/6/2000.

Rush, Michael, *New Media in Late 20th-Century Art*, London, Thames & Hudson, 1999.

Saul, Shiralee, *Round Trip Ticket*, http://www.abc.net.au/arts/digital/stories/s368114.htm, accessed on 1/10/2001.

Schwartz, Ineke, *Testing Ground for Interactivity*, http://synworld.t0.or.at/level3/text_archive/testing_ground.htm, accessed on 2/8/2001.

Seijdel, Jorinde, *B O R E a L I S*, http://www.montevideo.nl/second/borealis.html, accessed on 18/6/2001.

Sellars, D. and Ross, P., eds., *Bill Viola*, Whitney Museum of American Art in association with Flammarion, New York, 1997.

Shedroff, Nathan, 'Information Interaction Design: A Unified Field of Design.' *Information Design*, Robert Jacobson, ed., Cambridge, MIT Press, 1999, 267-92.

Shedroff, Nathan, *Experience Design*, first edn., New Riders Publishing, Indianapolis, 2001.

Simpson, Robert S, *Videowalls: The Book of the Big Electronic Image*, 2nd edn., n.p., Focal Press, 1997.

Small, Peter, *Magical a-Life Avatars: A New Paradigm for the Internet*, Manning Publications, Greenwich, 1998.

Spielmann, Y, 'Intermedia in Electronic Images.' *Leonardo*, 34.1 (2001), 55-61.

Sprawson, Charles, *Haunts of the Black Masseur: The Swimmer as Hero*, U of Minnesota Press, Minneapolis, 1992.

Spuybroek, Lars, 'Motor Geometry', *Architectural Design*, 68.5–6 (1998), 49–51.

Stack, Trudy Wilner, ed., *Sea Change: The Seascape in Contemporary Photography*, n.p., Center Creative Photography, 1999.

Stephen, Jones, *Some Comments on a Philosophy of Virtual Reality: Issues Implicit in 'Consciousness Reframed'*, 1997, http://www.culture.com.au/brain_proj/caiia.htm, accessed on 25/5/2001.

Van Cleef, Connie, 'Water Worlds: Design and Construction of an Exhibition Pavilion in Neeltje Jans, the Netherlands,' *The Architectural Review*, 204 (Dec 1998), 463.

Vasulka, Steina, *Borealis 1993 a Projected Video Environment by Steina*, http://www.santafe.edu/~woodyv/Steina/08BOREAL.PDF, accessed on 17/4/2001.

Vasulka, Steina, *My Love Affair with Art: Video and Installation Work*, 1995, http://www.c3.hu/scca/butterfly/Vasulkas/synopsis.html, accessed on 17/5/2001.

Viola, Bill, *Reasons for Knocking at an Empty House: Writings 1973-1994*, MIT Press, Cambridge, 1995.

Viola, Bill, *The Relationship between Video and Installation*, http://www.sfmoma.org/espace/viola/noqthtml/content/inter02.html, accessed on 13/5/2001.

Viola, Bill, *The Stopping Mind*, http://www.sfmoma.org/espace/viola/dhtml/content/viola_gallery/BV02.html, accessed on 19/7/2001.

Viola, Bill, *Viola on Waking Up*, http://www.sfmoma.org/espace/viola/noqthtml/content/inter04i.html, accessed on 13/5/2001.

Young, Michael Dunlop, *The Metronomic Society*, London, Thames & Hudson, 1988.

Zvonar, Richard, 'Case Study, Artifical Changelings by Toni Dove with Alex Noyles.' *Interactivity*, 2.14 (1996), 62.

