Visual Melodies

Design and Evaluation of an Interactive Art Installation for Clinical Environments

Amy Yi-Chun Chen

Doctor of Creative Arts

University of Technology, Sydney

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CERTIFICATE OF AUTHORSHIP/ORIGINALITY

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

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

Signature of Candidate

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Abstract

Over the past decades there has been a growing recognition of the value of art activities, such as visual arts, music, drawing, dance, poetry and writing, as therapeutic approaches to enhance healthcare settings. Numerous studies have identified the value of art and design in decreasing depression and anxiety and creating a holistic healing environment for hospital visitors and patients, as well as offering a positive working environment for staff. Therefore, I propose that interactive multimedia art offers an important new therapeutic avenue as a service for engaging visitors, patients and staff in hospitals.

Visual Melodies is an interactive art installation that engenders feelings of calm and relaxation in users. In this exegesis, I describe the theoretical background, development and evaluation of Visual Melodies. This creative trajectory draws on practice-based research, with the aims to create an interactive art installation, to evaluate its therapeutic potential, and to identify the semiotic dimensions of multimedia art that are most generally effective for producing therapeutic effects.

Based on the literature of the different techniques used in art therapy, colour therapy and music therapy, I propose a bridge between these three therapies through a platform of an interactive multimedia installation – harnessing images, colours and sounds. Eight design principles that form the foundation of the practice were developed along with the discussion of the design elements that have been shown to be effective for enhancing relaxation. In line with the design principles, the design

practice was then developed as a series of original landscape artworks and interactive animations accompanied by music specifically composed for the researcher. Audience feedback to the installation in a hospital waiting room was studied as a way of assessing its therapeutic potential. The evaluation feedback has been very positive and welcoming from visitors, patients and staff of all ages. Overall, Visual Melodies provides a relaxing and playful experience for the participants. The feelings most often reported were that of being relaxed, followed by calm, diverted, evoking memories and happy.

This project demonstrates that it is beneficial to create a relaxing and supportive therapeutic interactive multimedia artwork for promoting holistic healing environments. The practice-based research and findings in this exegesis extend our understanding of how we can fuse artwork and technology, to transform our healthcare settings from sterile treatment spaces, into healing places where 'care' is built into the environment itself.

Chapter 1

Introduction

We need the tonic of wildness. … At the same time that we are earnest to explore and learn all things,
we require that all things be mysterious and unexplorable, that land and sea be infinitely wild,
unsurveyed and unfathomed by us because unfathomable. We can never have enough of Nature.

(Thoreau, 1964[1954], p. 232)

The twentieth century brought much experimentation into the relationship between visual art and music. Paul Klee applied counterpoint and polyphony to convey the idea of sonic images. Wassily Kandinsky looked towards music for the roots of abstract visual expression. Apart from these visualisations of music on the painted canvas, many musicians were also gathering inspiration from natural landscapes and paintings. For example, Antonio Lucio Vivaldi's best known work is "The Four Seasons", composed in 1723, which is a set of four violin concertos depicting natural scenes in music.

More recently, advancements in computer technology have led to corresponding advances in the use of computer technology in art and design practices. For example, in 2000, Walt Disney employed computer technology to renew the musical animation, "Fantasia", first released in 1940, to create a new "Fantasia 2000". Over the past decades, this technological advancement has allowed artists/designers to explore outside of the boundaries that they were unable to cross in the past. Artists' explorations with music and images have become more experimental and are often also interactive. Comparing fixed and static photography, radio, or film to the dynamic and responsive internet or interactive environments, interactivity is possibly the most novel and challenging aspect of new media (Austin & Doust, 2007). As such, interactive artworks employing sound and images and concerning user-centric

or audience-based behaviours have become an important art field to explore. A further challenge is to shift the platform of interactivity from being in front of a computer to a more open physical setting, and so not limiting interaction only to moving a mouse, but also extending it to physical movement and creation.

1.1 Personal Motivation

The idea for creating an interactive multimedia art installation for clinical environments was developed several years ago when visiting my grandfather undergoing chemotherapy in hospital. While visiting my grandfather, I, as a hospital visitor, was very upset seeing my grandfather being critically ill and very uncomfortable and scared within that environment. My grandfather was in pain and very tired and missed being in his own home, and the hospital staff were always busy doing their jobs and looked very serious and devoid of emotional expression. When visiting my grandfather, most of the time I just watched him in bed with very few conversations, or just sat and waited and did nothing, or watched the TV screen with the sound muted even though I was not really watching what was on. I found that with the time I spent doing nothing, I started to think about how he was suffering and why he had this illness. Many negative emotions filled my mind and I was getting more and more upset. That experience shaped my view of healthcare settings - there was so much anxiety, anger, discomfort and sadness in that environment, and so much time spent waiting and doing nothing. From that experience, I began to think that it could be beneficial if the hospital became a place not just to treat illness physically but also to provide positive and supportive emotional experiences for patients and visitors while staying and waiting in the hospital. It was this thinking that inspired me to create something to ease people's anxiety and provide a positive and relaxing experience in clinical environments.

Coming from a visual communication design background, working as a graphic and website designer, I have designed numerous print materials and websites for the purpose of business promotion and advertising. However, I have also often wondered how to enhance the value of a design work, and how to present graphic design in a

practical and applicable way, such that it becomes something that was more functional than simply having a visual aesthetic quality for marketing purposes. Additionally, apart from making creative pleasing images to communicate a message or an emotion, I have often wondered to what extent a creative artwork is able to contribute to a person's emotional response and health, and what would be possible if the combination of art/design and technology was used for a therapeutic purpose, that is, to address the negative emotions that can arise in clinical environments (Figure 1.1).

Art/Design + Technology + Therapy = ?

Figure 1.1 What would be possible with the combination of Art/Design, Technology and Therapy?

I have often found it useful for myself when I am stressed to look at beautiful things, to be in a natural environment, or listen to gentle relaxing music; these things bring a positive change in my mood through positive distraction towards something more soothing and calm. Therefore, I thought of applying my skills of creating lovely images and developing interactive animated websites to create something beautiful and interactive that people could engage with, and which would help them feel better. This led me to create a multimedia art installation with therapeutic potential. An artwork that combines interactive technology may offer an important new therapeutic avenue that provides a playful and positive emotional experience for engaging patients and their visitors in hospitals as well as staff.

Thoreau wrote, "we can never have enough of nature". For the design practice created in this study, bringing nature into the hospital setting could be a means of promoting positive emotions that leads to relaxation and stress relief.

1.2 Methodology: Practice-Based Research

The main objectives of this creative practice research were:

1. to create the interactive art installation engendering relaxation and stress relief;
2. to evaluate the therapeutic potential for users in a hospital setting; and
3. to identify the semiotic dimensions of multimedia art that are most generally effective for producing therapeutic effects.

The research approach used in this study is based on practice-based research. As described by Dallow (2003), practice-based research is the combination of the presentation of a finished creative artwork and the documentation that describes the development process of creating the artwork. The research into the creative arts could include the behaviour of practice, the development of software and hardware, and further, what is actually possible through creation (Dallow, 2003).

According to Candy and Edmonds (2011), the trajectories of practice and research include *theory*, *practice* and *evaluation*. These three elements are carried out by the practitioner through the process of establishing theoretical frameworks, creating physical artworks and conducting evaluation studies. *Theory* in the context of practice-based research comprises the different ways of examining and applying knowledge and critique considered relevant to the practice, which is often referred to as design criteria or operating strategies in the creative practice. *Practice* is the primary element in the trajectories of practice-based research which includes conducting practice-making and generating activities for creating tangible outcomes. Informing the practice, the role of *evaluation* is to assess the practice and gain a better understanding of the research practice, which entails observation, recording and analysis as part of a semi-formal approach. However, Dallow (2003) pointed out the complexity of the relationship between actual creative arts practice and theoretical frameworks, and the difficulty of plotting a rational thought from the unknown imagination, which is to produce something new, to the tangibility of the artwork or productions of artistic practice. Sullivan (2005) pointed out that "theories

serve as important points of reference in research as they embrace conceptual systems, explanatory structures, methodologies, and practical pursuits that offer insights into issues that shape fields of inquiry" (p. 98). In regard to the complexity of the relationship between practice and theory, Sullivan (2005) also addressed that artists need to investigate "the potential for knowledge creation that exists *between* theory and practice, and *beyond* assumed discipline boundaries" (p. 152). As such, the trajectories of theory and practice in making the creative practice as research are intertwined and overlapping.

In accordance with the trajectories of practice-based research, the interactive art installation created in this research draws on existing theoretical arguments in order to address the criteria and guidelines that are already established to have a therapeutic effect. This process thus acts as the foundation of the theoretical framework that underlies the creation of the interactive art installation. In line with this, the framework developed also shapes the evaluation study to assess the interactive art installation for its effectiveness. Therefore, the structure for the creative practice presented in this exegesis is as follows:

1. Examine the literature to identify the design principles as the fundamental theoretical framework for creating the installation.
2. Create the interactive multimedia art installation based on the literature.
3. Evaluate its therapeutic potential, and identify which aspects might be particularly effective at encouraging relaxation.
4. Present an overview of the trajectory of this practice-based research by drawing together the theoretical frameworks and the practice, with the evaluation study results.

Following this structure, the chapters of this exegesis are outlined as follows.

1.3 Structure of the Exegesis

In Chapter 2, I begin by introducing a few approaches towards matching design and emotional response, as a prelude to a more extensive discussion on the forming of

principles to create interactive multimedia art with therapeutic potential. I clarify the different techniques used in art therapy, colour therapy and music therapy and propose a bridge between these three therapies through interactive multimedia. I then examine the design elements that have been supported for therapeutic use, from the different aspects of images, colours, music, and technology, to develop the design principles that form the foundation of the creative process. Finally, I present three short case studies of art installations that have been installed in healthcare settings and report what I have learnt from these installations. I conclude with the themes that are created in this project, accompanied by the eight design principles derived from the literature review.

In Chapter 3, I present the creative practice of the Visual Melodies interactive installation. Based on the design principles outlined in Chapter 2, the design goals for creating the interactive installation are differentiated by therapeutic effect, aesthetic of the content, interactivity, interface usability and technical factors. I also describe how the design principles and goals are implemented into the practice. I then detail the development process of the themes, including the conceptual development, content development and programming development, as well as the development of the physical interface that enables the interactivity of the installation, including the input parameters and appearance of the controllers. An overview of the evolution of the Visual Melodies installation is then presented.

In Chapter 4, I present the results of the audience feedback evaluation, that took place during the installation of Visual Melodies in a hospital setting. In this chapter, I first detail the methods of the evaluation that included observations and video-recorded interviews. Next, I present the results from my observations: I identify who chose to use the installation and the ways in which they interacted with the installation. Following this, I present the results from the video-recorded interviews. I describe how participants felt after using the installation and which aspects were reported by the participants to be effective for producing feelings of relaxation and calm. Suggestions for the improvement of Visual Melodies from participants are also included in this chapter.

Finally, Chapter 5 presents an overview of the trajectory of this practice-based research project, including the elements of theory, practice and evaluation by drawing together the theoretical frameworks developed in Chapter 2 and the creative practice described in Chapter 3, with the evaluation study results conducted in Chapter 4. In doing this, the eight principles developed as the foundation of the development of the creative practice are utilised as the core to frame the relationships between theory, practice and evaluation. The potential future development and applications of Visual Melodies are also addressed in the conclusion.

Chapter 2   Background

> There is a turning point in the course of healing when you go from the dark side to the light, when your interest in the world revives and when despair gives way to hope. As you lie in bed, you suddenly notice the dappled sunlight on the blinds and no longer turn your head and shield your eyes. You become aware of birdsong outside the window and the soothing whir of the ventilation system down the hall. You no longer dread the effort needed to get up, but take your first cautious steps, like a child, to explore the newfound space around you. The smell of food does not bring on waves of nausea or revulsion, but triggers hunger and a desire to eat. The bed sheets feel cool and soothing – their touch no longer send shivers through you, like chalk-squeak on a blackboard. Instead of shrinking from others, you welcome the chit-chat of the nurse who enters the room.
>
> (Sternberg, 2009. p. 1)

Hospital waiting rooms seem by their nature to be associated with feelings of powerlessness and discomfort. This was indicated by a spouse of a critically ill patient describing her waiting experience in hospital: "We walked around like robots… just staring at the walls, no purpose to our movement, just moving" (Leske, 1992, p. 393), and "we felt powerless, like a yo-yo, with someone else pulling the strings" (p. 394).

Studies have investigated the activities that patients prefer to do while waiting in hospital waiting rooms in order to make the waiting rooms more pleasant and comfortable. Hyde *et al.* (1998) for example, found that most patients in a waiting room preferred listening to music, reading, and chatting with other patients prior to their surgery. They also suggested that hospitals should provide a variety of activities for patients to choose, including television, video facilities, games, and a good selection of reading materials and music. More recently, Cooper and Foster (2008)

found that patients awaiting treatment or follow-up consultation in a waiting room were most in favour of listening to music (66%), followed by listening to the radio (19%), watching television (9%), reading books (3%) and playing cards (3%). However, opportunities that health services provide for activity are generally limited to watching television or reading magazines. While studies have mainly focused on the patients undergoing medical treatment, visitors and caregivers who are close to the patient are also often affected by the medical problem afflicting the patient. A relative or loved one of a patient may also be facing a stressful, frightening or uncertain waiting time. When stress is mitigated and relaxation is induced, the body's parasympathetic nervous system becomes active, following which muscular tension is released, blood pressure drops, the heart rate slows down, the respiratory rate decreases, the immune system is strengthened and endorphins are released (Benson & Klipper, 1975). As such, hospital waiting rooms are areas that should be made as pleasurable, sympathetic and hospitable as possible; not only for reducing the anxiety of patients but also for improving the quality of the waiting experience for visitors or caregivers.

There is a growing recognition of the value in using art activities, such as visual arts, music, drawing, dance, storytelling, poetry and writing, as therapeutic approaches to enhance healthcare settings (Daykin, et al., 2008; Heenan, 2006; Lane, 2005). Numerous studies have identified the value of art and design in decreasing depression and anxiety and creating a holistic healing environment for hospital visitors and patients (Daykin, et al., 2008; Schweitzer, Gilpin, & Frampton, 2004), as well as offering a positive working environment for staff (Burton, 2004; Naidoo & Naidoo, 2004). Therefore, I propose that interactive multimedia art offers an important new therapeutic avenue as a service for engaging visitors, patients and staff in hospitals.

This chapter proceeds by introducing a few approaches towards matching design and emotional response in Section 2.1, as a prelude to a more extensive discussion on the forming of principles to create an interactive multimedia artwork with therapeutic potential, specifically to engender a relaxing experience and stress reduction. In Section 2.2, I clarify the different techniques used in art therapy, colour therapy, and

music therapy with particular reference to their efficacy in promoting relaxation and stress reduction, and I propose a bridge between these three therapies through a platform of an interactive multimedia installation – using images, colours and sounds. Section 2.3 addresses the following questions, which I argue to be key to designing such an installation:

1) What kinds of images have been proven to be effective for therapeutic use?
2) What kinds of colours have been identified for enhancing relaxation?
3) What kinds of music have been suggested to induce relaxation?
4) What kinds of technology have been employed in healthcare settings?
5) What else needs to be taken into consideration to constitute an overall therapeutic milieu?

Along with the discussion of these elements I introduce a set of design principles that forms the foundation of the design practice. In Section 2.4 I examine the art installations that have been installed in healthcare settings to report on what I have learnt from these installations. Finally, I conclude with the themes that are to be created in this project, accompanied with the design principles derived from the literature review in the conclusion.

2.1 Designing for Emotion

People say the effect is only on the mind. It is no such thing. The effect is on the body, too. Little as we know about the way in which we are affected by form, by colour, and light, we do know this, that they have an actual physical effect. Variety of form and brilliancy of colour in the objects presented to patients are actual means of recovery.
(Nightingale, 2008 [1860], p. 44)

The focal point of this design practice is to create an interactive multimedia installation with therapeutic potential that can engender relaxation and mitigate stress in hospital visitors, patients and staff. The question is, how can we design interactive multimedia for enhancing the desired positive emotions and delightful user experience? Over the past decade, numerous designers and researchers have widely discussed this question in exploring the relationship between design and emotional

responses. Several approaches have been proposed, and the two most widely referenced approaches are Patrick Jordan's psychological pleasure theory and Donald Norman's neurobiological emotion theory. Jordan (2000) proposed that there are four conceptual types of pleasure[1] when people perceive a designed product: first, physio-pleasure that is derived from sensory organs; second, psycho-pleasure related to its usability and satisfaction; third, socio-pleasure which is gained from relationship with others; and fourth, ideo-pleasure referring to the value it embodies. In Norman's (2004) theory, three levels of brain mechanism were proposed: first, the visceral level which makes automatic judgments about a product's appearance; second, the behavioural level which relates to the pleasure of its usability; and third, the reflective level which connects to self-image and memories. Although the two approaches were drawn from different scientific fields, they share aspects in common when looking at the relationship between emotional effect and designed product, namely that of appearance, usability and associations. In other words, the sensory appeal, usability, reflection and associations of the designed product are the most prominent determinants for users' overall satisfaction. Therefore, to design a successful product that provides positive emotions and delightful user experience, we need to pay attention onto the pleasure level of its physical appearance, psychological usability and ideological associations.

In addition, Norman (2002) argued that "to be truly beautiful, wondrous, and pleasurable, the product has to fulfil a useful function, work well, and be usable and understandable" (p. 42) and "good design means that beauty and usability are in balance" (p.42). In light of the theories from Jordan (2000) and Norman (2004), a good design should provide a *beautiful* appearance in order to delight users' sensation and enable a user to *use* it with *pleasure* and satisfaction, and this design needs to elicit a positive ideological reflection and associations in the users. For design in a hospital context, I refer to the notes of Florence Nightingale, in the quote preceding this section, which also identified the therapeutic effects of beautiful things for hospital patients. This note also strengthens my understanding of the

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[1] These four pleasures were drawn from Lionel Tiger's book, *The Pursuit of Pleasure,* published in 1992.

importance of a beautiful design for hospital visitors, patients and staff. The first principle I developed for this design project is as follows:

Principle 1: To be beautiful, pleasurable and usable

Many studies have developed resources for design elements, such as lines, colours, forms, texture or movement in relation to their emotional response in users. For example, a study conducted by Govers *et al.* (2004) sought to find out if designers could create an iron product that was able to convey an emotion to the consumers. A number of shapes were illustrated to represent the iron designs to elicit feelings of happiness, cuteness or toughness. The study confirmed that the consumers understood the visual language of the design. Round and stocky forms were representative of being cute, open and stocky forms represented happy emotions, whereas big and robust forms represented a tough feeling. In addition, Jeamsinkul and Poggenpohl (2002) investigated the meanings of moving images, including interpretative meaning, emotional response and motion affordance, in terms of how users perceive and respond to various types of motion in interactive media. They generated a *Function-Emotion-Motion* framework for designers to select appropriate motions that will induce appropriate emotional responses (see Figure 2.1). They concluded that brightness transformation, such as from dark to bright and vice versa (Brightness d1 and d2) and the transformation from transparent to opaque and vice versa (Opacity d1 and d2) could elicit a calming and relaxing response, whereas the transposition moving from left to right (Move X d1) and motion of zooming in (Move Z d1) could evoke active responses and feelings of predictability. In sum, different forms and motions can elicit different emotional responses. A few design criteria for creating a relaxing emotional response have been identified here, such as the transformation of brightness and opacity. However, to design for relaxation and calm, further methods and principles are required; for example, looking at *what* should be created and *what* elements should be included to gain the desired emotional response. I will discuss the method and elements in the following Sections 2.2 (Art Therapies vs. Interactive Multimedia) and 2.3 (Therapeutic Elements).

FEM framework:
Matching Interaction Functions and emotional responses to Motions

$$F_1 \begin{bmatrix} E_1 \\ E_2 \\ \vdots \\ E_n \end{bmatrix} \begin{array}{l} M_1 \\ M_2 \\ M_3 \\ \vdots \\ M_n \end{array}$$

$E_1, E_2, ..., E_n$ are a set of emotional responses that F_1 (an Interaction Function + a Sub function) should consider. $M_1, M_2, ..., M_n$ are motions corresponding to the same set of interaction function and emotional responses. Matching possible motions requires insights from matrix pattern (e.g. table x.x).

Interaction Functions (F)		Emotional Response (E)	Motion Possibilities (M)	
Orienting	Advancing	Active Predictable	Move X d1	Move Z d1
	Retracting	Predictable	Move Y d2	
	Increasing	Active	Move Y d1	Move Z d1
	Decreasing	Predictable	Move Y d2	
	Forwarding	Active Exciting	Rotate Z d1	
	Reversing	Predictable	Move X d2	
Alerting	Revealing	Active Tense	Rotate X d1 Rotate X d2	Rotate Y d1 Rotate Y d2
	Focusing	Interesting Pleasing	Blur d1	
	Emphasizing	Calm Stable	Brightness d1	Opacity d1
Canceling	Concealing	Calm Relax	Opacity d2	
	Losing focus	Interesting Unpredictable	Blur d2	
	De-emphasize	Idle Relax	Brightness d2	Opacity d2

Transposition

Move X d1

Move Z d1

Transformation

Opacity d1

Opacity d2

Brightness d1

Brightness d2

Figure 2.1 FEM (Function-Emotion-Motion) Framework and sample application (Jeamsinkul & Poggenpohl, 2002)

2.2 Arts Therapies vs. Interactive Multimedia

In this section, I discuss the different techniques used in art therapy, colour therapy, and music therapy with particular reference to their efficacy in promoting relaxation and stress reduction. Following the discussion, I then bridge these three therapies to determine in what format they can be combined for use in this practice.

2.2.1 Art Therapy vs. Art

There are a variety of ways of using the visual arts to promote better healing environments, such as by viewing a beautiful painting or creating artworks with

counselling, also known as art therapy. In the 1930s, psychologists started using the artworks painted by patients as an assessment vehicle to analyse patients' emotions or feelings in order to conduct psychotherapy (Rubin, 1999). According to Malchiodi (1993), art therapy was defined as utilising art expression and imagery as a counselling tool to achieve holistic healing for people who are traumatised or undergoing serious medical treatment. Birtchnell (1984) defined art therapy as the combination of art and psychotherapy - art creation aesthetically stimulates a representation of the individual's reality, in which the creation process involves a powerful emotional release and catharsis, whereas psychotherapy involves conversations between the therapist and individual, talking through the imagery content to achieve emotional support. Bar-Sela *et al.* (2007) found that art-making activity through a rational intervention process helped patients to be at ease expressing themselves, significantly reduced levels of depression, and had some improvement in the degree of fatigue. Walsh *et al.* (2007) also suggested that art-making interventions could be set up at hospital waiting room areas where caregivers gather. Over the past few decades, much existing research on art therapy has focused on counselling-orientated forms, using visual art as an analysis tool to conduct verbal psychotherapy. However, more recently, there has been a growing interest in exploring the engagement of patients in the creative process *per se,* such as through art-making or viewing art, as therapeutic approaches in themselves (Lane, 2005).

Studies have shown that the process of art-making can be a cathartic process, promoting self-esteem and facilitating empowerment (Heenan, 2006). Many studies have also described the positive impacts of viewing art at several levels, such as by promoting a relaxing response, positive distraction and stress reduction (Hathorn & Nanda, 2008; Schweitzer, Gilpin, & Frampton, 2004; Ulrich & Gilpin, 2003). This has increased interest in investigating the effects of viewing art and also what constitutes appropriate art for healthcare settings. Among the suggested artworks, content based on natural settings are most often discussed.

Visual exposure to a beautiful natural landscape has been shown to be beneficial to human health and an experience of aesthetic appreciation for the viewer[2]. As to the question of why viewing nature has such a restorative effect on human health both physically and psychologically, an evolutionary theoretical perspective has been proposed by several researchers (Kaplan, 1995; Ulrich & Gilpin, 2003). According to this theory, human beings innately and emotionally prefer to be associated with natural environments, this preference being developed throughout early human history to select places for habitation. As such when modern humans affiliate natural environments with this early preference of selecting places of habitation this can promote restoration (Kaplan, 1987; Ulrich & Gilpin, 2003; Wilson, 1984). In line with this perspective, the emotional state also affects the preferred choice of environments. Van den Berg *et al.* (2003) showed that stressed people have higher preferences to be associated with natural environments and a lower preference for built environments. This preference of natural environments by stressed people could be a result of evolutionary mechanisms.

In addition, several recent studies in neuroscience have also proved that viewing a beautiful image of nature can increase sense of pleasure and lead the human brain to a state of tranquility. A study conducted by Yue *et al.* (2007) found that when people looked at scenes universally preferred such as a beautiful vista of trees, water, mountain and coastal views, the response in the areas of the brain which correspond to pleasurable experiences was increased. In a more recent study, Hunter *et al.* (2010) demonstrated that when people were presented with a tranquil image, such as a beach, this visual context could harmonise brain activity and enable better functioning of sight and hearing.

In sum, studies suggest that the art-making process enables patients to express themselves cathartically (Heenan, 2006). Furthermore, the viewing of art dominated by beautiful natural scenery can achieve better therapeutic effects by promoting relaxation and stress relief (Van den Berg, 2005). Through the process of viewing or making and engagement, art becomes healing. Based on this concept, my design

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[2] See Van den Berg (2005) and Velarde, Fry and Tveit (2007) for two recent reviews.

practice focuses on creating an artwork in which people are able to be involved with the creative process by creating or interacting with elements within the artwork itself. Rather than providing a blank slate for stressed people to make art, a design work can be created such that people can choose what they wish to create from the presented image elements in the nature-based background image. Alternately, if the users prefer not to create changes on the top of the background image, the users can act instead as passive observers to view the beautiful relaxing images as viewing art for healing. Other questions remain however: what kinds of natural scenes are most effective in providing restoration from stress and promoting relaxation, and what should be avoided, particularly for healthcare settings. In answering these questions, further studies on the healing effect of visual elements will be discussed later, in Section 2.3.1 (Visual Elements and Healing).

2.2.2   Colour Therapy

Colour therapy, generally recognised as light and colour therapy or colour psychology, is the practice of exposing a patient to coloured light at a biological level or environmental colour at psychological level to treat specific conditions or to enhance recovery when combined with other treatments. Coloured light has been used therapeutically for thousands of years. The ancient Egyptians believed in the healing power of the sun, and they built solarium healing temples where the sun's rays were refracted into the colours of the spectrum (Birren, 1950). Ever since Issac Newton's experiments found that the spectrum of light could be separated by prisms into seven hues - red, orange, yellow, green, blue, indigo, and violet, physicians began using the coloured light rays in conjunction with medicine. In 1878, Edwin Babbitt (1967) described the use of different colours to treat different illness, for example using blue light to treat neuralgic headaches and general nervousness (p.42). According to Babbitt's principles of light and colour, red and yellow stimulates the blood and nerves, and blue soothes them (Babbitt, 1967).

Physicists describe colour as wavelengths of electromagnetic radiation. Birren (1950) describes coloured light as having a direct biological effect on the human body, because of the influence of radiant energy, effected through the eyes and skin. In 1888, Charles Feré found that red light had the most stimulating effect,

physiologically, and that violet was the most calming. Kopacz (2004) mentioned that some people believe every individual is surrounded by an electromagnetic field called an aura, and that all colours are electromagnetic energies received by the body in the form of vibrations. Each vibration frequency and duration supports one or more basic bodily functions. Based on these speculative ideas, colour can be used to balance the aura of electromagnetic energy outside the human body, to supplement its deficiency and consequently to improve health.

The effects of colour are also evident in our psychological responses to it. This is also known as *colour psychology*. Mahnke (1996) pointed out the importance of colour at the psychological level - when we perceive a colour, its influence is not only that of seeing a visible colour, but also a sensory response which simultaneously triggers our conscious and unconscious cognitive responses. The psychological effects of colour includes several aspects: the emotional effect of colour, the synaesthetic effect of colour, and the symbolism and associations of colour (Meerwein, Rodeck, & Mahnke, 2007). Meerwein *et al.* (2007) explained that green colour stimuli can be associated with nature, formed by previous memories of walking in the green countryside. These aspects affect our responses by their association with memory and cognitive recognition processes.

In summary, colour therapy is the practice of exposing individuals to coloured light or environmental colour to promote a specific body function or to induce a specific emotional response, and therefore to enhance recovery. This theory of the colour corresponding to body function and its efficacy has not been clinically well-documented. However, the therapeutic use and efficacy of colour has been described at the psychological and physiological level since the nineteenth century. Therefore, the concept of colour therapy and how colours affect human emotion and behaviour are still a valuable reference when planning the creation of a therapeutic multimedia installation. With regards to which particular colours best promote relaxation, I will discuss the literature later in Section 2.3.2 on Colour Elements and Healing.

2.2.3   Music Therapy

It has been recognised for centuries that music contributes to emotional, mental and physical health, as well as having an effect on human behaviour (Gfeller, 1990; Howard, 2001). Bunt (1994) defined music therapy as "the use of sounds and music within an evolving relationship between client and therapist to support and encourage physical, mental, social and emotional well-being" (p.8). Davis and Gfeller (1992) described music "as a medium to help people maintain or improve important life skills in the areas of communication, academic performance, gross and fine motor development, social skills, and emotional development" (p.6).

Over the last few decades, much research has been conducted in measuring the efficacy of music in healing and psychological support. Several studies have shown that music therapy can achieve a state of deep relaxation (Cooper & Foster, 2008; La Torre, 2003), inhibit stress and reduce anxiety (Le Scouarnec, et al., 2001; Marconato, et al., 2001), promote feelings of power (Siedliecki & Good, 2006; Skewes & Thompson, 1998; Walt & Baron, 2006), as well as increase social interaction (Skewes & Thompson, 1998). The recommended interventions for musical therapy sessions vary, mainly depending on the needs of individuals, the therapists' training and the treatment facility provided (Scovel & Gardstrom, 2005).

Among these musical interventions, music listening and music improvisation have been most frequently studied for decreasing anxiety and inducing relaxation (Almerud & Petersson, 2003; Clements-Cortés, 2004). Listening to recorded music has been identified to provide individuals with a more passive role to induce relaxation and ease tension; conversely, music improvisation patients are required to be actively involved in making music which encourages patients to play a more active role and thus enhance a sense of control and personal satisfaction (Burns, et al., 2001; Magee, 2007). As such, different techniques of music intervention achieve different emotional results. Listening to music more passively tends to induce relaxation and music making actively acts to promote feelings of control.

In terms of exploring the therapeutic *duration* of music, Chlan (1998) conducted a two-group randomized controlled trial of the effect of a single 30-minute session of

music therapy intervention on relaxation and anxiety. They found that patients who received a single session of music therapy had a significant reduction in heart and respiratory rate and a significant decrease in anxiety, compared to a control group who rested alone. In a similar vein, Krout (2007) quantified and evaluated the effectiveness of single-session music therapy interventions for terminally-ill patients before and after their music session. The results suggested that patients who received single-session music therapy interventions had a significant increase in pain control, physical comfort and relaxation. In addition, Tansik and Routhieaux (1999) investigated the impact of music on visitors awaiting patients undergoing surgery in a hospital waiting room. Their study demonstrated that visitors experienced significantly increased relaxation and reduction in stress while listening to slow and relaxing music. As such, it seems that a single session of music listening therapy can indeed benefit individuals, and achieve the goals of decreasing stress and enhancing relaxation.

For the purpose of encouraging a relaxation experience for visitors, patients and staff in hospital waiting room environment, this design practice is primarily concerned with a single session of pre-composed music for a relaxing listening experience, as well as enabling users to interact with pre-composed sounds to encourage them to become involved in music-making. The genre of the music to be composed in this design practice will be discussed later in Section 2.3.3. In the next section, I will discuss how to bridge the different techniques of art therapy, colour therapy and music therapy to develop an interactive multimedia for therapeutic use.

2.2.4   The Therapies in Combination

There is increasing recognition that engagement with music and art has a positive effect on coping with illness and promoting health (Cohen, 2009). As discussed above, studies have shown that viewing a beautiful natural landscape has a positive effect on increasing sense of pleasure and relaxation, leading to a state of tranquility (Hunter et al., 2010; Ulrich & Gilpin, 2003; Yue, Vessel, & Biederman, 2007). Exposing individuals to coloured light or environmental colour has also been described to improve health and enhance healing (Birren, 1950). Evidence has also shown that music is a catalyst for inducing a sense of calm (Knight & Rickard, 2001;

Krout, 2007) and promoting feelings of empowerment (Burns, et al., 2001). Music and art *themselves* are naturally healing and can be achieved without other unfamiliar interventions (Lane, 2005). As a consequence, it can be seen that music, art and colour each have the potential to achieve therapeutic functions. And yet, we seldom find these three therapeutic practices, or even two of them, combined. I argue that by combining these therapeutic techniques, the efficacy of healing may be enhanced, to the benefit of people both psychologically and physically.

An interactive multimedia artwork contains the basic elements of all three therapeutic practices: images, colour and sounds, making it a potential resource for healing (Figure 2.2). I propose that it is beneficial to integrate the different techniques of music therapy, art therapy and colour therapy through an interactive multimedia art installation, for people to engage in a multi-sensory experiences and to promote relaxation and stress reduction. *Engagement and distraction* are the key factors in this therapeutic use of multimedia. Therefore, inspired by the techniques discussed in the previous sections, this design practice will focus on creating beautiful natural landscapes with the principles of colour therapy in mind, accompanied by a single session of pre-recorded music for a relaxing listening experience, during which users are able to interact with the animated elements, including images and sounds for the purpose of engagement and distraction. In the following sections, attention is paid to the method of 'designing an emotion' with particular reference to the elements, including images, colours and sounds, that are most effective at encouraging relaxation in hospital settings.
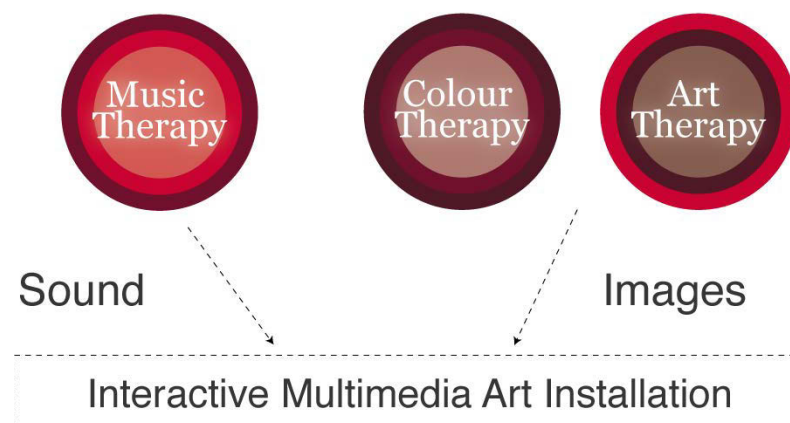
Figure 2.2 Music therapy, colour therapy and art therapy in combination

2.3   Therapeutic Elements

In this section, I address the elements that are associated with the emotional responses of relaxation. The elements discussed include the kinds of images and colours that have been proven to be therapeutic and relaxing, the kinds of music that have been suggested to induce relaxation, the kinds of technology already employed in healthcare settings, and other considerations to constitute an overall therapeutic milieu. Along with the discussion in the following sections, I continue presenting the design principles as related to each section.

2.3.1   Visual Elements and Healing

Perhaps the most important thing a window does is provide a portal – an escape from the frightening, painful reality of disease, or a way of accessing memories of a better time and place. Maybe windows exert their effect by allowing a patient to step into a space of meditation – a reverie that brings not just distraction but relief

(Sternberg, 2009. p. 9)

A study conducted by Irving Biederman and Edward Vessel in 2003 (Biederman & Vessel, 2003), aimed to investigate if there were any changes in the brain when we view images and why some scenes are preferred more than others. In this study, 60 images were shown to 12 participants with a five-time random repetition of each image over a two-hour session. In the study, the most and least preferred images were rated by the participants on a scale of one ("don't like it") to seven ("really like it"). The images most preferred were, a garden landscape with pond, an open plain with lightning, an urban cityscape behind a waterfront at night, a beachfront at dusk, a desert plain with storm clouds, and a rural fishing village set on a river (Figure 2.3).
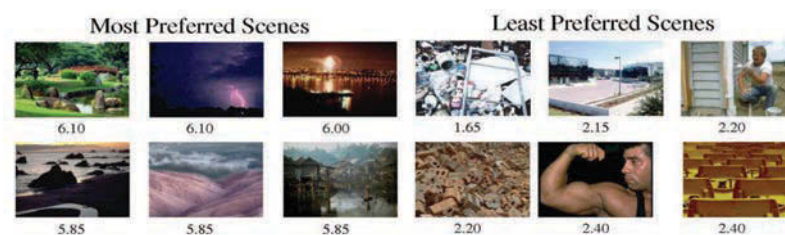
Figure 2.3 The most preferred and the least preferred scenes, and their average rating from participants (Biederman & Vessel, 2003)

Eisen *et al.* (2008) conducted a survey to discover art preferences in healthy children and hospitalised children in Texas. The study concluded that representational nature art dominated by natural vegetation, flowers or water were the most preferred images for both healthy school children and hospitalised children and adolescents. Similarly, Nanda *et al.* (2008) undertook an art survey at St. Luke's Episcopal Hospital in Texas to investigate the image preferences of hospital adult in-patients, interior design undergraduate students and architecture undergraduate students. The study found that realistic nature images such as waterscapes, flowers, animals and landscapes were rated significantly more highly by hospitalised inpatients than the student populations. With hospitalised inpatients, the highest rated image was the "Rock Quarry Falls" (Figure 2.4), and the overall lowest rated image was the nonrepresentational image with curvilinear graphic forms "The Kiss" by Gustav Klimt (Figure 2.5). Both studies suggest that realistic and representational nature images are generally preferred by hospitalised children, adolescents and adults.

Figure 2.4 "Rock Quarry Falls" © Bill Robertson (www.brphoto.net)   Figure 2.5 "The Kiss" by Gustav Klimt

Another study carried out by Komar and Melamid (1997) involved polling different opinions from around the world to investigate the most and least wanted paintings. The first poll was conducted in 1993 and involved 1,001 responses from around the USA. Based on this poll they created paintings derived from the criteria that were rated to be the most wanted and least wanted features (Figure 2.6). A series of the most and least wanted painting were also created for different countries around the world, for example the most and least wanted paintings in Turkey are in Figure 2.7. From this series of paintings, it can be seen that cultural background is a factor that can affect people's preferences in art.

Figure 2.6 USA: Most wanted painting (left) and least wanted painting (right) (Image source: awp.diaart.org/km)

Figure 2.7 Turkey: Most wanted painting (left) and least wanted painting (right) (Image source: awp.diaart.org/km)

In 1986, a famous painting 'Who's Afraid of Red, Yellow and Blue?' created in 1966 by Barnett Newman, was displayed in Stedelijk Museum in Amsterdam and was attacked with a knife. The attacker claimed to want to "take revenge on abstract art" (Anderson-Reece, 1993). With regards to artworks that have been attacked or have received negative comment in clinical environments, Roger Ulrich (1999) analysed 15 years of archival data recorded by hospital staff focusing on patients' negative responses and behaviour towards wall-mounted pictures. He found that seven pictures had been attacked and five of them had been attacked more than once; these attacked pictures all contained ambiguous or abstract content and contrasting colour. The five attacked paintings then needed to be removed (Figure 2.8). Another documented example was the sculpture installation called *Bird Garden* at Duke University Hospital in Durham, North Carolina, USA (Ulrich, 1999; Ulrich & Gilpin, 2003). The installation consisted of ceramic tiles and metal birds prevalent with rectilinear contours and abstract forms, with no greenery, water and flowers but many piercing features (Figure 2.9). Many negative comments and reactions had been reported to the hospital regarding its ambiguity, such as "it doesn't make any sense" and "what is it?" Cancer patients viewed the Bird Garden with dislike and fear. The hospital decided that the negative reactions towards the Bird Garden were unacceptably high and decided to remove the installation for medical reasons.

Figure 2.8 An abstract artwork that was attacked by patients (Ulrich, 1999)
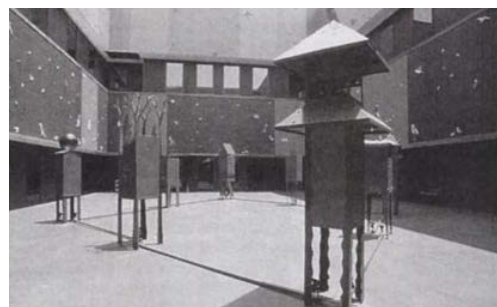
Figure 2.9 The Bird Garden (Ulrich, 1999)

With reference to selecting appropriate art for healthcare settings, Ulrich & Gilpin (2003) developed a set of guidelines for typical features that should be avoided in hospitals, including: ambiguity or uncertainty, emotionally negative or provocative subject matter such as spiders, closely spaced repeating edges, claustrophobic qualities, close-up views of animals staring directly at the viewer, and outdoor scenes with foreboding weather. In a similar vein, Nanda *et al.* (2008) also suggested that ambiguous abstract images should be avoided for stressed patients in hospitals, as the ambiguity of abstract art can increase the chance that the viewer might project their own negative emotions onto the ambiguous artwork, and this is more so the case in a stressful environment. In the review of the literature above, we saw that stressed people tend to have a higher environmental preference towards natural images (Van den Berg, Koole, & Van der Wulp, 2003), and that the majority of hospital patients and the general public ranked realistic and representational images of a nature scene as their most preferred images. Based on the discussion above, design principle 2 is proposed as follows:

> *Principle 2: Realistic or representational image style for the natural landscapes and avoid ambiguous and abstract images*

Following the discussion, questions then arise about what kinds of natural landscapes are most effective at delivering a calming effect. Among the studies in regards to viewing natural landscapes to promote relaxation and stress reduction, natural landscapes can be categorised into three main themes: a view of trees, a waterscape and a garden.

Several studies have shown that *a view of trees* can have a therapeutic effect (Hartig, et al., 2003; Herzog, Maguire, & Nebel, 2003; Parsons, et al., 1998; Ulrich, 1979, 1984; Van den Berg, et al., 2003). For example, the landmark study by Ulrich (1984) showed that a hospital room with a window view of a natural landscape could have restorative effects on post-surgical patients' recovery. He assigned 46 patients to two groups: one group had a window view of trees compared to the other group who had a view of a brick wall. The study found that patients who were assigned to a room with a view of trees had shorter postsurgical hospital stays, took less pain medication

and had fewer negative notes from nurses. Similarly, Parsons *et al.* (1998) found that participants who viewed a nature videotape of a forest had better restoration from stress and better immunisation against further stress. Van den Berg *et al.* (2003) found that stressed people who viewed natural environments dominated by park-like forests either with or without a creek had a significant improvement in mood and increased ability in concentration. Finally, Hartig *et al.* (2003) found that young adults sitting in a room with tree views had a more rapid decrease in blood pressure than young adults sitting in a viewless room.

Studies have also reported that *water views* provide positive health outcomes (Diette, et al., 2003; Laumann, et al., 2001; Tse, et al, 2002; Ulrich, Lundén, & Eltinge, 1993; Van den Berg, et al., 2003). For example, a view of open water has been found by Ulrich, Lundén and Eltinge (1993) to enhance patients' postoperative recovery, requiring fewer doses of pain-reducing drugs and experiencing a lesser degree of anxiety. Laumann *et al.* (2001) found that views of forests with pine trees, of park-like trees, of a sea with distant mountains, and of snowy mountains were all well-rated on their restorative and relaxing effects. Furthermore, Tse *et al.* (2002) documented the effectiveness of watching soundless videos of natural scenery, depicting mountains and waterfalls, in increasing tolerated pain threshold and a higher pain tolerance. In addition, Diette *et al.* (2003) found that the patients undergoing procedures had significantly reduced pain when they were presented with a photographic-quality mural of a mountain stream in a spring meadow mounted by the bedside, and listened to a tape recording of nature sounds before, during and after the procedure in the recovery area.

Continuing on the aquatic theme, other studies have argued that watching aquariums can have health benefits (DeSchriver & Riddick, 1990; Edwards & Beck, 2002; Wells, 2005). DeSchriver and Riddick (1990) reported a decrease in heart rate and muscle-tension response when elderly people watched fish swimming in aquariums. Interestingly, watching a videotape of a fish aquarium with the sound of a stream had better results in stress reduction than watching a live fish aquarium or a placebo videotape (colour tapes of television lines and static). The watching of the live aquarium and placebo were thought by the researchers not to be representative of a

normal recreational activity whereas watching the videotape was similar to the elderly persons' favourite entertainment of watching television. More recently, a study conducted by Edwards and Beck (2002) on the effect of viewing an aquarium on nutritional intake for individuals with Alzheimer's disease found that Alzheimer's patients with a view of a fish tank showed an increase in their appetite, compared to a control group who only viewed an ocean picture. Over 16-week period study, the Alzheimer's patients who viewed the aquarium during eating also experienced an increase in weight and a decrease in need for nutritional supplementation. In line with this, at Queen's University Belfast, Northern Ireland UK, Wells (2005) also showed videotapes of animals to 100 undergraduate students before and after visual exposure to a cognitive stressor such as reading aloud. She found that participants who watched the videotape of neon tetras in an aquarium, birds flying from one branch to another, and monkeys in trees, had significant reductions in cardiovascular response and psychological stress.

Researchers have also provided evidence of the effect of *viewing or visiting of gardens*, on the quality of the time patients spend at hospital and their health outcomes (Cimprich & Ronis, 2003; Ottosson & Grahn, 2005; Ulrich, Simons, & Miles, 2003). Ulrich *et al.* (2003) for example, conducted an experiment among 872 blood donors, measuring their stress response. The researchers found that blood donors in a waiting room had lower blood pressures and heart rates when a videotape of a savannah-like or park-like area dominated by verdant vegetation, or a videotape of a running stream and deciduous trees, were displayed on the wall-mounted television. Another study by Cimprich and Ronis (2003) assessed the effect of a natural environment intervention on restoring attention in 157 women newly-diagnosed with breast cancer, and bolstered the argument for the therapeutic benefit of natural environments in helping with attentional fatigue. The natural environment interventions included viewing trees or garden through a window, watching birds or wild animals, listening to birds or sounds of nature and watching a beautiful sunset or clouds. Apart from these research studies, Hamilton (2006) also described the setting of a sunken garden in the emergency department at St Vincent's Hospital in Portland, Oregon USA, which was reported to help visitors reduce their stress and provided a pleasurable experience by offering the view of a waterfall in the garden.

Ulrich and Gilpin (2003) recommended the following guidelines for choosing appropriate representational art for healthcare settings:

- Waterscapes: calm, still and non-violent conditions.
- Landscapes: depicting spring and summer with green plants and verdant flowers; depicting positive artefacts such as old houses, barns and with distant low rolling hills and mountains; with visual depth or openness in the foreground; avoid the use of dark landscapes.
- Flowers/Gardens: nourished and healthy flowers; types of flowers need to be recognisable and not unusual; open foreground.
- Figurative: depicting positive friendly and caring emotions; covering general cultural diversity; showing people in the environment with happy emotions.

Ulrich and Gilpin (2003) also suggested that in environments where an image would need to maintain interest and stimulation over long periods in order to be of therapeutic value, such as in boring or monotonous work environments or with long term patients in nursing homes, that representational landscape pictures outperform other types of images. However they also found that nature landscape images do not need to be perfectly representational in order to have a stress-reducing effect. Images such as a vast valley containing granite rock formations would work just as well as a painting of a garden or lake in inducing a change in stress levels.