Appendix Six: Influential web-sites and mailing lists

Ars Electronica Center. http://www.aec.at/index1.html

^ architexturez. http://www.architexturez.com/

ACM SIGGRAPH. http://www.siggraph.org/

Artbyte. 2001. http://www.artbyte.com/

Audiovisualizers. http://www.audiovisualizers.com/

Bill Viola section of the SFMOMA. 2001
http://www.sfmoma.org/espace/viola/fr_splash.html

Doors of Perception. 2001 http://www.doorsofperception.com/

Experience Design Resources. http://www.nathan.com/resources/

FilmSound.org. http://filmsound.studienet.org/

Intersections of Art, Technology, Science & Culture - Links. 2001.
http://userwww.sfsu.edu/~infoarts/links/wilson.artlinks2.html

invenção. http://www.itaucultural.org.br/invencao/invencao.htm

keyframe.org. http://www.keyframe.org/home/

Live Experimental Video. http://shoko.calarts.edu/~cchaplin/lev/lev.html

Michael Heim. http://www.mheim.com/

nettime-l mailing list http://www.nettime.org/

Physical Computing --A Hands On How To Guide for Artists.
http://fargo.itp.tsoa.nyu.edu/~dano/physical/physical.html

Rhizome.org. 2001 http://rhizome.org/fresh/

SoundCulture. http://www.soundculture.org/

STEIM: Center for Research & Development. http://www.steim.nl/

Zentrum für Kunst und Medientechnologie Karlsruhe. http://www.zkm.de/

Appendix Seven: Curriculum Vitae

Academic Record

1990-93	Bachelor of Fine Arts (Honours), University of Tasmania (Hobart)

Grants/Awards

2001	Australia Council, Development grant to 'gain expertise in making interactive objects which merge sensing, electronics and media technologies together'
1999	Australian Postgraduate Award Australian Network for Art and Technology conference fund to attend Siggraph99, USA and INVENÇÃO, Brazil CAST touring exhibition development funding Australia Council, New Works grant for the development of 'Archiving Imagination' Finalist in The Australian Internet Awards in the 'Use of Multimedia Section' Finalist in The National Digital Arts Awards Special mention in the Internet Multimedia Miniature competition organized in conjunction with the Warsaw Autumn festival
1996	Arts Tasmania, Individual Grant to enable the integration of virtual reality technologies into multimedia works

Corporate Support for work

1998	Macromedia and ComputerLand, Tasmania for interactive works that were part of the 'Ecstasy of Communication' theatre project

Solo Exhibitions

1997	'Clouds Of', Sidespace Gallery, Hobart, Australia, 11 – 21 Sept
1996	'A Window', Gallery Dunce, Hobart, Australia, 18 – 24 Oct

Group Exhibitions/Screening/Events/Inclusions

2000	‘Through the Looking Glass’, Beachwood, Ohio, USA, 15 – 30 Apr, <http://www.voyd.com/ttlg/>
	‘Shining Pixels’, Salamanca Arts Centre, Hobart, Australia, 10 – 29 May
	‘NFOS 2000 (off-line)’ CD-rom, <http://grafika.splet.net/infos2000/>
	‘Resoundings’ , Volume 3, Issue 1 Millersville University <http://marauder.millersville.edu/~resound/*vol3iss1/>
1999	‘TechnoOasis – Siggraph’, Los Angeles,USA, 8 – 13 Aug
	‘International Festival of New Film’, Split, Croatia
1998	‘Ecstasy of Communication’, Hobart, Australia, 27 – 13 Feb
	‘Best of Two Worlds’, Net Art survey, <http://aleph-arts.org/m2m/index.htm>
	‘Loud Online Gallery’ <http://www.loud.net.au/gallery/>
	‘Surface’, frAme e-journal, <http://human.ntu.ac.uk/frame/frame.html>
	‘L.A. Freewaves Festival’, Los Angeles, USA, 8 Sept – 4 Oct
	‘SEAFair 98’ , Skopje, Macedonia, 2-9 Oct
	‘International Festival of New Film’, Split, Croatia, 5 – 11 Oct
	‘VI Bienal Internacional De Poesia Experimental’, Brazil, 18 Dec
1997	‘Empire’, Hobart, Australia, 26 – 30 May
1996	‘audible evolution’, Eventworks, Boston, USA, 10 Apr
	‘Sky Theatre Rave’, Hobart, Australia, 6 Apr
1995	‘BIT.MOVIE 95’, Riccione, Italy, 13 – 17 Apr
	‘Beep 'n' Click’, Entrepot, Centre for the Arts, Tasmania, Australia, 13 -19 Sept
1994	‘Video’, Fine Arts Gallery University of Tasmania, 6 – 12 May
	‘Memento’, New Media Network, Melbourne, 13 Oct – 13 Nov
	‘e-TOPIA’, New Media Network, Melbourne, 15 Nov – 11 Dec
	‘New Minimalism’, Experimenta '94, Melbourne, 26 Nov
1993	‘Videoformes’ as part of ‘Nocturnes Magnetises’, France, 21 – 24 Apr
	‘Consume’, A touring exhibition of electronic art, Wynyard, Launceston, Devonport, Hobart, 8 Apr – 17 May
	‘International Audio Visual Experimental Festival’, Arnhem, The Netherlands, 4 – 10 Nov

‘All Over the Place, The Honours Shows’, Plimsoll Gallery, Hobart, Australia, 26 – 29 Nov

Collaborations

1998 – 97 Ongoing collaborations with Dr Diane Caney
The ‘Ecstasy of Communication’: a collaboration organised by Salamanca Theatre Company between five core artists from across Australia
Collaboration with writer Elizabeth Dean on ‘A Rich Fertile Country’: a Tasmanian Arts Council Identity Distinct project for the Midlands area of Tasmania

1996 ‘Sky and Land’ <http://www.artschool.utas.edu.au/skyandland/>, a project jointly organised with artist Peter Young

Writing

1999 Conference Report Siggraph ‘99 Los Angeles Convention Centre, USA, *Australian Network for Art and Technology News*, Dec 99 – Feb 00, Issue 39

Major Presentations

2001 Conference paper ‘The language of interactivity in the context of immersive video and sound installations’ for Spatial Cultures Conference at the University of Newcastle, 3 June

1999 Conference paper ‘Rewrapping the real world: using hyper-narrative in virtual spaces to create un-common realities’; Dr David Casacuberta, Robin Petterd, Adrianne Wortzel, for INVENÇÃO, Sao Paulo, Brazil, 25 – 29 Aug

1996 Joint Presentation with Dr Cassandra Pybus ‘The Development of the Australian Humanities Review’ for the AVCC symposium on Electronic Publishing, Sydney, Australia
‘The possibilities of realtime 3D Visualisation Technologies’ as part of the CSIRO’s Division of Marine Research, In Brief seminar program.

Reviews

2001 ‘Writing the Wave nodes, hypertext, trajectories’, Linda Carroli, *Artlink*, Vol 21,

	No 3
2000	‘Segue, stretto, strafe & sashray’, Dean Kiley, *Realtime* No 38 Aug – Sept
	‘Exposing an emerging genre’, Kaz Madigan, *Realtime* No 37, June – July
	‘New Dimensions’, Margaretta Pos, *The Sunday Tasmanian*, 6 Feb
1998	‘Art mimics vid-games’, Jenny Sinclair, *The Age*, 3 Mar
1997	‘Web Site takes close look at Church St’, *The Star*, 7 Aug
	‘Skyandland’, Joerg Andersch, *The Saturday Mercury*, 25 Jan
1996	‘The Tasmanian Connection’, Leigh Hobba, *Artlink*, Vol 16, Nos. 2 & 3 (Fall), pp 61–2
	‘Virtual art launches revamped gallery’, Llyssa George, *The Southern Star*, 24 Oct

Other Professional Experience

1998 – 2001	Casual teaching in e-media program, Tasmanian School of Art, University of Tasmania, Hobart
2000	‘Of the Sensors’ workshop for Art Teachers Conference, Hobart, Sept
1998	Polar Circuit Artists Residency, Lapland, Finland
1996	Contract with the CSIRO Division of Oceanography to develop high-end visualisation prototypes of scientific data. Co-organiser/ Curator of ‘Sky and Land’, <http://www.artschool.utas.edu.au/skyandland/> Technical Assistant (part time), Computing Studio, Tasmanian School of Art, University of Tasmania, Hobart Director of ‘The Other Edge’, <http://www.otheredge.com.au>
1995	Research Assistant (part time), Computing Studio, Tasmanian School of Art, University of Tasmania, Hobart Technical Assistant (part time), Computing Studio, Tasmanian School of Art, University of Tasmania, Hobart