Another point made by Sternberg (2009) was about familiarity and memory. Through the connection between our senses and our memories, human emotions become linked to places of experience, and their associated feelings. For example, memories of home can be associated with calm, and new places can be associated with excitement and anxiety. Therefore, when a person experiences or remembers a place associated with positive emotions, the place can trigger positive emotions for the person. Marcus (2006) makes a similar point, noting that when people are feeling stressed, many of them will look for places that are familiar and comforting. As such, good memories and familiarity help to promote healing. From this, I developed design principle 3:

Principle 3: Something with which people associate positive experiences

In summary, viewing certain types of natural landscapes can help to promote positive emotional changes and substantially reduce physiological stress as evidenced by positive changes in blood pressure, heart activity, muscle tension, and brain electrical activity. These natural elements include, views of *trees, forests, fields dominated by verdant vegetation, park-like forests with creeks, open water views, seas/lakes with distant mountain, mountains with waterfalls, mountains with streams, aquariums with swimming fish, birds, gardens and lawns, fruit trees, various species of flowers, a beautiful sunset or clouds, and open space*. Studies conducted in laboratory environments have consistently shown that after viewing a natural landscape the feeling of relaxation and stress recovery can be achieved in less than five minutes (Parsons, et al., 1998; Ulrich, 2006; Ulrich et al., 1991), and that this positive change can be achieved through an actual visit to nature, by sitting in a room with a window view of nature, or by looking at a picture/painting or video recordings of nature (Velarde, et al., 2007). An extensive review conducted by Van den Berg (2005) examining the strength of the evidence for the type of interaction with nature in a clinical setting or among clinical populations, found that viewing nature from a window or on screen achieved better health outcomes by promoting relief from stress and pain for patients than did an actual visit to a natural setting or physical contact with indoor plants and flowers.

Based on the literature just reviewed, I have developed the following visual elements to be included in my design practice:

- ❖ A scene of trees: forest, green vegetation, park-like, field
- ❖ A scene of hills or distant mountains: rolling hills, countryside, cultivated fields, and distant mountains
- ❖ A waterscape scene: seaside, lake, with distant mountain, creek, stream, and aquariums
- ❖ A garden scene: various flowers in bloom with some water feature, birds, and some spatial openness

2.3.2   Colour Elements and Healing

An early study by Sherman (1914) at St Luke's Hospital, San Francisco in the United States, reported on an operating theatre that had been painted with spinach green on the walls and blue on the ceiling. Sherman stated that spinach green was the easiest colour on the eyes in particular when conducting a surgery where shadows in the wound were a problem; because the green colour reflected less light into the surgeon's eyes. This colour scheme was inspired from the natural world where there is greenery on earth and above that the blue sky. This colour scheme employed in the operating theatre also seems to support the evolutionary theory mentioned in the previous section, that humans intrinsically favour the natural environment, verdant vegetation and sky. This was the beginning of the planned use of colour in hospitals. A few decades later, colour psychology pioneer, Faber Birren (1950), proposed a psychotherapeutic colour scheme for hospital settings, suggesting a variety of hues both warm and cool to be applied in the hospital lobby or waiting room. He suggested that cool blue, green and grey tones such as turquoise and lighter aqua were suitable for chronic patients who are hospitalised for longer durations, and that the walls in operating theatres should be painted in green or blue-green to decrease glare and eye strain for the surgeons and to compensate for the red tissue of the human body.

Another study was carried out recently by Dalke *et al*. (2006) who audited twenty hospitals in UK, with the aim to establish a colour and lighting guidelines for enhancing hospital environments. The study suggested that seats and the colour schemes in a waiting area should create a feeling of intimacy and restfulness, using a low-saturation violet colour for example. They also suggested that a homely domestic colour scheme including colours such as peach and cantaloupe orange was desirable for patients' day rooms to evoke a feeling of peace, and also to include artworks as visual distractions for day rooms. These are the kinds of colours that have been suggested for therapeutic use in hospitals. In the following section I discuss the relationship between particular colours and human responses. To begin with, descriptions of the biological and psychological influence of individual colours were provided by Birren (1950) as follows:

Red is the most energetic colour. Biologically, it has been found to have the effect of increasing blood pressure and heart rate. In terms of its psychological effect, red equates to arousal and stimulation, it increases nervous tension and also helps to increase productivity. Modified reds, such as rose, maroon and pink are beautiful, expressive and deeply emotional. (p. 258)

Green and *blue-green* are peaceful colours and help to reduce nervous and muscular tension. Psychologically, green is thought to provide an environment that requires sitting and concentration. Bluish green is pleasing and comfortable. (p. 259)

Blue is thought to be restful and sedate. In contrast to red, blue will act to decline blood pressure and heart rate. Blue is naturally a low saturation colour, which is less stimulating. If applying a blue colour in a large area, it may raise feelings of being cold and depression. (p. 260)

Another study by Crozier (1996) reviewed a number of studies on different hues and their emotional associations, and found some patterns. In general, red is perceived as adventurous, sociable, powerful, protective and exciting; green is perceived to be calm and restful; and blue is perceived as affectionate, cautious, pleasant, soothing, calm and restful.

In further support of the notion that blue and green are restful and calming and red is energetic and stimulating, an experimental study was carried out by Kaya and Crosby (2006) with 98 college students to investigate individuals' colour associations with different building types (such as hotels and hospitals). The study found that blue was reported as soothing and calming, and it was the colour associated with hospitals and operating theatres because of its restful character. In a similar vein, Manav (2007) examined the emotional associations of colour by asking participants to match one of forty-one colour samples to a list of emotional adjective words. Her study found that both light blue and green were associated with calmness, peacefulness and relaxation, although pure light blue was sometimes considered as cold and dull; in contrast, pink and yellow colours were manly associated with feelings of warmth, romance and enjoyment.

A list of colours with their associated emotional responses and meanings is presented in the following Table 2.1, taken from a book written by Meerwein *et al.* (2007). This table provides a guideline for choosing colours that promote positive emotions and relaxing responses.

	Emotional responses	Meaning
	Soft, embracing, sunny	Gentleness, brightness, cosiness
	Cheerful, radiant, exciting	Communication, openness, activity
	Soft, warming, fruit	Excitement, comfort
	Stabilizing, natural, resonant	Security, tradition, rootedness
	Provocative, fiery, lively	Passion, dynamics, joie de vivre, aggression
	Girlish, gentle, fragrant	Playfulness, rapture, romanticism
	Flowery, elderly	Artificiality, temporality
	Majestic, solemn, ceremonious	Dignity, elegance, distinction
	Dignified, noble, pompous	Ritual, power, splendour
	Relaxing, quiet, reserved	Calm, balance
	Calm, deep, concentrated, relaxing	Gathering, calm, sumptuousness
	Deep, distancing, untouchable	Ambivalence, instability, tradition, noble
	Cool, airy, light	Distance, expansion, opening
	Distant, cold, calming, reserved	Security, concentration, seriousness, aloofness
	Watery, icy, celestial	Openness, lightness, freshness
	Balancing, natural, calming	Balance, simplicity, security, liveliness
	Concealing, natural	Tradition, stability

Table 2.1 Colour perception and sensation table was based on Meerwein *et al.* (2007)

In summary, the literature suggests that red is the most stimulating of colours, pink and purple colours evoke charming and elegant associations, golden-yellows are cheerful colours, green, blue-green, and blue elicit soothing feelings of calm and

relaxation, and are recommended to be applied to environments that require rest or sedentary tasks. Interestingly, blue and green colours are also associated with the natural environment as discussed in Section 2.3.1 (Visual Elements and Healing). For example a scene of plants and a forest is dominated by greens; and a scene of a lake or other water environments such as an aquarium are dominated by a variety of blues and greens. This may also explain why visual exposure to natural environments leads to lower blood pressures and heart rates in patients, and quicker recoveries.

Apart from the limited empirical evidence available, I would argue that there is no one colour scheme that achieves the goal of healing due to the complexity of colour, including different factors such as saturation, value, tint, contrast and harmonies. In addition, when we look at a natural environment, it is clear that it consists of millions and millions of colours. One plant alone includes a variety of greens in its foliage. Furthermore, findings from recent studies have suggested that the saturation and brightness of colours may have more influence on emotional changes than their hue (Gao & Xin, 2006; O'Connor, 2011). In other studies it has been identified that emotional responses to colour are very subjective, varying by gender, age, personality and cultural background (Crozier, 1996; Ou, et al., 2004). However, by using the recommended colour schemes as references to induce specific emotions and by avoiding colour schemes that have been identified to cause stress, a well-managed colour scheme may still help to achieve a relaxing effect. Thus, from the studies reviewed above, blues and greens as calm and soothing and pink and orange as charming and cheerful act as a general guideline for the colour schemes of this design practice. The brightness and saturation of the colours will be adapted to the final visual elements created in this design practice. Design principle 4 for this creative practice is thus developed as follows:

Principle 4: Colour scheme dominated by a variety of calming greens or blues, decorated with soft pinks and oranges

2.3.3   Music and Healing

In Section 2.2.3 above (Music Therapy), I have described how a single session of music, in conjunction with interactive sound elements, would be applied to this design practice. In this section, I attend to the kinds of music and sounds that have been used for therapeutic purposes in hospitals.

A study conducted by Thayer and Levenson (1983) investigated whether music listening has any influence on changing emotions, or physiological responses such as heart rate, blood pressure, and the electrical properties of the skin. The study found that participants who watched a film with stressful music had a higher level of stress response, and those who watched the same film with relaxing music responded with a lower level of stress, compared to those who watched a soundless film (the control group). These findings suggest that different kinds of music can increase or decrease heart rate, level of arousal and stress. However, the specific *kind*s of music, defined for example by tempo, pitch, volume, rhythms, timbre, or instruments, were not defined in this research. The question still remains as to what kinds of music are generally perceived to be relaxing and what musical elements help to achieve such effects.

Wigram, Pedersen and Bonde (2002) suggested several parameters to define the components of relaxing music. These are: a slow and steady tempo, gentle timbre, few accents, stable and predictable cadences, consistent texture (combination of sounds and musical instruments), stability or only slight changes in its volume, rhythm, timbre, pitch and harmony. Other studies have suggested that the tempo of the music has a significant effect on the listener's emotional perception, heart rate and respiration, by a synchronisation with the cardiovascular system (Holbrook & Anand, 1990; Trappe, 2010). Therefore, it is important to identify what tempos are considered to be slow, to lower our cardiovascular response and to enhance a feeling of calm and relaxation. A definition was suggested by Milliman (1982), that fast tempo music could be defined as having a tempo of 94 beats per minute or more, whereas music with a tempo of 72 beats per minute or less was classified as slow tempo music.

In an interesting study, Chlan (1998) examined the effect of relaxing music interventions on the levels of relaxation and anxiety amongst mechanically-ventilated patients from intensive care units in three university-affiliated teaching hospitals in the urban midwest of the USA. The relaxing music used in this study was instrumental music with 60 to 80 beats per minute, which we would regard as slow tempo music by the definition above. Types of instrumental music used in this study included classical, new age, country & western, religious and easy-listening. The study confirmed the general hypothesis that listeners' heart rates and respiratory rates were in sync with the melodic beats of the music, and as a result, patients experienced decreased heart rates and respiratory rates over the single 30-minute music intervention period, in comparison to patients who were in a control group without music. Another interesting result presented in this study was that among the selection of music provided, most of the participants (56%) preferred to listen to classical music, followed by country-western (28%), easy-listening (12%), and new age music (4%).

There is a wealth of literature supporting the effectiveness of classical music in stress reduction and enhancing relaxation. Kaempf and Amodei (1989) showed that preoperative patients waiting in a holding area who listened to classical music had a lower level of anxiety than a control group. Similarly, Knight and Rickard (2001) showed that listening to Pachelbel's *Canon in D Major* for 20 minutes could reduce levels of state anxiety as well as blood pressure and heart rate caused by a cognitive stressor. In addition, Tansik and Routhieaux (1999) investigated whether listening to relaxing background music in a hospital's surgery waiting room could reduce levels of anxiety in visitors. They found that the use of classical music, such as Rossini's *Complete Sonatas for Strings* (string quartet), Bob James's *The Scarlatti Dialogues* (electronic Baroque keyboard music), Schubert's *Impromptus* (solo piano music), and Mozart's *Sonata for Two Pianos in D Major* (piano music), had substantial effects on visitors in terms of decreasing state anxiety and enhancing relaxation. In support of the therapeutic effects of listening to classical music, a number of classical music pieces, such as Beethoven's *Suite 1 from Sonata in C-sharp minor*, Debussy's *Clair de Lune* and Bach's *Air from Suite for Orchestra no. 3*, were also demonstrated by Almerud and Petersson (2003) to alleviate anxiety and promote relaxation in

patients and hospital visitors. In a more recent study, Albinoni's *Adagio in G minor*; Bach's *Brandenburg concertos*, *Cantata No.147*, *Orchestral Suite No.3: Air*, and *The well-tempered clavier*; Corelli's *Adagio*; and Tartini's *Adagio cantabile* were also recommended to benefit people's health, in particular those who were suffering from pain, stress and depression (Trappe, 2010).

Apart from classical music, sounds of nature are also often used for therapeutic purposes in hospitals when combined with video displays of a natural environment. Ulrich *et al.* (1991) for example, showed video clips of a natural landscape dominated by trees, with sounds of birds and a light breeze, and a waterscape with sounds of a stream to 120 undergraduate students, and found that these interventions had a great impact on restoration from stress. Likewise, Whall *et al.* (1997) found that providing nature images and sounds of birds and brooks in the shower room of patients with late-stage dementia could prevent increasing stress and aggressive behaviour.

So far, I have identified several studies arguing for the restorative effects of natural scenes. With regards to the use of sounds from nature alone, the evidence is more limited. A recent sound installation, *Dawn Chorus,* was set up in 2007 at the Liverpool's Alder Hey children's hospital in UK. This installation using recordings of bird song has been commended for its therapeutic effect in reducing stress and fear in young patients (StaffNurse.com, 2008b). Although there was no formal evaluation of this installation, I have drawn from this example in my own design practice. A detailed description of the sound installation will be presented in the following section 2.4.2.

Although it has been argued that music that is preferred by the listener has more favourable effects on relaxation and reducing stress responses (Good et al., 2001; Leardi et al., 2007), some researchers have also argued that there are no statistically-significant differences between preferred versus therapist-selected music (Siedliecki & Good, 2006; Silverman, 2003). Cooper and Foster (2008) examined the effect of background music on patients' anxiety levels while they were seated in a waiting area, for an average of one hour. The study found that when patients enjoyed the

music they were listening to, their senses of calm and relaxation increased. Classical music and easy-listening music in particular had profound effects in increasing feelings of calm, whilst easy-listening music and pop music also induced positive feelings. From the discussion above, it can be argued that either preferred music or therapist-selected music can achieve restorative effects as long as it is regarded as relaxing and sedative music, and it can be assumed that musical genres such as classical music are still most often preferred when applied for stress reduction.

The concept for music in this design practice is based on the findings described above, that listeners' physiological responses become naturally synchronised with the rhythms of the music they listen to (Chlan, 1998). Considering the nature of a waiting room environment, which is normally occupied by a variety of different people, understanding and catering for each person's needs would be quite difficult. Therefore, in this particular design project, I follow the general elements suggested, as well as the genres of classical music, easy listening and environmental sounds reported to be gentle, relaxing and restorative, as guidelines for composing a series of relaxing original music. With regards to the instruments to be used, piano and string quartets are the major instruments employed in this project, considering their common usage in classical music, with its strong evidence base for therapeutic effect. Sounds of nature are also well supported to have an effect in stress reduction and relaxation when combined with visual elements. Therefore, sounds of birds, streams, and insects are also included.

With regards to the length of the music to be composed, single sessions of music intervention utilised in hospitals are generally between 15 minutes to 40 minutes long[3]. Many recordings published in the market for relaxation purposes are around 20 to 30 minutes long. Multiple short pieces of music can also be used, but it is possible that transitions between tracks may interrupt the relaxing effect (Krout, 2007), therefore tracks of longer duration may be more beneficial for relaxation. Considering that the visual elements that are designed for this installation should match the progression of music, both the visual contents and background music will

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[3] See Cooke, Chaboyer & Hiratos (2005) for a review.

be created as a seamless loop, 5 to 10 minutes per loop. To achieve this, in each piece of music, the last section of each music score will be composed to repeat a few notes from the beginning of the score in order to connect with the next loop. Thus, the music will be heard as a loop without a sudden change, and can be performed smoothly as a longer duration track. According to the discussion above, design principle 5 is then developed:

Principle 5: Seamless loop sound with slow and stable tempos, gentle timbre, and predictable cadences

2.3.4   Virtual Reality, Video Game, Interaction and Healing

With the development of technology, there is a growing use of multimedia simulation-based technologies such as virtual reality, video games or interactive installations as auxiliaries for encouraging therapeutic effects. Virtual reality, video games and interactive installations all provide an immersive experience and allow a user to interact with a simulated environment. Through this immersive engagement: audio stimulation (music), audio-video stimulation (e.g. television, virtual reality) and user interaction (e.g. video game, interactive installation), a user can be distracted from their pain and stress. In theory, this method of engagement can distract patients from focusing their attention on painful experiences (Sharar et al., 2008).

It has been shown that immersive engagement can affect physiological responses. Hoffman *et al.* (2000) found that virtual reality could be of use as a powerful non-pharmalogical pain-reduction technique for adult burn patients. In addition, Gorini *et al.* (2009) conducted a study to investigate the effect of emotional responses to the medium of virtual reality in patients from both rural and city areas in Mexico, during an ambulatory surgical procedure. Two groups of patients were shown the *Green Valley*, a non-interactive immersive environment that depicted a mountain landscape around a calm lake though a head-mounted display and headphones (Figure 2.10). The results demonstrated that the virtual reality experience reduced physiological arousal responses in all patients, but the emotional response was different in each

group. The city dwellers could identify with the technology, having been exposed to it before, but the people from rural backgrounds who had never experienced the technology still showed a physiological relaxation response, but not a change in their perceived anxiety. In this context, it is evident that an immersive engagement helps provide a distraction from a person's anxiety and pain. However, an unfamiliar technology could also affect perceived anxiety.

In support for the use of immersive engagement to elicit positive distraction, Wolitzky *et al.* (2005) used cartoon viewing as a distraction technique for oncology patients aged seven to fourteen, and found that it helped to reduce the young patients' pain. In a similar vein, Das *et al.* (2005) used virtual reality game-playing to decrease procedural pain in burn-injured children aged five to eighteen. Children were able to interact with the game through a head-mounted display device with a tracking system by moving the head and neck and a mouse. The virtual reality game was reported to distract children and was helpful in ameliorating their pain.

Hand-held video games have also been offered to children to facilitate coping behaviour and reduce anxiety in preoperative areas and during induction of anaesthesia. Campbell *et al.* (2005) found that the use of a multimedia video game displayed on the computer helped children to cope with their preoperative anxiety significantly (Figure 2.11). Patel *et al.* (2006) found that a hand-held video game used as an interactive distraction could significantly reduce preoperative anxiety in children. Similarly, they suggested that children became absorbed by the game and were thereby distracted from their feelings of anxiety. As such, non-pharmacological interventions such as interactive multimedia and hand-held video games are a helpful coping strategy for children's preoperative anxiety.

Figure 2.10 VR, Green Valley (Gorini, et al., 2009)   Figure 2.11 Multimedia video game (Campbell, et al., 2005)

The use of video games has not only been assessed as useful for children but also for adult rehabilitation. Smith *et al*. (2011) developed a video game based on the Dance Dance Revolution (DDR) platform for exercise rehabilitation for elderly adults, with an average age of 78.9. With this modified DDR videogame, participants respond to a set of step instructions that are shown on an LCD monitor and drift slowly from the bottom to the top of the screen. The participant then steps on the corresponding step instruction on the DDR mat. They found that older adults were still capable of using such a videogame-based platform and that engaging with this system would help to reduce the risk of falls.

A recent interactive installation focused on biofeedback called *The Heart Library* was created by George Khut (2006) to enhance the awareness of the connection between body and mind, and thereby to promote health. The installation picked up users' heart rates and displayed the interpreted heart beat as a projection of abstract coloured spots imposed over a video portrait of the user (Figure 2.12). The user lies on their back in a darkened room, holding onto a wireless sensor. The spots then moved and changed colour as the user's heart rate or breathing changed. The installation used sounds and visuals to help participants become aware of their breathing and heart rate activity. In another project, Cammuri *et al*. (2003) designed an interactive multimedia-based simulation for patients with Parkinson's disease. The work integrated gesture recognition in a real-time simulation. A large screen acting as a canvas was presented where the patients could see a representation of themselves as an image 'painted' on the screen. The physical control of the 'painting' was based on the movements of the patient, for example, fluidity of movement determined colour, the quality of motion determined the trace of the image, and pauses in movement allowed for the re-mapping of the interaction (Figure 2.13). The authors designed the interaction this way to encourage the improvement of steady movement in patients. The interactive installation was found to help motivate patients towards more effective rehabilitation and therapy. Both installations described above show how we can enhance our bodily awareness through the interaction between body and screen, and thereby achieve a therapeutic result.

Figure 2.12 The Heart Library (Khut, 2006)

Figure 2.13 An image from the interactive multimedia simulation (Camurri, et al., 2003)

Many people experience a loss of control when they become hospital patients, entering an institution where the choice of clothing, food and visiting hours, amongst other things, are controlled (Marcus, 2006). Hamilton (2006) also discusses the importance of offering control to the patient as a means to reduce stress. As Sternberg (2009) described,

> One of the things that affects stress level is the degree of control you have over a situation. The more you are in control, the less stressed you will be; the rush of hormones and nerve chemicals will make you feel stimulated, even exhilarated. The less control you have, the more stressed you feel. (p. 102)

Sternberg used the examples of a labyrinth and a maze to explain the relationship between sense of control and anxiety. For example, the routine tracing of a finger through the path of a labyrinth (which has only one path) can help by focusing attention and taking the mind away from stressful situations, whereas a maze presents uncertain choices including dead ends and different paths and possibilities which cause anxiety and a stress response. Therefore, providing a sense of control is important for designing a video game or interactive artwork for hospital environments, this control needs to be provided with choices that are intuitive and provide certainty.

In a context of a waiting room environment, it would be difficult to use a virtual reality or video game technology for a variety of visitors, and to accommodate the needs of each individual. However, a large scale of projected screen on a wall in a waiting room may be able to encourage an immersive and interactive experience,

that can be engaging for more than one participant at a time. In this case, this interactive experience can become a collaborative art-making activity as discussed in Art Therapy vs. Art (Section 2.2.1) that involves talking through the imagery content to achieve emotional support. Furthermore, through the use of interactivity, it is also possible to increase the degree of engagement. Summarising the discussion above, design principles 6 and 7 are as follows:

Principle 6: A large scale projection to foster an immersive experience

Principle 7: Interactivity that offers choices and options to modulate one's sense of control

2.3.5   Creating a Healing Setting

For the most powerful of healing places is in the brain and in the mind.

(Sternberg, 2009. p. 296)

Beautiful scenes of nature, colours of blue and green, relaxing music, as well as interactive and immersive settings have been well-documented to enhance feelings of calm and to alleviate pain and anxiety. With these principles in mind, I now take a step back and look at the overall concept to discuss what else is required to create a healing setting.

In her book *Healing spaces: The science of place and well-being* (Sternberg, 2009). Esther Sternberg constructed a compelling argument to support the notion of the impact of the place in which a person heals, on how well and how fast that healing process may be. As she argued, "our sense of place is created through what we see and feel and smell and hear – through all of our senses. It is created and re-created in memory each time we experience and re-experience the place" (p. 290). Healing therefore is achieved through sensory experiences. When these senses are well-combined, such as being visually exposed to a beautiful natural landscape, smelling a fragrant plant, hearing birdsong or touching soft material, a rich positive experience is then generated and elicits emotions of relaxation and peacefulness. The elements that contribute to healing described in her book also correspond with the elements

described above in the previous sections on healing elements (Section 2.3). Based on this concept of a multisensory experience, design principle 8 is as follows:

Principle 8: Multisensory design – using audio and visual media to enrich the experience

2.4   Art Installations in Healthcare Settings

In this section, I examine three art installations that have been installed in healthcare settings. The installations discussed here were selected based on the similarity of the projects to my design practice and the effects of these installation in promoting distraction and relaxation. I also described what I have learnt from these installations in relation to my design practice.

2.4.1   *Natural Window*: Interactive Installation in Cardiac Theatre in Harefield Hospital in London

Natural Window is an interactive installation commissioned by rb&hArts[4] and developed by the interactive design consultancy AllofUs[5] in September 2006 in Harefield Hospital, UK. The installation was created in a waiting area where preoperative patients wait for some minutes before being wheeled into the cardiac theatres. It aimed to support pre-medication with art as positive distraction and to alleviate patients' stress and anxiety before major heart operations.

To achieve the core of the project, the design consultants undertook an assessment with the theatre staff and two long-term transplant patients to find out what kind of scene would be the most adequate for such a situation. Their assessment identified that the most preferable scenes were a depiction of blooming flowers (bluebells were most favorable), shifting light and colours of a sunrise, and a panoramic view punctuated by foliage in the foreground (Cooper, 2006). Based on the results of their

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[4] rb&hArts was established by the Royal Brompton & Harefield NHS Trust in London in 2002, with the aim of bringing all forms of the arts to improve the well-being of patients and staff.
[5] See http://www.allofus.com

assessment, the waiting area was then transformed into a space featuring natural elements (Figure 2.14). The four walls in the room were specifically tailored with wooden panels of plants and flowers and the interactive installation was an image of a waterscape projected in the centre of the wooden panel. The waterscape included the visual elements of rippling water, birds and butterflies, and sound elements of birds singing and wildlife, to enhance sensations of calm. In addition, the light and shadow of the installation varied according to the time of day. The preoperative patients could interact with the waterscape using a remote control, by pointing the cursor at certain spots on the projected screen. The interactions included dragging a mouse cursor across the waterscape image, which generated ripples in a lake or redirected a group of ducks, for example. The installation returned to a standby idle mode as a default if the patient chose not to interact.

The interactive installation introduced two effects for the preoperative patients, that of positive distraction and empowerment (Cooper, 2006). It enabled a sense of control for the patients in being able to interact with the projected image on the wall. It was reported by theatre staff that the installation aided in helping patients fall asleep before major surgery (Hume, 2007), which is useful in such a situation. A statement by a senior anaesthetist in the hospital noted that the preoperative waiting space has now been turned into a space less associated with negative connotations and visits have been included into the surgery schedule (Cooper, 2006).

The Natural Window interactive installation supports the literature reviewed in the previous sections, that both visual and auditory exposure to beautiful natural elements aids to reduce levels of anxiety and to enhance relaxation. The Natural Window installation also supports the studies described above that suggest that immersive as well as interactive experiences help users to stay focused on the experience and to amplify distraction from less positive feelings.

From this project, I have understood the importance of natural elements, both visual and auditory, with trees, water and birds in particular, to facilitate stress reduction and relaxation. In addition, by using the surrounding walls, the installation was able to engender an immersive experience. The controller utilised in this work was mobile and provided great accessibility for patients in bed to interact. The Gyration air

mouse tracks two rotational Degrees-of-Freedom using gyroscopic motion sensors, which maps the pointing movements of the patient to the cursor of the installation. However, it requires a certain method and moving distance in order to trigger an animated response, for example pointing then dragging the controller to the desired location, which is similar to moving a cursor on a computer monitor from one corner to the other corner. Further, I argue that the modality of interaction in controlling the animated elements is limited in terms of its responses to the controller and the variety of images. As discussed earlier, preferences and options may have an influence on therapeutic effects (Sternberg, 2009). It has been also recommended that a choice of nature-based images should be provided to patients for them to select the ones they prefer (Eisen, et al., 2008). As such, for the design practice in this study, a variety of interactive elements and controlling parameters should be considered, as well as a variety of natural settings, which may better adapt to user preferences, to result in a higher level of empowerment and achieve a better restorative effect.

Figure 2.14 The Nature Window, Harefield Hospital, London, UK (Image Source: http://www.allofus.com/work/nhs/harefield-hospital-nature-window)

2.4.2 *Wild Song at Dawn:* Sound Installation in Alder Hey Children's Hospital in Liverpool, UK

The second project to be discussed here is called *Wild Song at Dawn*, which was a sound installation in the Alder Hey Children's Hospital in Liverpool, UK, in 2007. It was commissioned by FACT (Foundation for Art and Creative Technology) and Alder Hey Children's Hospital, as part of the Alder Hey Arts programme. The sound installation is a 6-minute long soundtrack of the dawn chorus recorded by award-winning sound recordist, Chris Watson, in the nearby Springfield Park across a three-

day and three-night period (FACT, 2007). The aim of creating this dawn chorus installation was to bring the natural sounds from the park into the hospital, such that the patients and staff could see the Springfield Park from the hospital window and also hear the sounds from the park. Hospital patients, staff and family members were also invited to be involved in the recording process under the guidance of Chris Watson (BBCRadio4, 2007).

Three days of natural sound recordings were then re-mastered with time compression, and combined with light to create a sound installation that captured the experience of the dawn chorus from the park, so that the installation could be re-lived within the hospital. Since then, patients and staff have been able to listen to the sounds of chorus on a personal audio player. The soundtrack of the dawn chorus is also available online at Chris Watson's website[6].

A nurse on this project (StaffNurse.com, 2008a) mentioned some early positive observations from this project: "I watched as a patient from our mental health unit simply lost his troubles in a world of nature" and "It was magical. He was standing there transfixed and that is when I knew the idea would work". The sound installation from autumn 2007 until the end of March 2008 has been experienced by 50,558 people (Hanna & Sephton, 2009). The installation was reported to have improved the hospital experience by providing positive emotions, such as feeling more uplifted and relaxed (Hall, Byatt, & Jones, 2008) and contributing to decreasing the level of anxiety among young patients prior to their operations (Dempsey & Williams, 2011). Since the sound installation was installed in the Alder Hey Children's Hospital, which is one of Europe's busiest children's hospitals, the project has also been rolled out to other primary care waiting spaces in the Liverpool area.

The Wild Song at Dawn installation also supports the studies described above that argued that the sounds of nature, with birds singing in particular, have an influential impact in reducing pain and anxiety and enhancing relaxation in listeners. Even

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[6] See http://www.chriswatson.net/downloads.html

though the dawn chorus soundtrack only lasts for about six minutes, the benefit of listening to the dawn chorus installation has been successfully proven. The sound elements recorded in this project and the studies reviewed in the previous sections (Section 2.3.3) guide me to recognise the significance of the sound of birdsong. Again, according to Sternberg (2009), a variety of choices may deliver a better therapeutic effect. For the design practice in this study, the interactive sound elements include not only birdsong, but also other sounds of nature, such as those relating to water or air. These will also be created to accompany related visual elements.

2.4.3 *Open Window*: An Ambient Virtual Window in Bone Marrow Transplantation Unit in St. James Hospital, Dublin

The final case study discussed in this section is the *Open Window* project installed in the Denis Burkitt ward of the National Blood and Bone Marrow Transplant Unit at St James's Hospital in Dublin, Ireland. The Open Window installation was produced by a group of artists[7] in 2004, aiming to reduce feelings of isolation and depression and promote healing in long-term hospitalised patients who were undergoing bone marrow transplantation and chemotherapy treatment (Cullinan, et al., 2004; Roche, Agamanolis, et al., 2004; Roche, Hegarty, et al., 2004). These treatments require radiation therapy, which produces severe toxicity and patients may stay in a single isolation room for up to 6 weeks continuously, having very limited contact with family and friends. As such, feelings of depression, anxiety, anger and difficulties for the patients in communicating with medical staff can occur.

The Open Window installation created an ambient virtual window in a patient's room, consisting of a ceiling-mounted projector, a pair of speakers mounted to the wall behind the bed and a remote controller that a patient uses to control the system. The virtual window is projected directly onto a wall of the patient's room, displaying low frame-rate images (Figure 2.15). There are two channels that patients can access,

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[7] Artists include Barrie Cooke, Brian Maguire, John Gerrard, Nick Miller, Liadan Cooke, Anthony Lyttle, Suzanne Mooney, Paul O'Conor, Cathy Fitzgerald, Emma Finucane, Paul Monaghan,Remco de Fouw, Sheila Gorman and Andy Folan.

one being pre-recorded natural landscapes and images accompanied by specially-commissioned music with a soundscape incorporating human voice and music; the second channel allows the patient to view images that are sent to the system in real time via a mobile phone camera device. Patients' family members are able to use this portable mobile phone camera to send images back to the Open Window network server, allowing patients to watch the images sent from their family members in their isolated room. These cameras take and send an image every few minutes such that it provides a slide show rather than a full frame rate video. The system developers (Cullinan, et al., 2004) noted that an advantage of using these cameras is that the family can plug them in wherever there is power and cellular network coverage. Patients are therefore able to switch between each of the two channels using the trackball provided. The remote control for the projector is also provided in case the projector is switched off entirely. The image transitions, either between the two channels or between images, designed to be gradual so as to avoid a disruptive change. A high-fidelity sound system was also included in the system.

This project is currently undergoing a clinical trial to evaluate its impact on long-term hospitalised patients who are undergoing stem cell transplantation treatment. It has been reported however that the system is easy to use, effective and reliable as a multimedia-based technology for a critical care room (Hegarty, et al., 2009).
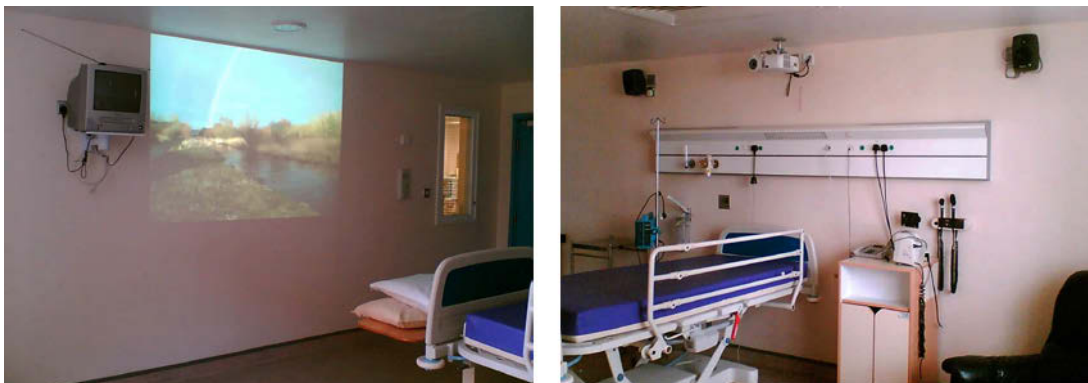
Figure 2.15 Open Window in the National Bone Marrow Transplant Unit, St James Hospital, Dublin

This project affirms again the significant therapeutic value of visual and auditory exposure to simulated natural scenery. Another two important aspects to this installation are the variety of natural videos provided as well as the portable camera device to record natural landscapes and allowing the patient or family member to

produce the subject matter. This variety and ability to cater to the patient's preferences has enhanced the contribution of the project. The interaction within the project is cleverly targeted at patients who may be unable to engage in a highly physical manner. However the lack of interaction may hinder the patient from becoming fully immersed within the installation, which may lead to boredom in the longer term. This project gave me a stronger understanding of the value of natural landscapes and the importance of giving patients a choice.

2.5   Conclusion

The field of developing the therapeutic use of interactive multimedia art in healthcare settings is still in its infancy (Chen, Bongers, & Iedema, 2009). However, there is a growing trend towards the use of interactive multimedia art as a means of promoting positive distraction and stress reduction. The discussion in this chapter bridges the techniques in art therapy, colour therapy and music therapy through a platform of an interactive multimedia installation. The specificity of the elements to be applied, especially those of visual, colour and sound stimuli as well as the technologies, have been classified in order to establish systematic principles for creating a relaxing and therapeutic interactive multimedia artwork. Based on the literature reviewed above, eight design principles were established as a foundation of the design practice:

❖ Principle 1: To be beautiful, pleasurable and usable

❖ Principle 2: Realistic or representational image style for the natural landscapes, and avoid ambiguous and abstract images

❖ Principle 3: Something with which people associate positive experiences

❖ Principle 4: Colour scheme dominated by a variety of calming greens or blues, decorated with soft pinks and oranges

❖ Principle 5: Seamless loop sound with slow and stable tempos, gentle timbre, and predictable cadences

❖ Principle 6: A large scale projection to foster an immersive experience

❖ Principle 7: Interactivity that offers choices and options to modulate one's sense of control

❖ Principle 8: Multisensory design – using audio and visual media to enrich the experience

Following the design principles and the discussion addressed in Section 2.3.1 (Visual Elements and Healing), the four major themes were identified. With each theme the corresponding image elements, colour scheme and sound elements are matched against each of the four themes. This is summarised in Table 2.2.

Theme	Image elements	Colour scheme	Sound elements
Garden/Flowers	Verdant and blooming flowers with some water feature, birds, some spatial openness (Biederman & Vessel, 2003; DeSchriver & Riddick, 1990; Edwards & Beck, 2002; Wells, 2005; Biederman & Vessel, 2003; Eisen et al., 2008; Nanda et al., 2008)	Green colour scheme (Birren, 1950; Dalke et al., 2006; Crozier, 1996; Meerwein et al., 2007)	Tranquil music with birds sound, some texture by string quartet (Knight & Rickard, 2001; Tansik & Routhieaux, 1999; Almerud & Petersson, 2003; Trappe, 2010; Ulrich et al., 1991; Whall et al., 1997)
View of trees	Many trees, thick forest (Hartig, et al., 2003; Herzog, Maguire, & Nebel, 2003; Parsons, et al., 1998; Ulrich, 1979, 1984; Van den Berg, et al., 2003)	Green (Birren, 1950; Dalke et al., 2006; Crozier, 1996; Manav, 2007; Meerwein et al., 2007)	Sound of nature, some texture by string quartet (Knight & Rickard, 2001; Tansik & Routhieaux, 1999; Almerud & Petersson, 2003; Trappe, 2010; Ulrich et al., 1991; Whall et al., 1997)
Waterscapes	Lake, waterside, distant mountain and spatial openness (Diette, et al., 2003; Laumann, et al., 2001; Tse, et al, 2002; Ulrich, Lundén, & Eltinge, 1993; Van den Berg, et al., 2003; Eisen et al., 2008) Aquariums (DeSchriver & Riddick, 1990; Edwards & Beck, 2002; Wells, 2005)	Blue (Birren, 1950; Crozier, 1996; Crosby, 2006; Manav, 2007; Meerwein et al., 2007)	Piano music (Tansik & Routhieaux, 1999)
Rolling hill / countryside	Rolling hill and distant mountain view, grass (Cimprich & Ronis, 2003; Biederman & Vessel, 2003; Laumann, et al., 2001; Ulrich & Gilpin, 2003; Velarde, 2007)	Green (Birren, 1950; Crozier, 1996; Meerwein et al., 2007)	Piano music (Tansik & Routhieaux, 1999)

Table 2.2 Design practice: Major themes and its elements

It was recommended by Malkin (2006) and Malenbaum *et al.* (2008) that a therapeutic physical setting might involve interactive art, a computer-generated soothing image of a nature landscape accompanied by music composed specifically for the healthcare setting, projected onto a wall in a hospital room. As addressed at the beginning of this chapter, to design for an emotion, the method and elements that are utilised to obtain the desired emotional responses should be studied. It is therefore imperative to begin with a fundamental knowledge. By understanding the fundamental principles and looking at other projects in existence, I better understood how to create a novel and unique design practice in this research. In the next chapter, I will present the development process of the design practice for the Visual Melodies interactive installation.

Chapter 3
Development of Visual Melodies

This chapter presents the development process for the Visual Melodies interactive installation. I begin by addressing the design goals in Section 3.1 for creating a multimedia interactive installation, differentiated into aspects of therapeutic effect, aesthetic of the content, interactivity, interface usability and technical factors. In Section 3.2, I detail how I drew from the literature reviews and the design principles and design goals to develop the four themes that form the content and interactivity of Visual Melodies. In Section 3.3, I then detail the development processes of the four themes: Garden Theme, Forest Theme, Marine Theme and Night Theme, including how the concepts were conceived, how the graphics were created from sketches, how the music was composed and edited, how the animations were created, and how I programmed the connections between the input devices and output multimedia. During the creative practice, I also attempted to draw the images that I perceive when I envision a landscape that includes my own experiences and childhood memories of relaxation. I attempted to present images that evoked positive emotions for me with the hope that they would elicit some positive emotions for the users too. Problems encountered during the creative process and their solutions are also discussed. Finally, the development of the controller table is detailed in Section 3.4. I describe how the input parameters were chosen, the process of material and shape development, and several stages of the interface user testing. The chapter then concludes with an overview of the evolution of Visual Melodies, presented in Section 3.5.

3.1 Design Goals

Following the eight design principles established in the literature review, a set of design goals were also developed for creating the installation which are divided into five different aspects:

1. **Therapeutic effect**: to provide users with a soothing and supportive environment, and to engender feelings of calm and relaxation in the user.

2. **Aesthetic of the content**: to present something beautiful, pleasing and appealing to users, and to create a multisensory experience to enrich the sense of relaxation and peacefulness:
   a. Hearing - the background music and interactive sounds;
   b. Sights - the images, colours, interactive animations; and
   c. Touch - the wool felt controller interface.

3. **Interactivity**: to enable freedom of control to the user by presenting *manipulable* environmental art.

4. **A useable and inviting interface**: to entice the user's curiosity, and encourage them to engage and explore. The interface needs to be soft, pleasantly tactile and palm-sized, allowing users to press comfortably with the palm or with 3 fingers instead of a one-finger clicking action akin to the action on a computer keyboard or mouse. It needs to be able to resume its original shape immediately after being pressed, and to allow users to learn to use the controller in a natural way with ease, particularly for users from non-technical backgrounds.

5. **Technical factors**: to allow many users to interact at once without slowing down or crashing the computer, to be able to stably connect the output system (interactive animations and sounds) with the input parameters (sensors), and to minimise the negative effects of the technology, such as the quality of the speakers, the resolution of the projector and the speed of the computer.
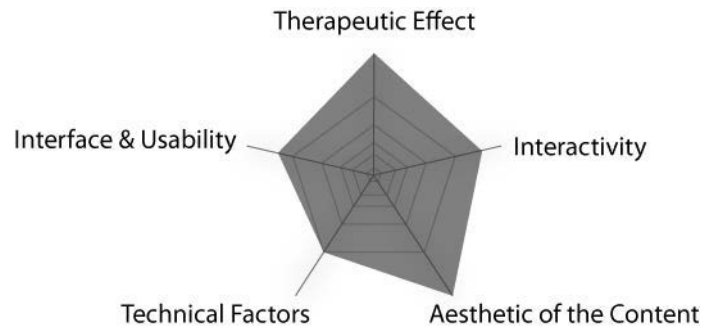
Figure 3.1 Focal point of the design concept

In terms of the focal points of the design goals (Figure 3.1), *therapeutic effect* and *aesthetic of the content* are the top priorities here. The secondary priorities are *freedom of interactivity* and an *inviting interface* and its *usability*. While *technical factors* are an important consideration, they are primarily enabling design goals to maximise the performance of the installation.

3.2   Design and Implementation

> *One way art can usefully be thought of is as an indeterminate condition, a threshold between conscious thought and unconscious feeling, an opening onto a liminal space where rationality (theory) and irrationality (experience, emotion, art) mix in the individual creative act (practice).*
>
> *(Dallow, 2003)*

Guided by the literature review, design principles and design goals, I then implemented these principles as a foundation and employed the design goals as a set of priorities to develop and create the animations, sounds, interactivity, interface and physical settings of the installation. As concluded in Chapter 2, the interactive installation to be created in this exegesis is for the purpose of engendering feelings of calm and relaxation in users in hospitals. Following Principles 1 to 5, it is designed to consist of a series of original artworks depicting beautiful natural landscapes, accompanied with music compositions produced specifically for the installation. Following Principles 6 and 7, the soothing landscape artworks will be projected directly on to a wall at a large-scale, with users sitting comfortably on a sofa, listening to the music and interacting with the images and sounds using custom-made controllers. According to Dallow (2003) the act of creative practice is an intertwining process between objective thought (theory) and subjective feelings (the artist's

experiences and emotions). As such, I not only drew on the scenes and elements of natural landscape that I had taken from the studies, but also included my own experiences of relaxation, memories, emotions and imaginative thoughts in this creative practice. Through this process, I hoped that the images I created that had a positive emotional affect on me could also have some positive effects for the users of the installation.

Based on Principle 8, a harmonic multisensory experience refers to experiencing a harmony between different senses. The installation mainly addresses the senses of sight and hearing, and as such the name of Visual Melodies[8] was conceived.

Having several opportunities to present the artwork in different workshops, exhibitions and conferences, the project received a fair amount of interest and enquiry. Due to this, a website was also created - www.visualmelodies.org[9] to publicise the interactive installation. As such, people who are interested in the project can go to the website to look at the images and find out more about the project at anytime.

Figure 3.2 Visual Melodies logo designed by Amy Chen

In general, my approach towards creating the content of the Visual Melodies first began by sketching (Figure 3.3). This was to find out the most appropriate images and elements to be created. Two stages of sketches were involved; I first focused on drawing images such as trees and streams at a conceptual level. I then extended this concept to further possibilities of creation. For instance, from the sketch of a stream I went on to illustrate images that could be related to the stream, such as a waterfall,

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[8] It represents a harmony between visuals and sounds as well as the harmony between the artwork and the environments.
[9] The website was established in December 2009 and created by Amy Chen. See screenshot of the website in Appendix E.

water movement on the rocks and water drops on a leaf. While sketching, I also made notes to address the possibilities for its interactivity, for example the interaction of a flower could be growing or shrinking, or petals could fall off from the flower. Secondly, I digitised the sketches into computer graphics by drawing in Adobe Illustrator[10], followed by transforming all the graphics into animations in Adobe Flash[11]. For the music composition, the sketches and computer graphics were shown to the music composer, David Sunderland[12]. I then liaised with him in regards to my ideas for the types of music and musical instruments to be composed, based on Principle 5 (Section 2.3.3). Finally, gathering all the visuals and sounds, I then programmed the interactivity by mapping the connections between the input parameters and output multimedia interactive elements.
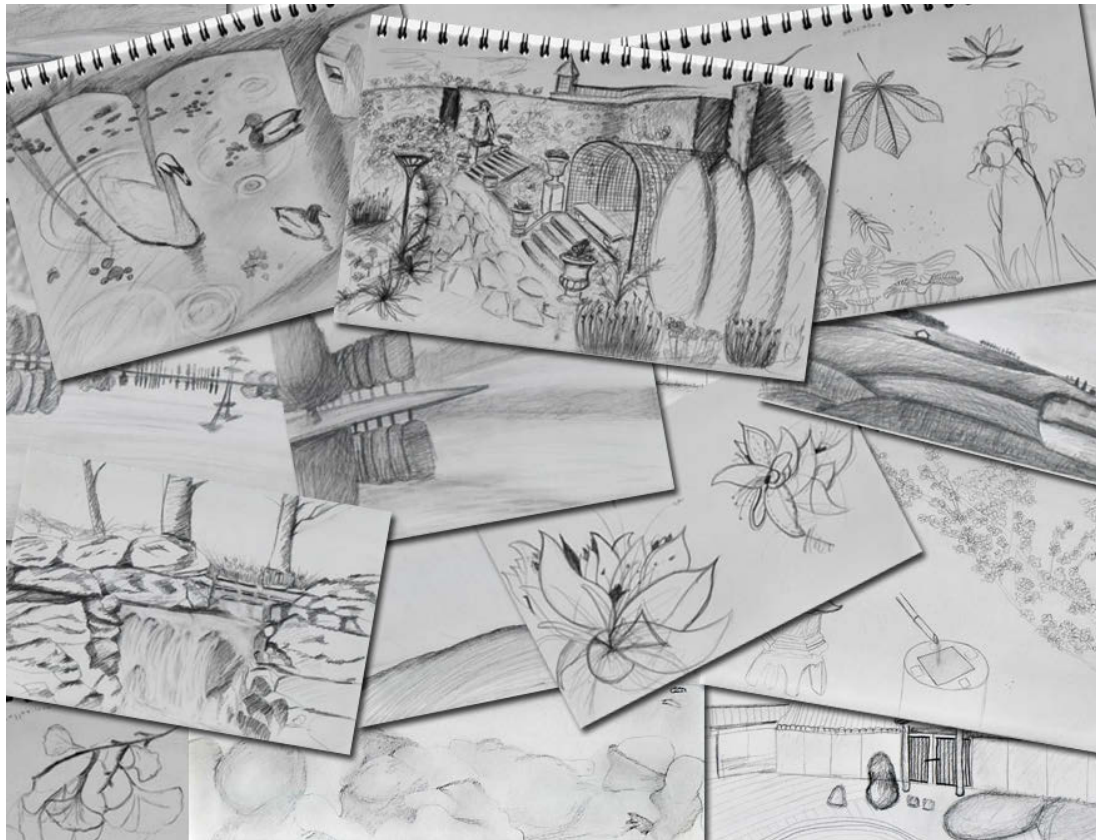
Figure 3.3 First stage of sketches illustrated in 2007

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[10] Illustrator is one of the Adobe Creative Suite products that allows users to illustrate vector graphics.
[11] Flash, one of the Adobe CS products, is a multimedia platform that allows user to add animations, video and interactivity. Flash can manipulate vector and raster graphics.
[12] Through an advertisement, I found a music composer, David Sunderland, who specialises in string quartet compositions, and who also plays the piano and trumpet.

3.2.1 The Four Themes

As described in the previous chapter, studies have found that soothing music and images are able to help people to relieve their stress and relax (Chlan, 1998; Heenan, 2006). Studies have also identified that beautiful and peaceful natural landscape scenes are able to help people shift into deep relaxation, particularly with scenes of flowers in bloom, forests, seaside settings, the shifting light and of sunshine through green foliage (Biederman & Vessel, 2003; Cooper, 2006; Sternberg, 2009; Ulrich, 1984). The images, colours, sounds and interactivity of Visual Melodies discussed in this exegesis are based on the four major scenes and they are as outlined in Chapter 2: Garden, View of trees, Waterscapes, and Countryside.
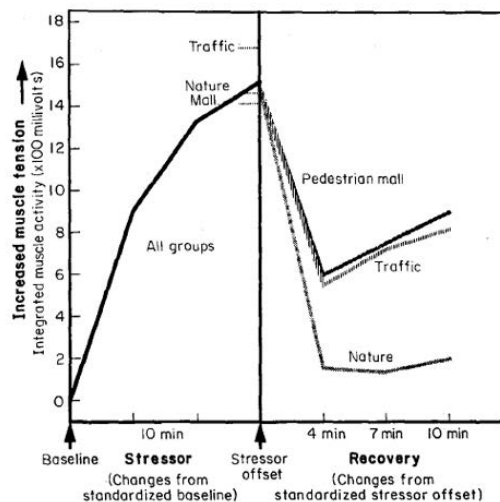
Figure 3.4 Changes in muscle tension during stress and recovery (Ulrich, et al., 1991)

According to a study conducted by Ulrich *et al.* (1991), visual exposure to a nature video helped to achieve a better restoration from stress recovery, and this effect could be achieved within 4 minutes. It can be seen in Figure 3.4, from the stressor offset point which is the start of the nature video intervention, that from the first minute when participants start watching the nature video, their muscle activity decreased significantly. From 4 to 10 minutes, their muscle activity plateaus at a low level, which means that participants were less stressed compared to the beginning of the intervention. It was suggested by Davis (2003), according to the iso-principle, that it is helpful to initially match a music recording to an existing level of activity and stress of the listener, then gradually change the music to a slower and less active tempo in order to change the listener's mood and help foster relaxation.

Therefore, I was inspired to create the four major scenes that corresponded to the rhythm of the stress recovery timeline as shown in Figure 3.4, like the course of a day. As such, the four scenes would begin with a bright morning surrounded with glowing light and colours with a cheerful feeling and abundant interactivity, to the afternoon with sunbeams shifting through woods with moderate levels of interactivity, creating a sensation of tranquility and encouraging the user to slow down. This then evolves into an evening waterscape scene evoking sensations of dreaminess, surrealness and magic, where a sense of adventure with more possible interaction is presented, to a night time scene with silhouettes and gentle music with limited interactivity to evoke feelings of rest and peace. I then placed the four major scenes into the day timeline as well as the stress recovery timeline outlined above - the Garden Theme (Garden / Flowers) in the morning with high interactivity, a Forest Theme (View of trees) in the afternoon with moderate interactivity, a Marine Theme (Waterscapes) in the evening with a more exploratory forms of interactivity and a Night Theme (Rolling hill / Countryside) with more limited interactivity.

Storyboard Development

Following this diurnal timeline, I initially created a storyboard with a linear storyline (Left in Figure 3.5). In this storyline, each interactive element was designed as a task and each task/interactive element would be triggered once the previous task was completed. Most of the ideas for the interactive elements were conceived at this stage of storyboarding. A linear storyline, however, would substantially limit the *freedom of interactivity* (design goal 3 in Section 3.1). For example, the freedom of changing between the four themes is limited and the freedom of interacting more with certain elements is also limited. As suggested by Eisen *et al.* (2008), it would be good to provide several choices for patients to select a preferred image although the images provided should all be based on natural settings. In a similar vein, Ulrich & Gilpin (2003) pointed out that providing the choices of art for patients can enhance the sense of personal control and thus help restoration. Based on Principle 7, interactivity that offers choices and options to modulate sense of control have been identified as an important therapeutic element in a healing setting. As such, the storyboard was then amended from a linear storyline to a non-linear storyline (Right in Figure 3.5).

This increases the level of interactivity and enables users to have a higher level of control over the interactive elements as well as changing the four themes at any time they wish to. For example, after experiencing the Marine Theme in the evening, they can choose to move to either the morning Garden, afternoon Forest or Night Theme.
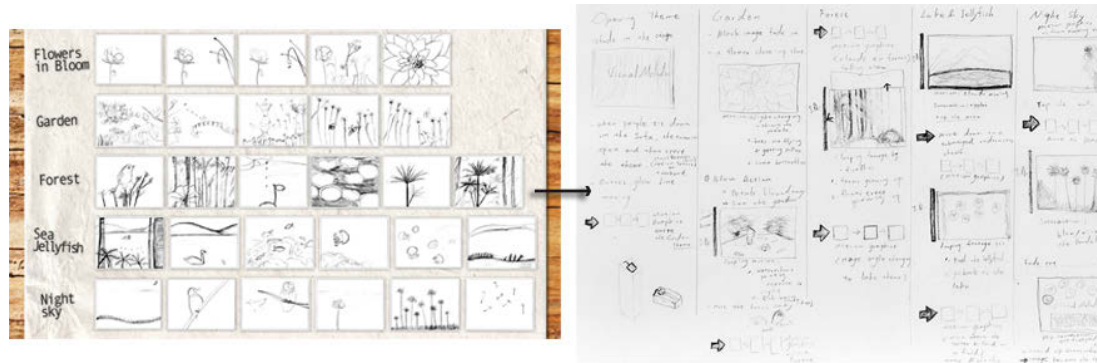
Figure 3.5 Left: Storyboard with linear storyline. Right: Final Storyboard with non-linear storyline

Each theme structure consists of two layers: one is the background layer that contains non-interactive looping footage and music; the other layer is the interactive layer which contains all the interactive animated elements and sounds (Figure 3.6). To enable a user to change themes, four controllers for changing the themes were then set. As such, when a user manipulates the Garden theme-change controller, the image projected on a wall would immediately change to the Garden Theme. In regards to controlling the interactive elements on the interactive layer, nine object-change controllers were set to control different interactive elements[13]. Unlike the theme-change controllers, the object-change controllers are sharable to be used in each theme, for example, an object-change controller can trigger the frog jumping animation in the Garden Theme, and the same object-change controller can trigger a flower growing animation in the Forest Theme, or rain animation in the Marine Theme. Detailed descriptions of how I developed the four themes are presented in the following section 3.3.

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[13] All the controllers were connected to an InterfaceKit (*See* Section 3.2.3), and each InterfaceKit contains 8 analog inputs. Unlimited InterfaceKits can be connected to the computer. Considering the appropriate amount for the control elements, being not too many or too few, two InterfaceKits were connected for this installation which allowed me to have up to 16 inputs. As such, 12 inputs were left for changing the objects. Considering the size of the controller table, a total of 13 cube controllers were the best amount to be pleasantly visually presented without being too crowded. Therefore, 9 controllers for changing objects were set.
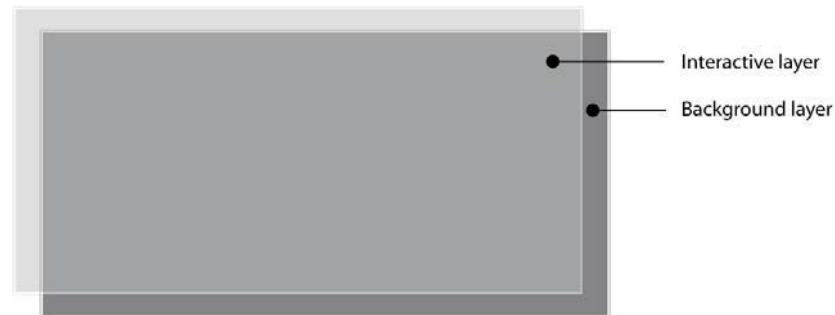
Figure 3.6 Theme structure

3.2.2   Physical Interface

Considering the hospital waiting room environment and following the design principles, there were several practical requirements for designing the physical interface:

1. Accessible for less mobile users
2. Accessible for non-technical users
3. Intuitive, not requiring any supplementary instruction
4. Able to be used from the seated position
5. Something soft, pleasantly tactile and squeezable
6. Easy to clean and hygienic
7. Sharable usage for different interactive themes

According to Bongers & Harris (2002), to design the appearance of the physical interface, the notion of input parameters need to be considered first and then mapped to the most appropriate parameter to be used. As such, in the design process of developing the physical interface, I first identified the most appropriate input parameters to be used for the installation. I then designed the appearance of the controllers, followed by fine-tuning the display of the controllers on the table. A detailed description of how I developed the controller table is described in Section 3.4.

3.2.3 Technologies

The creation of the Visual Melodies interactive installation involved several separate elements of software and hardware. To create the graphics and animations of the installation, Adobe Illustrator CS4, Photoshop CS4, Flash CS4 and After Effect CS4 were used. For editing sound elements, Apple GarageBand '09[14] and Adobe Soundbooth CS4 were used. The installation hardware included sensors, two Phidget Interface Kits[15], a ceiling mounted projector and two active speakers.

In terms of interactivity, I used a PhidgetWebService, a super light socket server, as a platform to which the Flash application connected to in order to connect the output and input devices/sensors. The range of data a sensor sends to the computer is measured in number from zero to 1000. I used Flash CS4 and Action Script 3 (AS3), a computer-programming language, to program the responding animations when receiving data from the sensors.

I explored using Max/MSP Jitter at the early stage of the project. However, the quality of visually presenting a vector[16] image in Jitter is not as good as in Flash; this is because Jitter is designed to manipulate video which is based on raster graphics, whereas Flash is designed to animate vector images. Furthermore most of the interactive elements were to be drawn as vector images, allowing the animated elements to be manipulated individually. Although, a very limited tutorial was published for connecting sensors to the Flash application and it was quite difficult to program to manipulate objects within the video, I argue that Flash/AS3 was still the most appropriate platform to create this interactive installation. The main challenges in this creative practice were to find a way to map the sensor to the animated elements in Flash, to find a way to control each element, and most importantly to

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[14] GarageBand is an Apple Mac application developed by Apple Inc. that allows users to create/edit music.
[15] Phidget Interface Kit 8/8/8 was developed by Phidget Inc. It provides a connection to interface the computer with various devices.
[16] Vector images are developed by mathematical functions using points and lines, whereas raster graphics are made by the combination of individual pixels.

learn AS3[17]. Figure 3.7 presents the basic structure of the connections between the
hardware input devices and the multimedia outputs.
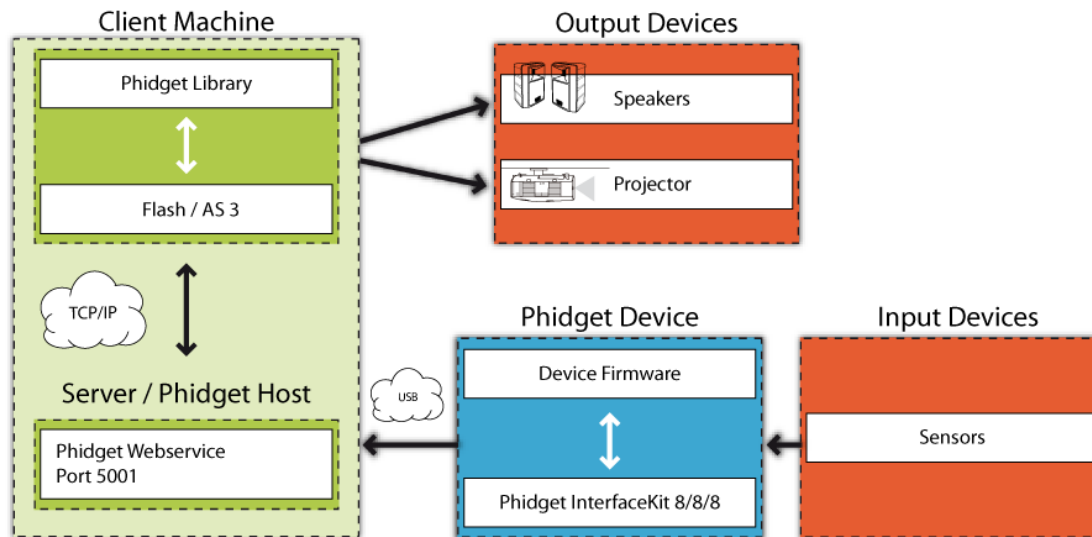
Figure 3.7 Basic structure of the connections between hardware devices and multimedia outputs. Redrawn by Amy Chen. The
diagram was adapted from the Phidget diagram, *Phidgets Actionscripts 3.0 API Reference* Version 21.2[18]

3.3 Development of the Four Themes

In this section, I detail the development of the four interactive themes that form the
content and interactivity of Visual Melodies: Garden Theme, Forest Theme, Marine
Theme, and Night Theme. Each theme development is documented according to the
following structure:

- Concept;
- Content development: sketches, background footage, interactive elements,
  music, and animations;
- Programming development: mapping and the problems and solutions.

---

[17] In my past experience working as a flash web designer, I used AS2 to program interactivity to
develop a website. However, the medium to connect between Flash and sensors is through the
PhidgetWebService, which only interfaced with AS3 (see the difference between ActionScript2 and
ActionScript 3 in Appendix A).
[18] Accessed and downloaded12/05/2010 from http://www.active-
robots.com/products/phidgets/phidgets/AS3_API_Manual.pdf

3.3.1 The Garden Theme

Drawing from the literature review with regards to a view of gardens enhancing healing effect (Section 2.3.1) and the four themes described in Section 3.2.1, the Garden Theme was set in the morning surrounded with glowing light, bright colours, flowers in bloom, cheerful music and designed with abundant interactivity. The Garden Theme is the theme that users potentially may begin with when interacting with the installation. As such, it plays an important role in enticing users to come, play and remain with the installation. Before users reach the installation, potential users may have been walking around, talking to someone or engaging in other activities. As mentioned in Section 3.2.1, the Garden Theme is designed with a high level of interactivity and intended to match with a user's initial level of activity. In addition, when a user sits down in front of the controller table, they may not know how to interact with the installation. As such, the interaction for the theme should be very simple with an instantaneous response, to make it easier for users to find out how to interact with the installation.

3.3.1.1 Content Development

Sketches

Figure 3.8 Sketches for the interactive Garden Theme

The original idea for creating a garden scene was to create a view full of roses and peonies (Figure 3.8). I have always dreamt of visiting a garden like that. However, I had been searching for gardens in different places and different countries and did not find any that matched my idea of this garden. I attempted to digitally create such a garden on the computer, but it did not realistically match my original idea either. Therefore, I started to study plants and flowers in the natural environment by visiting different gardens in New South Wales (NSW) and Victoria in Australia (Figure 3.9). This was to understand flowers and plants in more detail, including colour, structure and movement. I also attempted to refine the representational image style for the theme (based on Principle 2) and discover the interactive elements to be included.

A chance trip to the Chinese Garden in Darling Harbour impressed me with its peacefulness and serenity. Once I entered the Chinese Garden, I felt like I was not in Sydney anymore and at that moment my mind had been shifted into another special atmosphere. The branches of willows were moving with the gentle breeze, lotus and waterlilies were glowing on the water surface, I could see koi in the water. I was totally drawn into its beauty and peacefulness. I then determined that the image style for the Garden Theme would be set at the Chinese Garden with pond (water feature as described in Section 2.3.1).

Figure 3.9 Inspiration photos for the Garden Theme

Background Footage

Four pieces of footage were selected from the overall footage I filmed in the Chinese Garden (Figure 3.10). The selection was based on the following criteria: its composition, the feelings that the footage evoked, whether it had sufficient space to add the interactive elements and whether the footage could be modified into a seamless loop. Considering the composition and space for setting up interactivity, footage 3 and 4 became my final two options; one was a panoramic view of the garden with tree branches being gently blown over the top of a pond with water rippling, and the other footage was of a bridge and some lotus flowers floating in the pond. In footage 3, I felt that the panoramic view and wind effects created feelings of a cold day in winter, whereas in footage 4, the gentle blowing wind with the bridge, stones and lotus leaves evoked feelings of warmth and peace. I then chose the footage 4 as the background video for the Garden Theme.
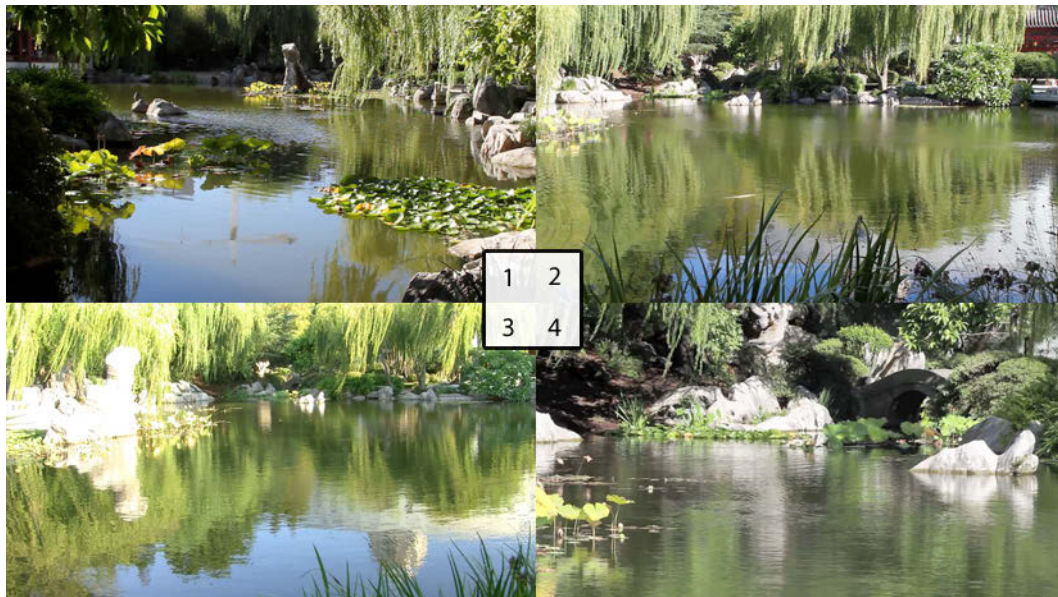
Figure 3.10 Garden Theme background footage

To enhance the colour of the footage and create a seamless looping background video, Adobe After Effects was used to adjust the contrast and saturation and to edit the timeline. Figure 3.11 presents a comparison of the colour enhancement before and after. It can be seen that in the image on the right, the colour is richer and more vibrant, and the green colour of the trees and the colour of the water reflection is much more dynamic compared to the image in the middle.

Figure 3.11Background footage colour adjustment, before (left) and after (right)

Interactive Elements

The interactive elements in the Garden Theme include manipulating a dragonfly flying, two ducks and one swan swimming, butterflies flying, a frog jumping, and waterlilies and a lotus flower shrinking into the water. As addressed in the theme structure (Section 3.2.1), these elements were created in the interactive layer, which is on the top of the background footage layer.

Ducks and swans were part of my initial sketches (Figure 3.3). The footage of ducks and a swan swimming were filmed at Sydney Olympic Park. I also observed *how* they swam, in order to create a more natural kind of swimming path. The making of the swan animation is presented in Figure 3.12. This process included editing the footage timeline in After Effects to loop the video naturally and seamlessly and removing the footage background so that the swan would stand out as an individual object (left in Figure 3.12). It was then ready to be added on the top of the background footage in Adobe Flash and to make it move according to the direction I coded in AS3. Filter and colour enhancement were also employed to create some extra texture to the swan animations.

Figure 3.12 The making of the swan animation

The vector images of waterlilies, lotus, leaves, koi fish, butterfly, dragonfly and frog were drawn in Illustrator. For example, for the drawing of the waterlily vector image, I used a photo taken in the Chinese Garden as a reference to illustrate a digital waterlily (Figure 3.13). Once the first model of a waterlily was drawn, I then duplicated the waterlilies into different images with different visual presentation by rotating the petals, adjusting the lines and form and changing the colours.

Figure 3.13 Interactive elements: Waterlilies

Music

The structure of the sound field for the Garden Theme is shown in Figure 3.14. A continuous loop of background music serves as a base for the theme, and each interactive element has its sound imposed on the top of the base music that starts to play when a user triggers a controller (See a list of the soundtracks for the Garden Theme in Appendix B).
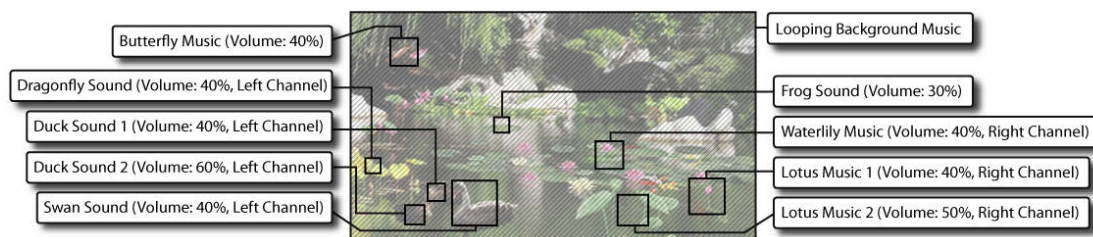
Figure 3.14 Soundscape for the Garden Theme

In respect to the background music composition, David Sunderland explained that he used the instruments of Chinese flute and Chinese piano to evoke the feeling of a Chinese Garden and he also added bird sounds to give an extra dimension to the music. Based on Principle 5, the slow and stable tempo gentle background music was attached to the Garden Theme and coded to play as a continuous loop. It is important to note here that the loop music could cause boredom and annoy users; as such, the freedom of enabling the users to be able to change theme at any time, with the background footage changing as well as background music changing become very important in addressing this issue.

To create the interactive sound for each interactive element, the sounds were chosen to mimic the interactive elements' own organic sounds. For example, a frog croak for the frog and a buzzing sound for the dragonfly. To add the sounds for the animals, I downloaded the sound of the frog croaking, dragonfly waving their wings, ducks splashing in the water, and a swan honking, from the professional sound effects website SoundSnap[19]. For the elements that did not require an obvious organic sound, a short piece of music was employed for their interactive sound. For example,

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[19] SoundSnap (http://www.soundsnap.com/) is an online database of downloadable sound effects. The downloads can be used in any music, film, video game, website etc., whether commercial or not.

the interactive sound for the butterfly flying was edited to 17 seconds of a string

quartet from a 4-minute long piece of music[20].

Animations

There were several different methods that I used to animate the vector graphics in

Flash. An example of creating the interactive Koi fish animation is presented in

Figure 3.15. To create the animations, four different pictures of fish graphics were

first drawn separately. I then inserted these four vector images into Flash, each with

its own frame. As such, when the object starts to play and the frame starts to cycle,

the picture will change according to my setting for the frame, and so the fish will

look like they are swimming.
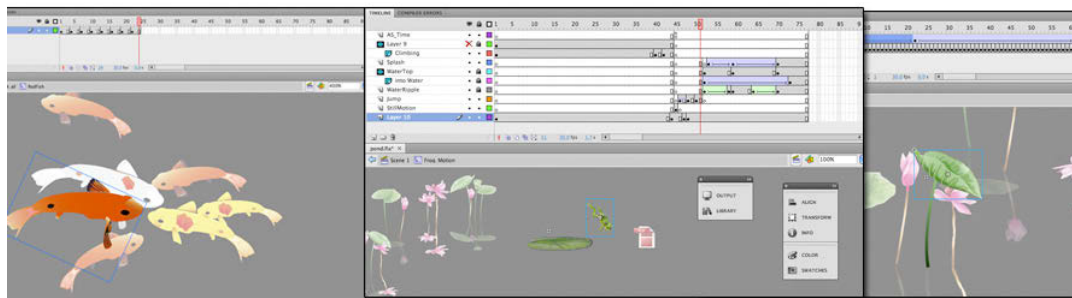
Figure 3.15 Creating animation for the koi fish

3.3.1.2 Programming Development

The Garden Theme was designed to create an easy-to-use interaction with

straightforward and instantaneous responses. As mentioned in section 3.2.1, in each

theme there are nine object-change controllers that can be mapped to different

interactive elements. In the Garden Theme, for example, controller 5 is configured to

map with the dragonfly animation, controller 6 is for the frog, and controller 7 is for

the swan. Each interactive element will start to play when its linked controller is

triggered. Each interactive element also has its preset animation when the element is

not triggered so that it will still move by itself. For example, when the controller is

idle, the interactive swan animation is in standby mode in which the swan only

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[20] The string quartet music was performed by "Clear Strings" Quartet and David Sunderland
(Composer) and engineered by Mike Morgan with Chris Doherty (Assistant). It was recorded at
Studios 301 in Sydney.

moves its head in the same spot. Once a user triggers the controller, then the swan will swim away. After a certain amount of time, the swan will reappear in the theme and stay in standby mode to wait for the next trigger. Figure 3.16 illustrates an example algorithm for the Garden Theme.
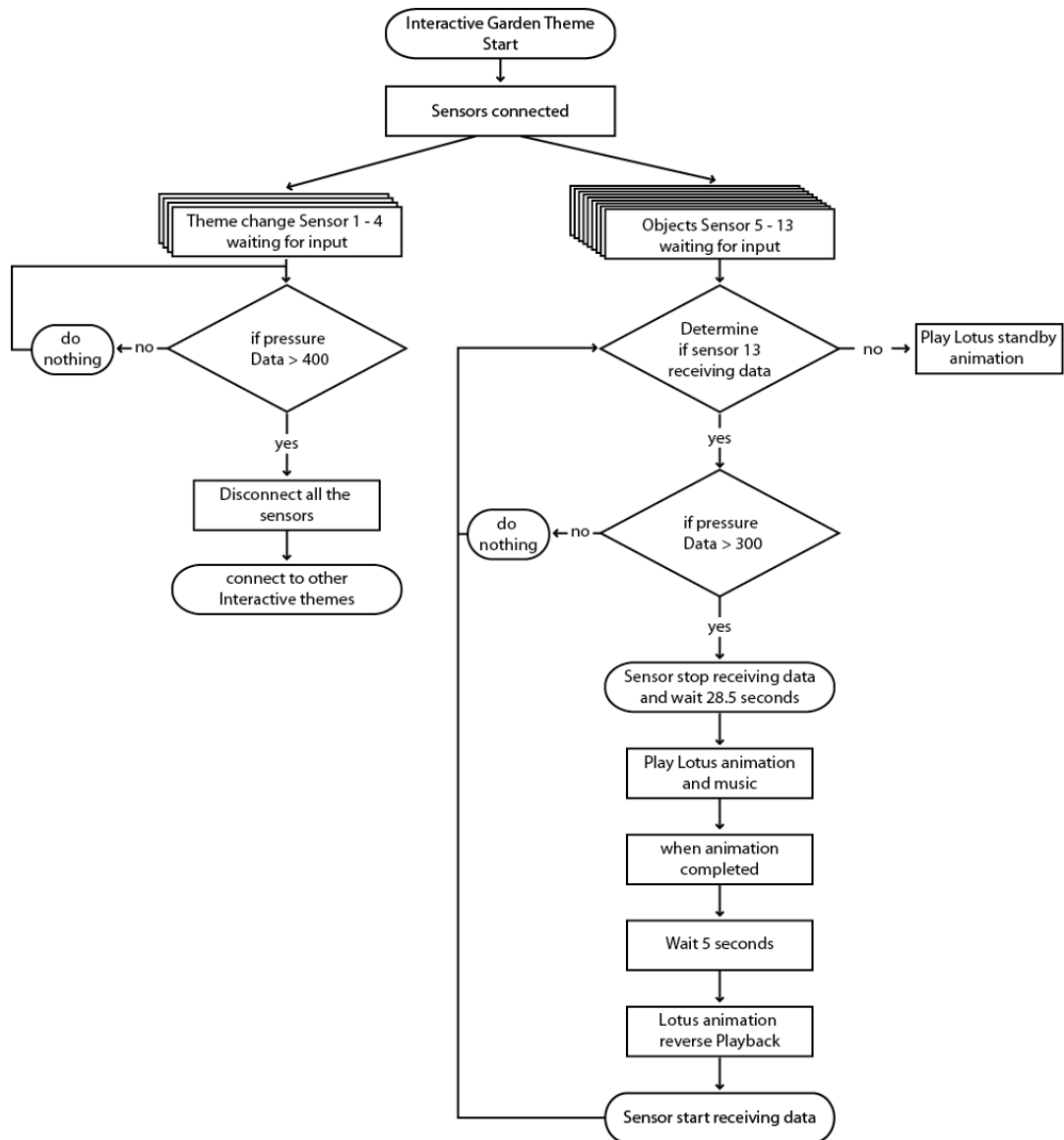
Figure 3.16 An example algorithm of the lotus flower

The final version of the interactive Garden Theme is presented in Figure 3.17:
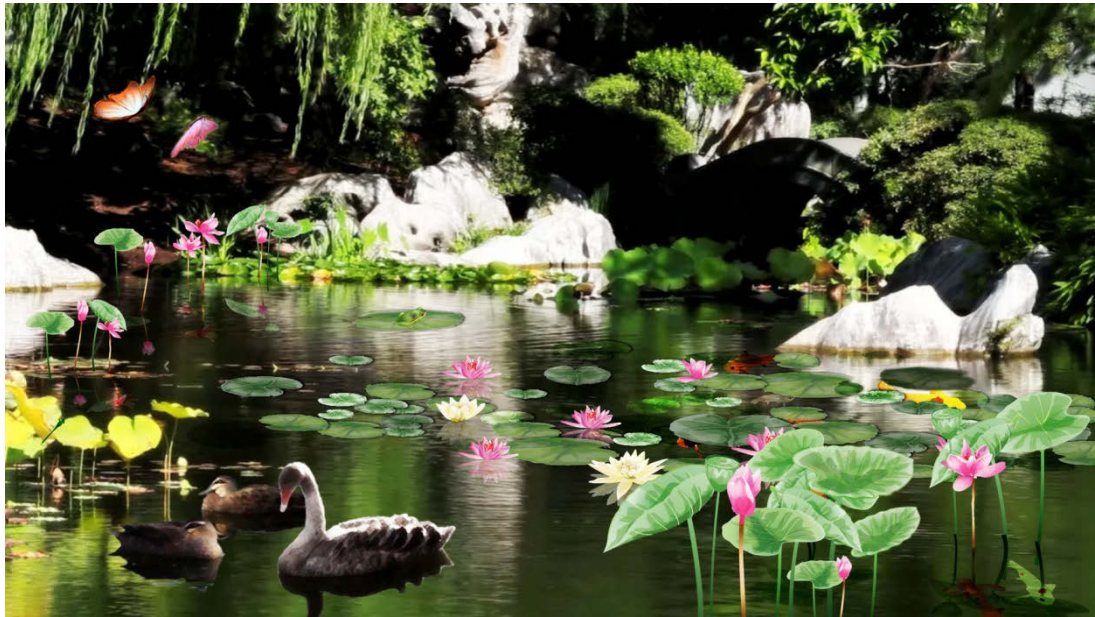
Figure 3.17 Final version of the interactive Garden Theme

3.3.2 The Forest Theme

As mentioned in Section 2.3.1, a view of trees has been well documented to help patients recover more quickly and to enhance recovery from stress and anxiety. As outlined in Chapter 2, the tree scene will contain a thick forest dominated by a variety of green colours and with nature sounds as a background loop accompanied with some string quartet music as interactive sound elements. Based on Section 3.2.1, the interactive Forest Theme was set in the afternoon with sunbeams shifting through woods, with a moderate level of interactivity to create a sense of tranquillity, and to encourage the user to slow down.

3.3.2.1 Content Development

Sketches

According to Nakamura (2008), the sounds of creeks and the feel of sunshine through forest leaves can promote a relaxing effect. Further, the images of flowers in bloom, the shifting light and colours of a sunrise and a panoramic view punctuated by foliage in the foreground were also found to help stress relief (Cooper, 2006). When I was a child, my family used to go for holidays in the mountains. I always

had a sense of relaxation and happiness when we walked in the forest and listened to bird sounds. After moving to Australia, each time I visited mountains and walked in the bush, those feelings of being happy and peaceful came back. Therefore, I attempted to include those positive feelings elicited for me in the development of the Forest Theme discussed in this exegesis. Some sketches were illustrated: trees, sunshine through plant leaves, moss, fern trees, a waterfall, and water drops on a leaf (Figure 3.18).

Figure 3.18 Sketches for the interactive Forest Theme

Visiting different forests in New South Wales, including forests in the Blue Mountains, bushland in the Hunter Valley, the Southern Highlands, Newcastle and the Royal National Park allowed me to understand a forest better (Figure 3.19). The trips were not only for taking photos, filming the forests and defining the type of forest to be presented. The trips were also for discovering the details in the forest and the elements that would be possibly added on to the interactive layer. For example, the sunshine through leaves with their colours and light changing and moving, many small white specks of spores moving gently with the breeze in the air, and interactive elements of growing ferns, leaves and flowers.

Figure 3.19 Forests and bushland

Background Footage

Based on the criteria[21] mentioned in the previous section, twelve pieces of footage were then chosen, which were filmed in different forests (Figure 3.20). To gain an objective opinion, I conducted a small informal survey among the fellow researchers in the Interactivation Studio. I explained the nature of the project and the criteria for selecting the footage, three pieces of footage were thus chosen as labelled 1, 2 and 3 in Figure 3.20. To select one from these three possible pieces of footage, I then showed the three pieces of footage to fellow researchers in the Centre for Health Communication. The aim of the project and criteria were also introduced. From their feedback, video 3 was seen to be greener in colour, but the looping video with the wind blowing constantly elicited feelings of being cold. Video 2, which included a waterfall with green ferns waving in the breeze and water washing over the rocks was fairly relaxing. Finally, video 1 with trees and scattered rocks, some light patches on the ground contrasting with moss and a footpath elicited a feeling of serenity in the afternoon. Considering the scope for imposing interactive elements over the background, video 1 had more potential than video 2 and 3. Furthermore, both the Garden and Marine Themes contain water features, and video 2 also contained a water feature, which would go against providing a variety of image content and different choices (Principle 7). As such, video 1 was chosen as the background footage for the Forest Theme.

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[21] The criteria included its composition, the feelings that the footage evoked, whether it has sufficient space to add the interactive elements, and whether the footage could be modified to a seamless loop.

Figure 3.20 Footage filmed for the Forest Theme

To fine-tune the background footage selected, a sunbeam animation was created so that some of the sunrays would appear in front of trees and some of them would appear behind the trees. Colour enhancement with saturation and contrast to enrich the colour of the footage was also employed (Figure 3.21).
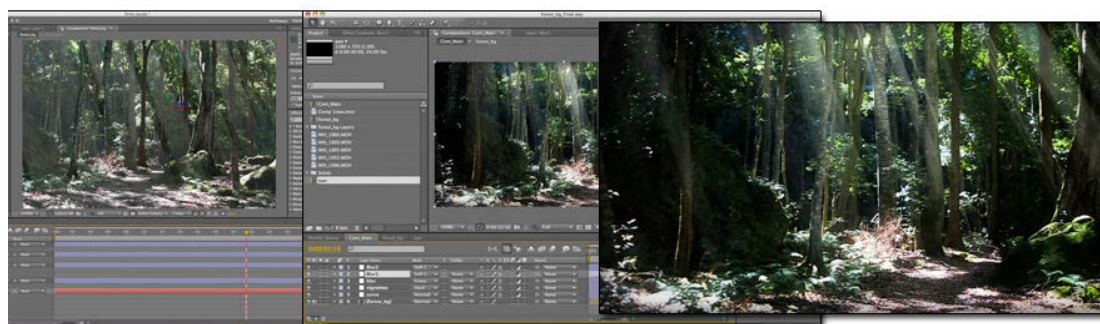
Figure 3.21 The making of the forest background footage

Interactive Elements

The interactive elements in the Forest Theme include growing ferns, mushrooms popping up, growing flowers and water drops falling on leaves. All the interactive elements were vector images. Some of them were drawn by myself in Illustrator and

some of the vectors were purchased from an online image stock library with commercial licence usage[22]. Figure 3.22 shows an example of how I drew the vector image of a water drop. As the water dropped onto the leaves, it needed to have the translucent reflection of the leaves inside the water drop. Because of this, the colour of the water droplet needed to be the same as the leaf but showing a shadow and highlight to present the droplet as transparent.

Figure 3.22 Interactive element: Water drop

Music

The soundscape for the Forest Theme consists of the natural sounds of the forest as a background loop and a series of interactive sound elements played when a user triggers the controller (Figure 3.23). The natural sounds were recorded while visiting the Blue Mountains. The sounds were recorded onto a hard drive using a stereo microphone and then the raw sound was imported into Apple GarageBand to edit. The bird sounds and waterfall sounds were recorded at different times and at different volumes, and the sounds needed to be edited into one cohesive background loop. I also incorporated sounds from the GarageBand library to augment the loop, for example using different pitched bird noises that were not recorded in the Blue Mountains. For the interactive sound elements, several short pieces of a string solo were edited from a long piece of original string quartet composition and attached to the interactive elements. As such, when a user triggers the controller, the interactive sound will play along with the animation (see a list of the soundtracks for the Forest Theme in Appendix B).

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[22] Online image stock library: iStockphoto (http://www.istockphoto.com/) is an online image resource for illustrations, photos and videos. All purchased iStock files are royalty-free, which means once the file is purchased it can be used multiple times without extra charge, and with a legal guarantee which means that any content used within the license agreement will not violate any copyright, moral right, trademark or other intellectual property right.
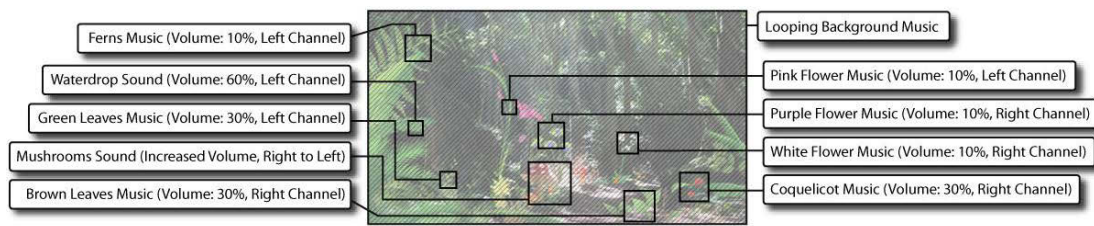
Figure 3.23 Soundscape for the Forest Theme

Animations

One of the interactive animations created for this theme was a flower opening, as shown in Figure 3.24. To make the animation for the flower-openings look more realistic, each flower petal needed to be animated separately by changing the perspective and size of the petals. The image on the left is at frame 1 when the flower is closed, and the image on the right is at frame 30 when the flower is fully opened.
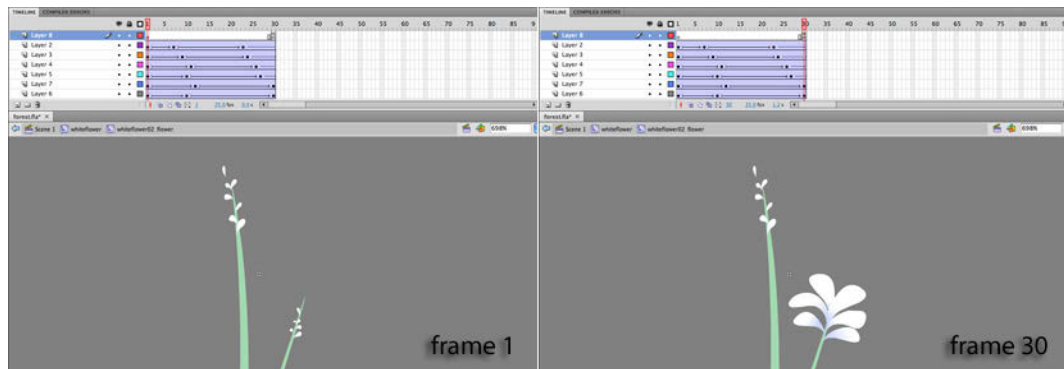
Figure 3.24 Flower opening vector animation

3.3.2.2 Programming Development

The interaction in this theme was focused on making a slow growing movement and listening to solo string music of a slow tempo. The nine object-change controllers are mapped to trigger different interactive animations of flowers, ferns and mushrooms. For example, controller 5 is mapped to trigger the ferns growing; controller 6 is for the pink flower growing; and controller 11 is for the mushroom popping up. The algorithm below illustrates the mapping process for triggering the pink flower animation. As shown in Figure 3.25, the flower animation was designed to play automatically for a certain amount of time when the theme was activated and it would then stay in a standby mode waiting for a user to trigger further growing animations. Once a user triggered the controller, the flower would then start to grow

until the flower was in bloom, pausing for a few seconds, then playing back in reverse returning to its standby mode and waiting for the next trigger.
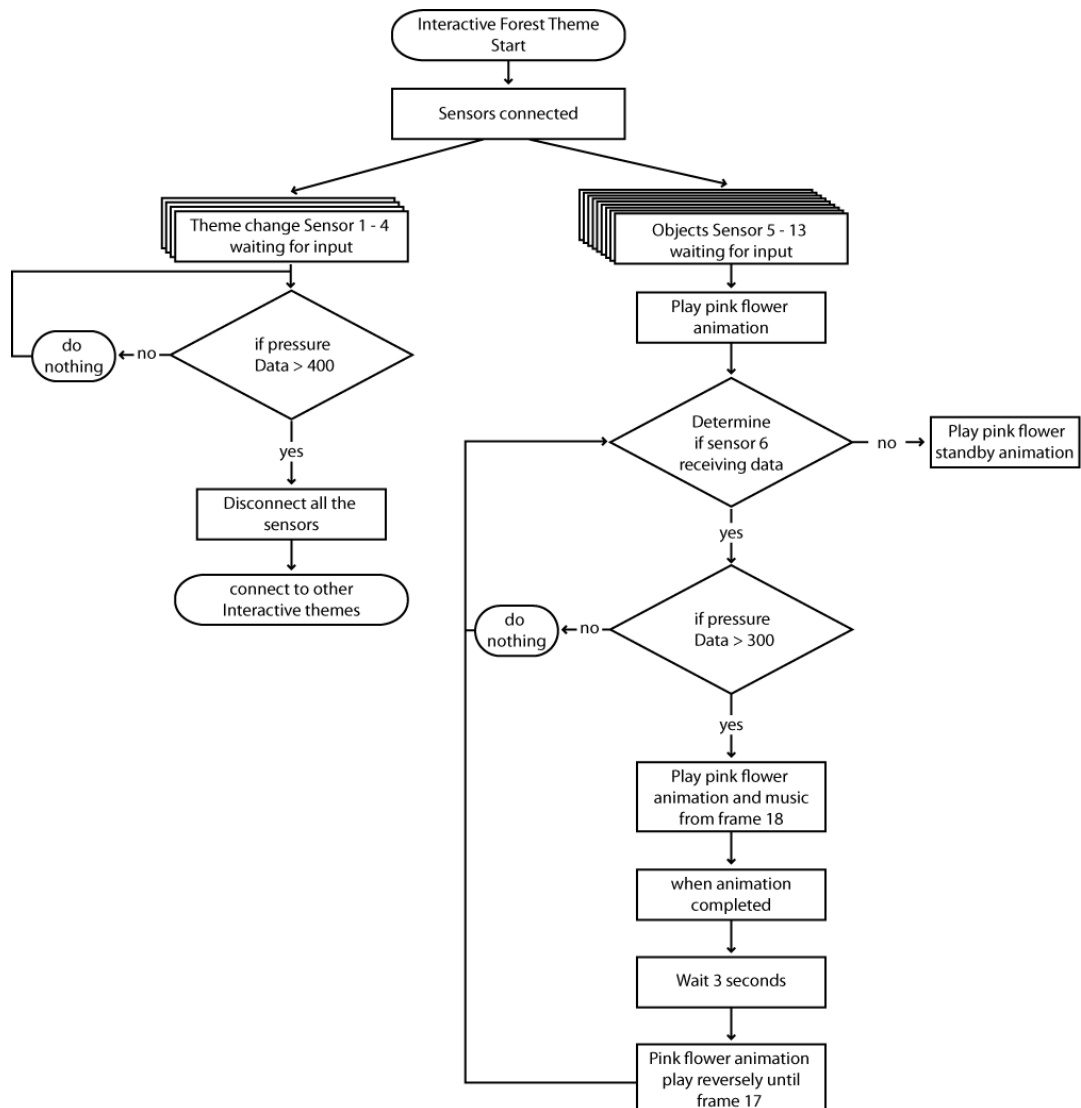
Figure 3.25 Interactive Forest Theme algorithm

The final version of the interactive Forest is presented in Figure 3.26:

Figure 3.26 Interactive Forest Theme

3.3.3 The Marine Theme

This theme is set in a marine environment as studies (described in section 2.3.1) have shown the benefits of viewing waterscapes for relaxation. Based on Section 3.2.1, the interactive Marine Theme was set in the evening to evoke feelings of dreaminess and calm, where an adventure with as much interaction as possible is presented. From Principle 4, blue is the major colour scheme for the Marine Theme, chosen for its promotion of relaxation.

The Marine Theme is intended to be the third theme presented to users. It is designed to continue the feelings created from the Forest Theme, but adding extra emotions of surprise and wonder in order to engage users' curiosity. From my experience of snorkelling, I found the view of being half under the water as well as half above the water increased my desire to discover. As a result, I wanted to create an underwater scene that a user was able to move up and down through the water's surface. As such, I have created three separate scenes within the theme, these being the lake surface, secondly an underwater transition with jellyfish and thirdly a deep underwater scene with tropical fish. This enables the user to interact with different

interactive elements on the lake surface, different elements underwater, as well as to move the scene from lake surface to an underwater world, and vice versa.

3.3.3.1 Content Development
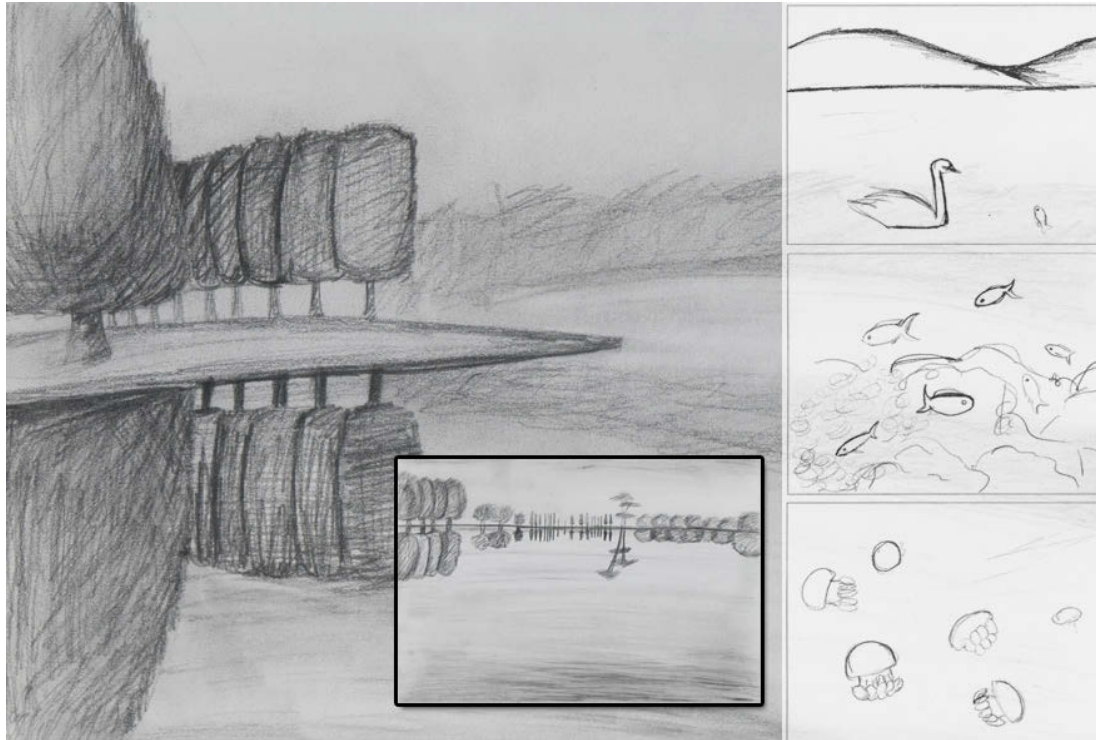
Sketches

Figure 3.27 Sketches for the Marine Theme

For this theme I went through two stages of sketching; the first was to draw multiple compositions of lake images to find what induced relaxation the most; the second stage was to imagine what elements could be created in the interactive layer (Figure 3.27). I then visited the Sydney aquarium to observe the underwater world better. Some examples of photos and footage I took in the aquarium are presented in Figure 3.28.
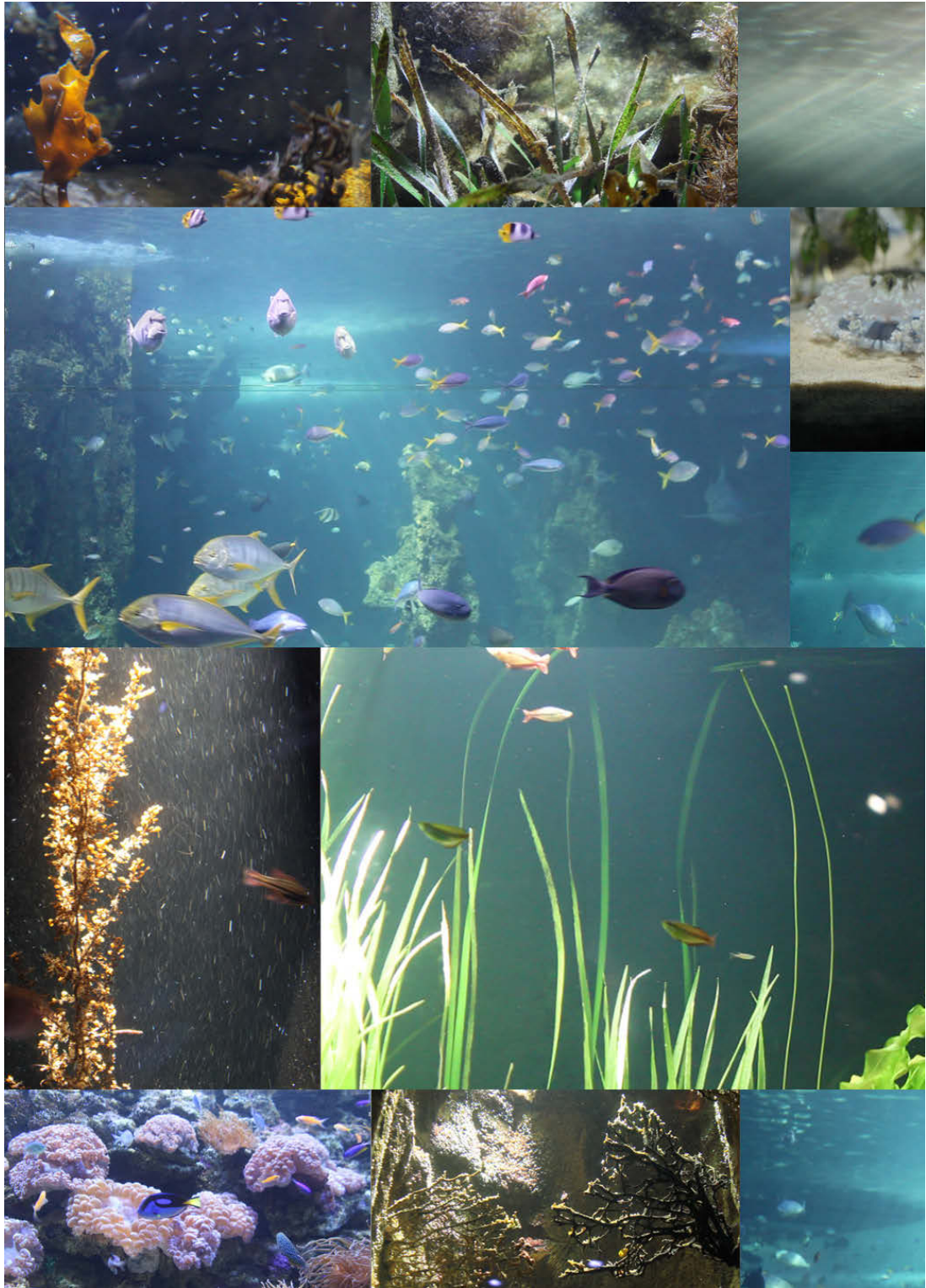
Figure 3.28 Underwater world inspiration footage and photos

The first graphics of the Jellyfish scene were created in Adobe Photoshop as raster images. It was created by manipulating the gradient colour setting and filters to generate the image of underwater with water texture and light rays. The image was exhibited in the Up and Coming Design Expo[23] (Chen, 2009).
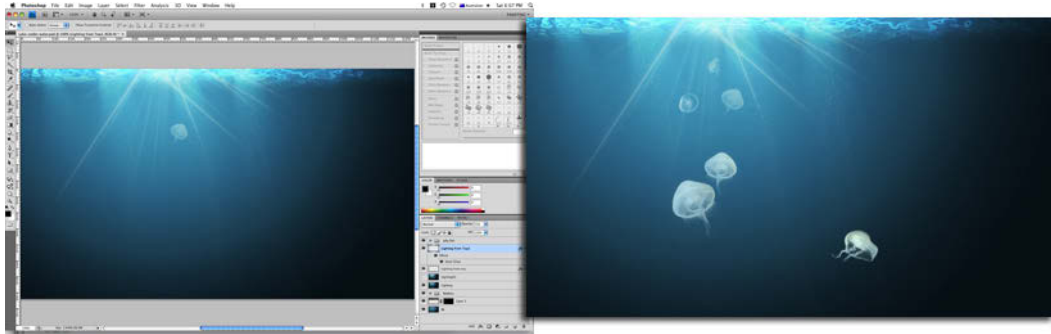
Figure 3.29 Jellyfish Scene graphics

Background Footage

Three pieces of background footage were created in this Marine Theme: lake, underwater and aquarium. Below is the example of the footage development for the Lake Scene, and also an example of the transition image from the Jellyfish Scene to the Lake Scene. The lake image was sourced from an online image stock library and it was taken in the Brecon Beacons National Park in Wales, UK[24]. The original photo is shown on the left and the image in the middle was created after photo manipulation (Figure 3.30). I then used After Effects to incorporate moving waves into the still lake photo by creating a wave movement. The key point here was to create a gentle wave movement with waves moving from far to near. The wave height is not too high and the motion is gentle. I then made this movement into a seamless loop.

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[23] http://www.upandcoming.com.au/artists.html
[24] The Brecon Beacons National Park spans 519 square miles (1,344 square kilometres). Established in 1957, it is located in mid-Wales in the UK, and contains some of the most spectacular and diverse landscapes in Europe.

Figure 3.30 Background footage of the Lake Scene

Interactive Elements

The interactive elements for the Marine Theme include multiple elements spread across the three scenes. For the Lake the interactive elements include skipping stones, rain and thunderstorms, transforming clouds, jumping fish and a fog cloud. For the Jellyfish Scene the interactive elements include the jellyfish and a seahorse. The final interactive elements for the Fish Scene included tropical fish.

The inclusion of interactive skipping stones comes from memories of my childhood, delighting in being taught how to skip stones with family members on vacation. Seeing clouds in the sky has always reminded me of childhood memories of trying to discern shapes and patterns in clouds overhead. I also wanted to include a rain storm as I have noticed that the sound of rain falling makes me feel relaxed and cosy. Thus I created interactive elements to reflect these memories and experiences. Both of these notions support Principle 3 of evoking something which people associate with positive experiences.

Below is an example of how the interactive elements for the Fish Scene were drawn. The Fish Scene has as its base footage of real fish swimming in an aquarium. To create the interactive fish, I used the actual footage of the real fish as a reference for drawing vector images of fish (Figure 3.31). The fish then became interactive elements on the interactive layer of the Fish Scene.

Figure 3.31 Vector drawing fish

Music

As described earlier, there are three separate scenes presented in the Marine Theme. Each scene consists of its own background footage and interactive elements as well as background music and interactive sounds. Three pieces of background music were composed for the Marine Theme: Lake (03:47), Jellyfish (05:16), and Fish (04:28). The background music for the Lake and Fish Scenes are original piano compositions aiming to provide feelings of calm and dreaminess. David described the gentle rising piano key sounds as representing the water ripples and their movement across the water's surface. The background music for the Jellyfish is an original composition of ambient music aiming to create a feeling of mystery and being underwater. David described that the single stopping key sounds were to represent the echo sounds that can be heard when underwater.

The interactive sounds were either designed to match the organic sounds of the element being represented or with a short period of music (see a list of the soundtracks played in the Marine Theme in Appendix B). The interactive sounds for the Lake Scene included a gentle rain storm with quiet thunder, rippling water for the skipping stones, the splashes made by a jumping fish[25] and a short composition of music accompanying the fog and transforming clouds (Figure 3.32). The interactive sounds for the Jellyfish Scene matched the triggering of the jellyfish and seahorse and were sound effects made in Garageband to mimic underwater sonar sounds. The sounds for the Fish Scene were a series of piano melodies to accompany the schools of fish swimming through the scene.

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[25] The natural sounds, including water splashes, thunderstorms and rain were downloaded from Soundsnap with a commercial licence.

Figure 3.32 Soundscape: Lake Scene

Animations

One of the animations created for the Marine Theme was the jellyfish. These are an interactive element of the Jellyfish Scene (Chen, et al., 2009). To make the jellyfish animation, three pieces of actual jellyfish footage were employed[26]. To create this, as an interactive element and to impose the real footage on the interactive layer, the background of the original jellyfish footage was removed. Nine jellyfish were duplicated from the original three by changing the angle, time frame and perspective of the footage. As such, each of the nine jellyfish looked distinct from each other when swimming. From this, each piece of jellyfish footage was separated into a single element, able to be controlled through coding. The interactive animation for the jellyfish swimming was achieved through Flash. The coding was established so that when a jellyfish was triggered as an interactive element the speed and direction were random and when a jellyfish hit the edge of the screen it would bounce back gracefully.
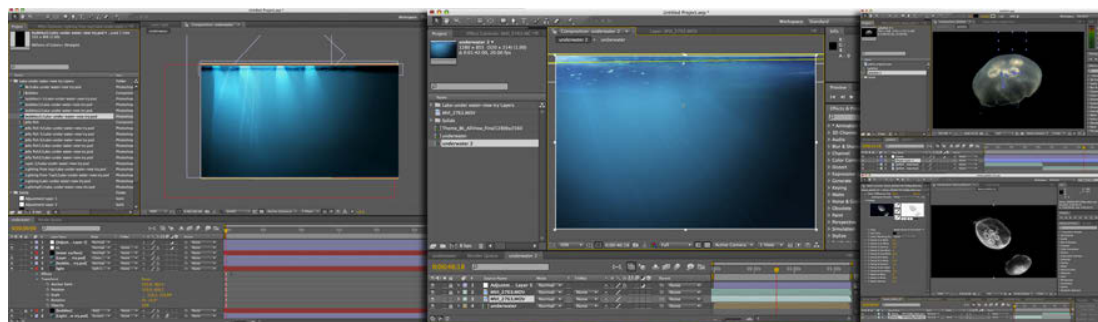
Figure 3.33 Interactive Jellyfish: Animation making of

[26] The footage was purchased from iStock an online image library for commercial licence usage.

3.3.3.2 Programming Development

The interactive Marine Theme was the most complicated theme to create when compared to the other themes as it has three layers of scenes, it needs to be able to move up and down at any time, and each scene layer has it own interactive elements. As per the other themes, four theme-change controllers were indexed and the rest of the nine object-change controllers were used for the interactive elements. The difference in this theme was that the nine object-change controllers would trigger different objects according to which level of the scene was displayed. For example one controller would trigger the rain clouds in the Lake Scene, jellyfish movement in the Jellyfish Scene, and in the Fish Scene it would trigger fish movement. Figure 3.34 is an example of the algorithm used for the interactive Jellyfish Scene.
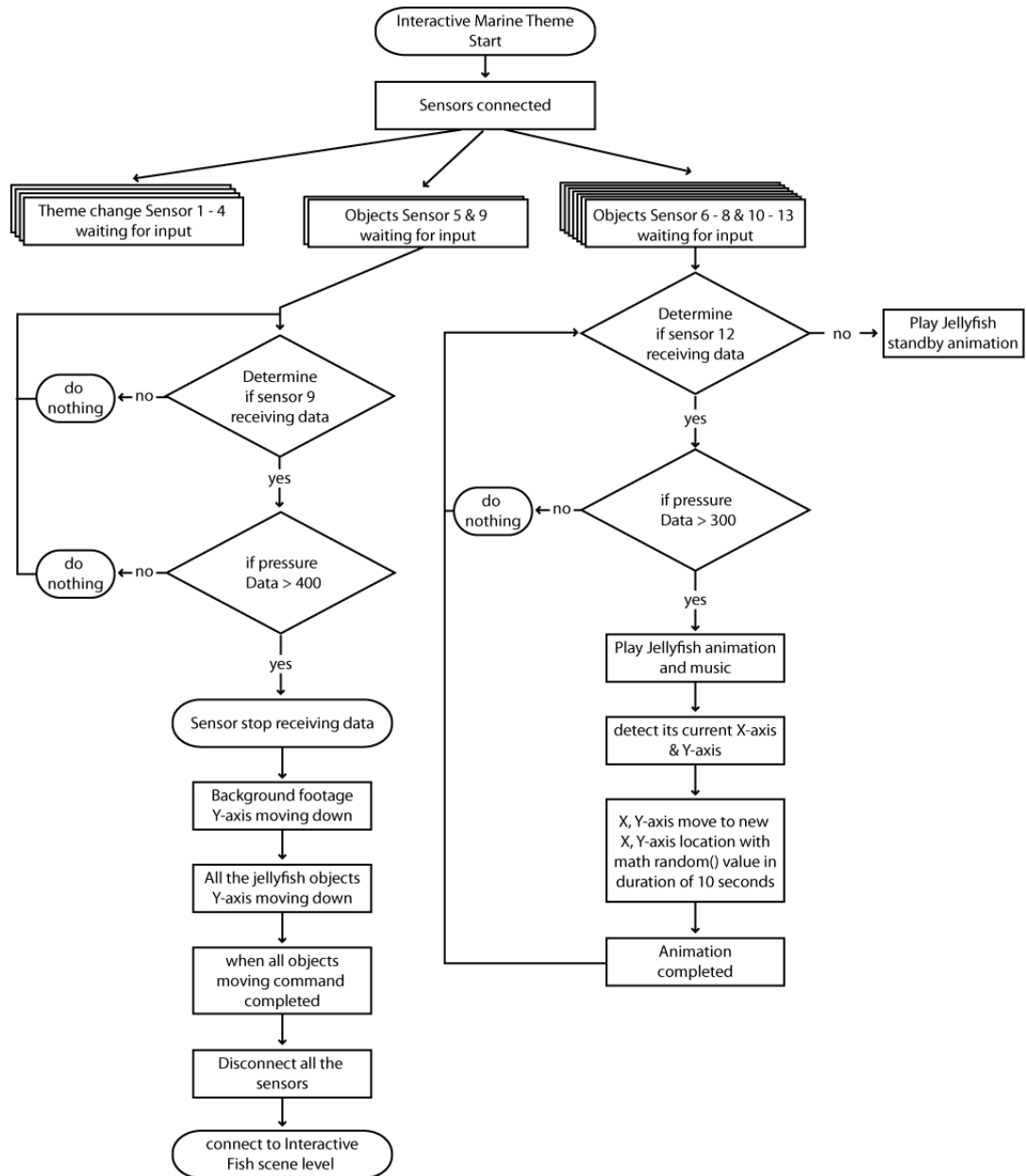
Figure 3.34 Algorithm for Jellyfish Scene interaction

The final result of the interactive Marine Theme is presented in Figure 3.35:
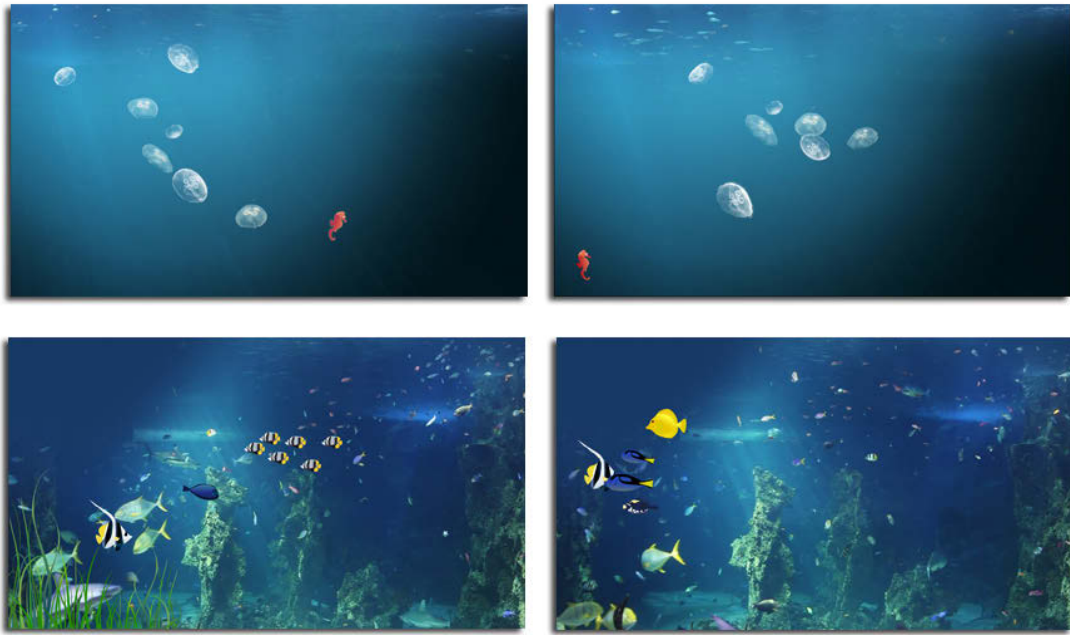
Figure 3.35 Interactive Marine Theme

3.3.4 The Night Theme

The interactive Night Theme is aimed at creating feelings of peace and rest for users (Chen, et al., 2009). It is the last theme presented and also designed to be the final stage of the relaxation timeline as mentioned in Section 3.2.1. The interactivity is limited and does not require much participation from users.

I have always been very easily drawn into scenes of the sun setting in the sky behind a landscape of rolling hills. With the beginning of the sunset, the colour of the sky is often a very beautiful gradient ranging from a soft tangerine to a pale blue colour. The colour changes very gradually; once the sun completely disappears, this gradient of colour is replaced by black, but with millions of bright shining stars and the odd shooting star. I also like watching stars in the night sky, especially growing up in a city where light pollution obscured many of the stars, and also because of the simple lack of an opportunity to just sit outside and watch stars, the moon, shooting stars and to listen to night sounds. Therefore, it was a privilege for me to create a rural landscape with the view of an open field, beginning with a transition from the evening to the night, and followed by an interactive nightscape with a million stars shining in the sky and falling shooting stars.

3.3.4.1 Content Development

Sketches

Figure 3.36 Night Theme sketches

As with the other themes, several images were drawn, such as rolling hills and trees. In Figure 3.36, the images on the left were created in the first stage of sketching and the images on the right were created in the second stage. In the second stage of sketching, I focused on discovering elements, such as plants, animals and natural objects that could be included in the Night Theme. I brought in my own desires to watch millions of stars, making a wish when seeing a shooting star and blowing dandelion seeds away, by including these as interactive elements. To make the night scenery more dynamic, I then started to think about adding nocturnal creatures, such as a bat, kiwi or owl. Bats however are often associated with negative feelings and the kiwi is an unusual bird native only to New Zealand, and so I finally chose to create an owl in the theme.

Background Footage

The theme begins with a non-interactive animation, with the sky colour changing from the evening to the night. The interactivity only starts once the night transition

animation is complete. The sky changing animation was created with Flash, amended with a colour adjustment. The animation for the dandelion seeds and shining stars were completed through coding.
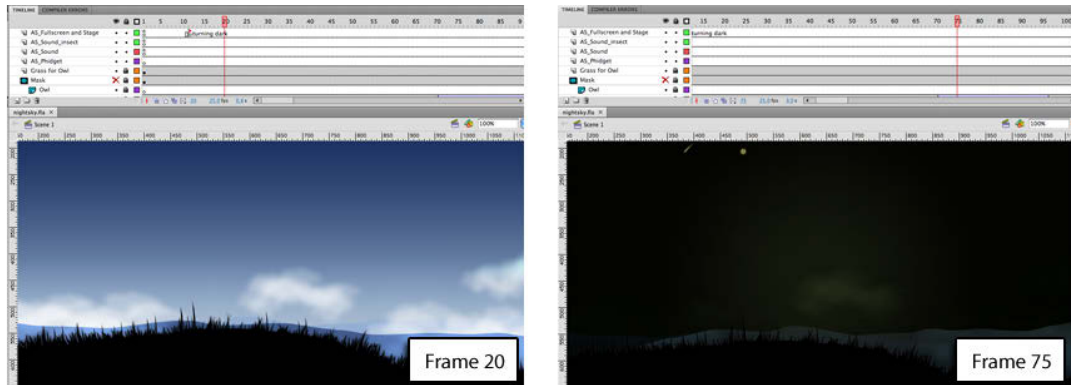
Figure 3.37 Transition animation from evening to night time

Interactive Elements

In my childhood, I used to search for dandelions, and if I found one, I would pick it up and blow all the seeds away. I always loved and was engrossed with the act of blowing the dandelion seeds away. This has always been a special sentiment for me. As such, when creating the interactive elements in the Night Theme, I wanted to create interactive dandelions that enabled users to blow dandelion seeds away. The vector images of a dandelion seed and stalk were first drawn in Illustrator. I then duplicated the dandelion seed symmetrically with a rotation setting in Flash to create a whole dandelion and the interactivity for each seed. After duplicating enough seeds, one dandelion was thus completed.
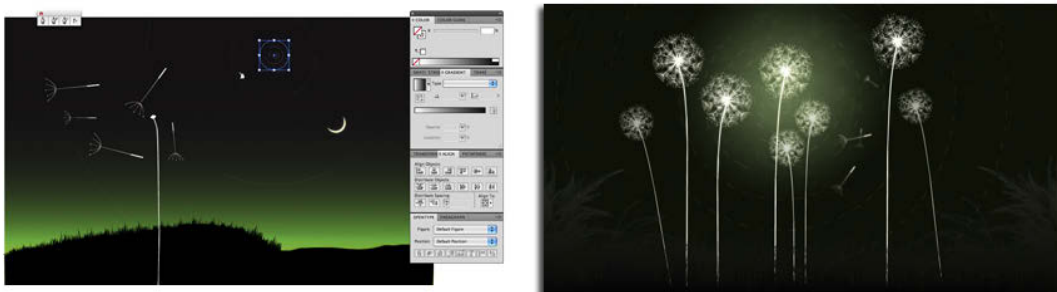
Figure 3.38 Interactive element: Dandelion

Music

This theme is the last theme of the four themes and is set up at night before sleep, and as such, its music needed to be very gentle, caring and tranquil. The background music was a piece of piano music (08:03) composed by David Sunderland. He explained that he used the rest between the piano key sounds to create the space in between the melodies, and that each pause also created a second of quiet for the ear as well as a feeling of rest and peace in the music. For the interactive sound of blowing dandelion seeds away, the sound effect of blowing[27] through the mouth was recorded. Figure 3.39 below shows the soundscape for the interactive Night Theme (see a list of the soundtracks for the Night Theme in Appendix B).
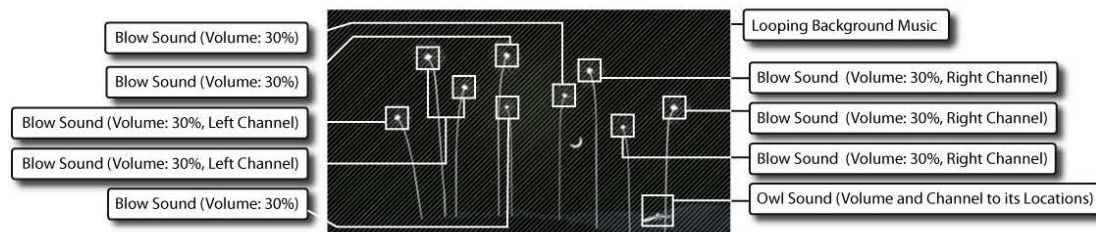
Figure 3.39 Night Theme soundscape

3.3.4.2 Programming Development

The interactivity for this theme is designed to be limited as it is designed to encourage users to rest and enjoy the ambience. The mode of interactivity in this theme is to make the dandelion seeds blow away and then the seeds will grow again to wait for the next trigger. Of the nine object change sensors, eight of them are mapped to trigger different dandelions and the last one is mapped to trigger the animation of an owl. To make the dandelion seeds blow away more realistically and to be more interesting, different levels of blowing seeds were programmed, for example, if a user presses the controller harder, a bigger value will be sent from the sensor to the computer, thus more dandelion seeds will be blown away, if a user presses the sensor gently, a smaller value is sent by the sensor, and a smaller amount of seeds will be blown away. The owl animation was designed to be somewhat

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[27] The blow sounds were recorded from a stereo microphone by Aaron Wahlen.

randomised. It contains five different flying routes as well as stopping points, and so each time a user triggers the owl, it will appear at a different spot. The five different owl paths are coded to be chosen randomly, so it will not take the same path twice in a row. Figure 3.40 is an example of the algorithm for the Night Theme:
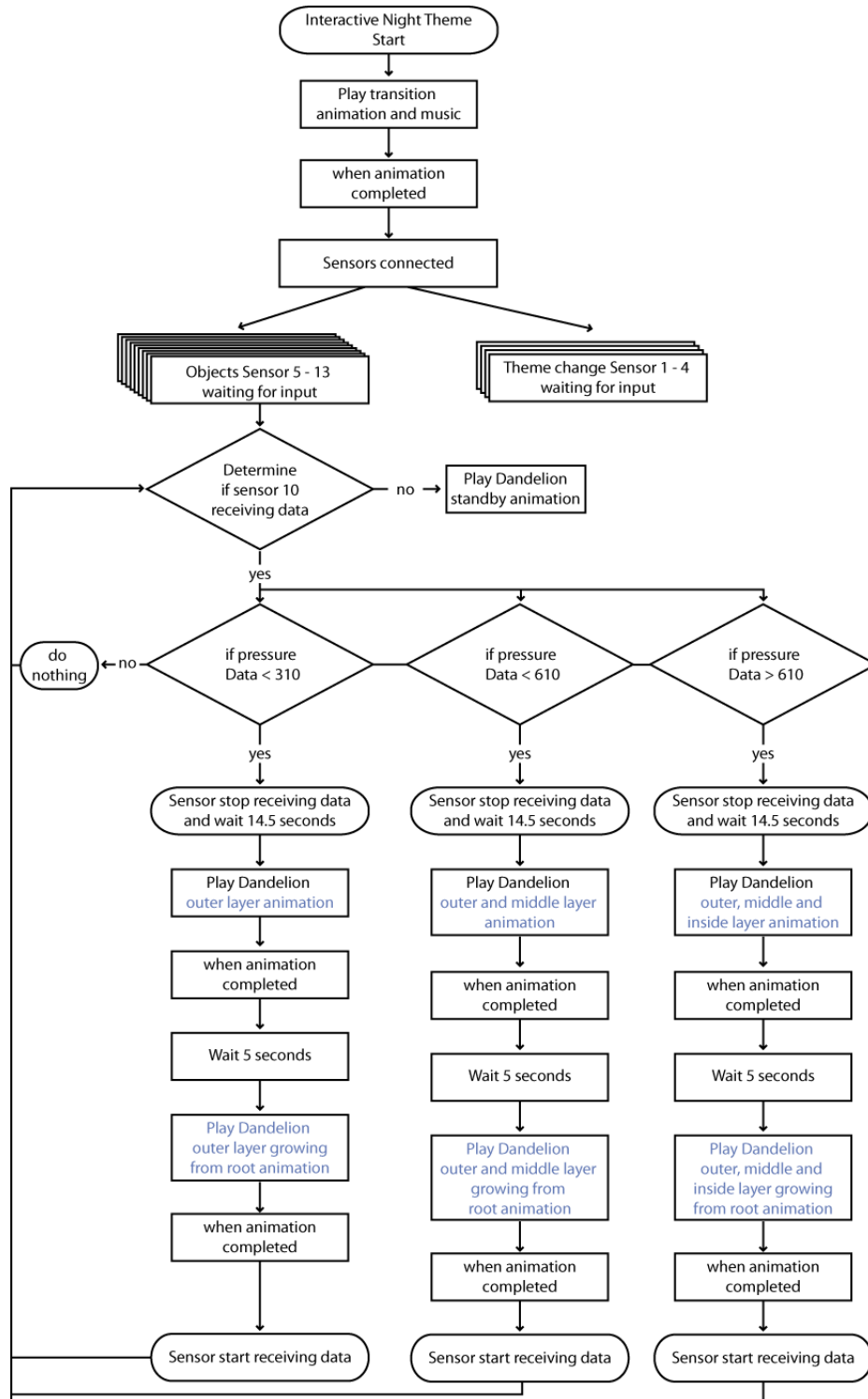
Figure 3.40 Interactive Night Theme algorithm

The final result of the interactive Night Theme is presented in Figure 3.41:
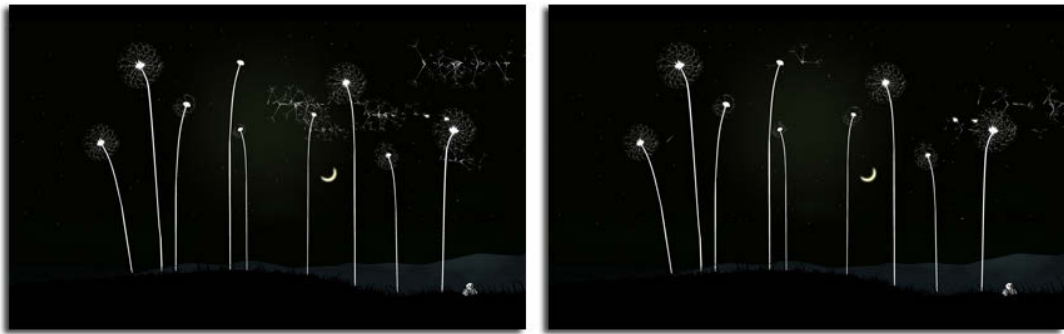
Figure 3.41 Final version of interactive Night Theme

3.3.5 Problems and Solutions

Several problems I encountered while I was developing the four themes included the challenge of creating an animation and playing a sound together, keeping the file size small but sustaining the quality of the image, and moving the scene up and down in the Marine Theme. In the following sections, I describe some of these challenges and my solutions to them.

Playback in Reverse and Timer

To create a flower opening animation with a realistic natural look, I needed to animate one petal at a time, and each petal needed to open at a different angle and timing, in relation to the other petals. The interactivity for the lotuses and waterlilies was designed such that the flower would appear from the water and then open its petals to become a flower in bloom. Once a user triggers the controller, the flower's petals would close gently and once it was fully closed, the flower would then shrink back into the water. Two kinds of animations needed to be created here: growing up from the water and shrinking back into the water. For 30 seconds of animation, the first version flower animation was created with 500 frames, which increased the file size substantially and so slowed down the computer. To reduce the file size, I commanded a code at the last frame of the opening animation to play backwards. In this way, I would only need to create the opening animation, and the reverse playback function at the end of the opening animation would create the shrinking back into the water animation. When the last frame is reached timer coding was also

incorporated. The timer would count 5 seconds and then the animation would playback in reverse. This significantly reduced the file size and made the application run more efficiently.

Sound Attachment

To synchronise the sound with the animation movement, the sound file needed to be imposed onto the frame to match with the animated action, for example, when a user triggers the frog animation, the sound of the frog croaking will play according to the frog's mouth opening. However, using this method for every interactive sound and background sound would increase the file size. I therefore changed most of the sounds (the sounds that did not require the accuracy of matching to the animation) to play by a coding method[28], which meant that the sound files are not attached to the animations and document; instead, the sounds are temporarily loaded into the document when the file is called. Once the sounds finish playing, they are removed from the document immediately to wait for the next call.

By creating the animations and editing the sounds using this coding method, the flash document for the Garden Theme was reduced from 57.8MB to 16.7MB, and the published file was reduced from 10.4MB to 2.3MB.

Moving the Scene Up and Down in the Marine Theme

Each scene was framed with 1280 pixels by 720 pixels. The movement between the three scene levels needed to be smooth and natural; if it moved too fast it would make people feel dizzy and if too slow it would make people wait and lose interest. As such the pixels of each scene layer movement needed to be calculated accurately, and each interactive element plotted so it moved with the scene as it transitioned. When moving between scenes all controllers were disconnected, so when the scene was in transition up or down the controller would stop sending any data preventing the user from inadvertently triggering interactive elements (Figure 3.42).

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[28] Playing sound method was learnt from *Controlling sound volume and panning* in the *ActionScript 3.0 Developer's Guide*.
http://help.adobe.com/en_US/as3/dev/WS5b3ccc516d4fbf351e63e3d118a9b90204-7d1f.html
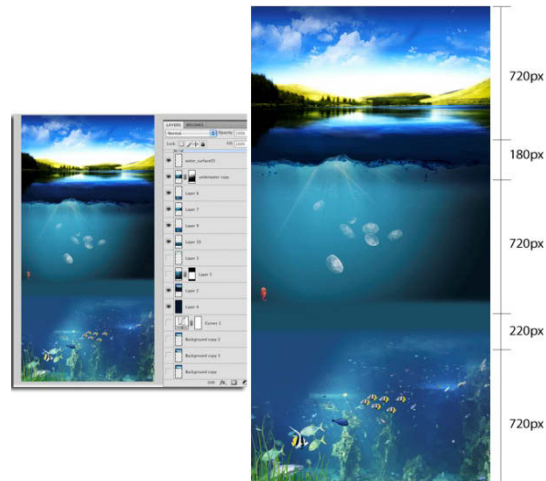
Figure 3.42 Marine Theme: Three scene levels connected

Controlling the Multiple Dandelion Seeds

To create nine individual dandelions, the total number of dandelion seeds for the nine dandelions was around 250. The seeds needed to be blown away with variable speeds and different flying routes, and so the seed animations had to be set up individually. Using a code method to command 250 objects each and enable each of them to run its own route and speed, would put a lot of demand on the computer's CPU, meaning that the program would respond more slowly over time. To solve this problem, I simplified the code by separating each command onto a different animation frame. As such, the code on the frame controls the dandelion seeds flying route, and the code that connects between the controller and multimedia output controls which animation frame will be playing. As such, this eased the demand from the computer programming and the dandelion seeds were still able to fly with different routes, speeds and angles.

3.4   Development of the Controller Table

In this section, I elaborate on the development process of the controller table, including the decision made for the sensor choice; soldering the sensor connection into the InterfaceKit; choosing the material to be used; designing the covering for the sensor; and arranging the display layout for the theme-change controllers and object-change controllers on the table.

3.4.1 Input Parameters

In order to determine the most appropriate parameters to be used for a hospital waiting room environment, I created prototypes for several informal user tests with Human Computer Interaction (HCI) experts and non-expert users.

Firstly, the interactive Forest Theme was created as a prototype example. A variety of sensors were connected to the prototype, including a touch sensor, a proximity sensor, a pressure sensor, a motion sensor, a force sensor and a vibration sensor. Different sensors were programmed to trigger different interactive elements. For instance, a pressure sensor requires the value received from the Z direction (Bongers & Harris, 2002); a motion sensor detects any movement according to the subject's moving speed; and a vibration sensor sends data when any physical vibration is detected.

The first informal user test was conducted on the 12th April 2010 at a Community of Scholars[29] event at UTS. The attendees were 5 people and were all non-expert users. During the test, the attendees were asked to freely interact with the sensors and to trigger the animation projected on the screen. The sensors were randomly displayed on the table. I first explained the nature of the project, then observed how they interacted with the sensors and asked how they felt about the interaction. Several issues were discovered after the first informal user test. One was that the way the sensors were presented needed to be rearranged, as the connection from each sensor to the interactive element was ambiguous and difficult for the users to recognise. Secondly, without physical covers for the sensors, users found it difficult to understand how the sensors worked and how to interact with them. Also, by presenting many different modalities of interaction together, such as movement detection, distance detection and pressure detection, users were confused and frustrated by these changes in the ways of interacting.

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[29] Community of Scholars (CoS) is a monthly get-together for research students in the Faculty of Arts and social Sciences UTS, usually occurring on the first Monday of the month, from 5-7pm.

The second round informal user test was conducted between April and May 2010 at the Interactivation Studio. The attendees were HCI experts, about 6 people. The example prototype tested here was based on addressing the issues that arose from the previous user test. The display of the sensors had been rearranged to a more systematic layout and the types of the sensors were narrowed down to three: a proximity sensor, a force sensor and a vibration sensor. For the second prototype, the Forest Theme, the Marine Theme and the Night Theme were developed. As per the process mentioned previously, I first explained the project, followed by observing and asking how the attendees felt about the sensors. One important consideration was suggested during this discussion, which was to re-think the connection between humans, the interface and the objects on the screen. For instance, to make a tree grow we water it, and so the interaction could be a gesture of a human using a watering can; to blow dandelion seeds away we blow, and so the interaction could be an action of blowing; to create millions of stars we could wave our arms, and the sensor could detect the body movement of the user. This modality of interaction that enables a user to trigger animated objects in a natural way using a variety of sensors will be a great creative solution. However, the installation is encompassed of four themes and each theme consists of nine interactive functions, which would require thirty-six sensors to trigger thirty-six different interactive functions. This would be against requirement 7 (that the same sensor would trigger different elements in different themes) and also against the third issue addressed in the first user test that many different modalities of interaction could confuse users. Although this would substantially increase the creative quality of the installation, it may not be an appropriate way for engaging non-technical users and visitors in hospitals who are stressed (see physical interface requirements 1 to 4 in Section 3.2.2).

Followed by the feedback from the previous two informal user tests, the third prototype was then created - the Forest Theme with a force sensor and a proximity sensor. This third round information user test was conducted on the 4th June 2010 at the workshop: 'Analysing modes of communication in interaction' at the Faculty Research Student Conference at UTS (Chen, 2010). The attendees were about 10 to 15 people with a mixture of HCI experts and non-expert users. The same process of observing and questioning was followed. During this user test, I found a majority of

users learnt more quickly to interact with the installation as the sensors had been
narrowed down to two modalities and arranged to display in a more systematic way.
This user test confirmed with the issues addressed above. Following this workshop, I
concluded that *simple interaction, instant response* and *consistency for the modality
of interaction* helped to reduce the time users spent on figuring out new interfaces
and that this was far more engaging for a user. Users would feel more in control of
the interface, which would encourage them to interact more. As such, this would
meet with the physical interface requirements 1 to 3 (Section 3.2.2).

These informal user tests led me to a better understanding of the user experience of
interacting with such a projection based interactive installation, and it also helped me
to narrow down the choice for the types of sensors. In Table 3.1 I present the final
two sensors of choice and their character and suitability to a hospital waiting room
environment:

Modality of interaction	Character	Healthcare Settings
Distance detection - Proximity sensors	It is invisible and so it will create a free interactive space. However, it will be difficult for users to predict how to trigger the animations and where to interact, as the sensor will be hidden.	▪ Limited for less mobile users ▪ Location movement doesn't allow user to sit down ▪ Reduced length of time users spend interacting with the installation
Pressing action - Force sensors	An object is needed to encapsulate the sensor. Users will see several objects displayed on the table, and they can see it, touch it and feel it, and then see the immediate results of their interaction.	Need to design an object covering that has to be easy to clean and comfortable to use.

Table 3.1 Characteristics of sensors in healthcare settings

Following this evaluation of sensor interaction, I concluded that using distance
detection sensors would have more limitations for a hospital waiting room
environment, whereas a pressing action would have more potential although it would
require more work to build and develop its covering appearance. Force sensors were
therefore the final choice for the installation. In Figure 3.43, the process of building
the input devices is presented, including the raw material of force sensors and

resistors, a circuit diagram for the soldering plan, how I soldered each sensor, resistor
and cables together and plugged into the Phidget InterfaceKit for final sensor testing.
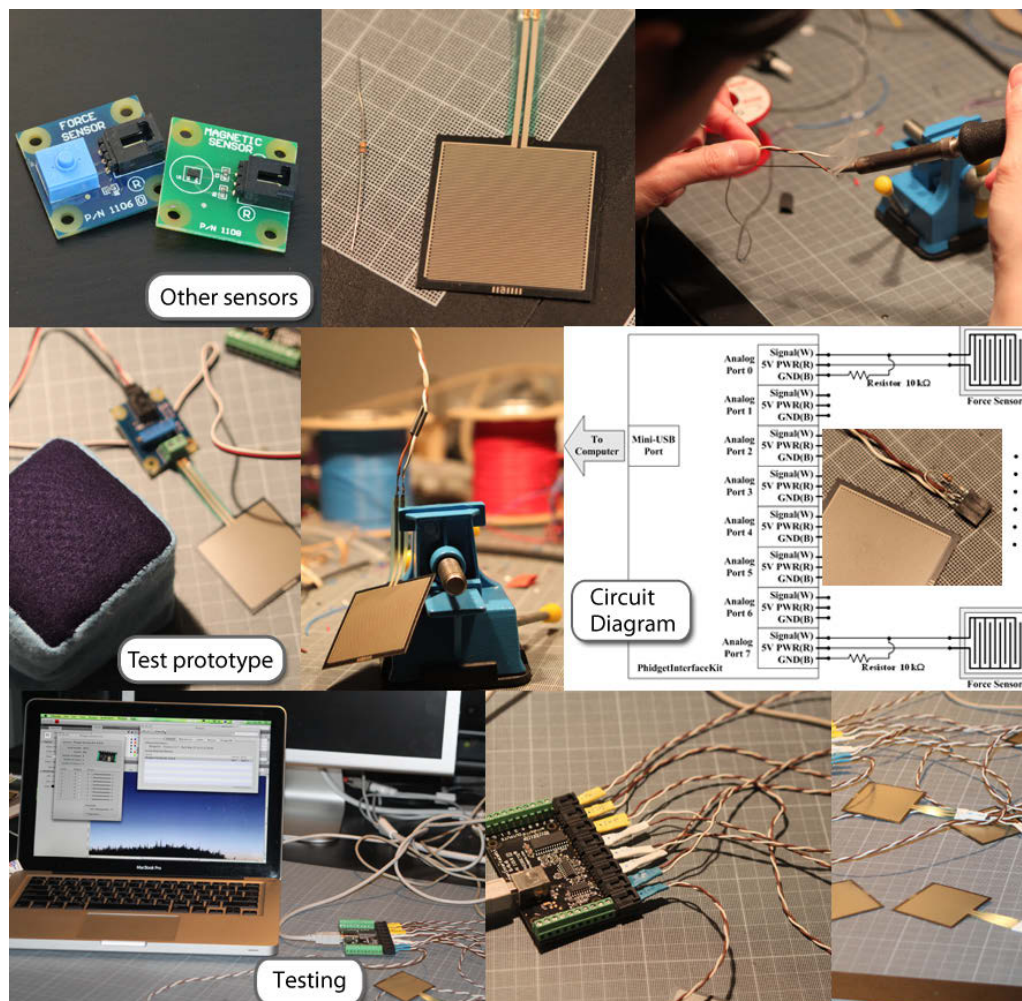
Figure 3.43 Sensors

3.4.2 Controller Appearance

The physical appearance of the covering of the sensors needs to help users to
understand the modality of interaction. According to requirement 3 mentioned in
Section 3.2.2, the most important mechanism for developing an intuitive controller is
affordance[30], the way in which users potentially visually perceive the controllers and

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[30] The concept of affordance was introduced by J. J. Gibson (1979). He defined the term as follows:
"The affordances of the environment are what it offers the animal, what it provides or furnishes, either
for good or ill... It implies the complementarity of the animal and the environment" (Gibson, 1979, p.
127). In 1988, Donald Norman introduced the term affordance into the HCI community as the
consideration of the design of an object which suggests how the object could be used – an intimation

naturally know the possibilities of the action to the controller without any explicit instruction or guideline.

Taking into consideration for the capabilities of the force sensors and with the physical interface requirements 5 and 6 (Section 3.2.2) in mind, a two-stage design process was employed. The first was to discover appropriate materials to be used and the second was to design an appearance that would encapsulate the sensors in order to create controllers that are soft and tactile, squeezable and easy to clean. Table 3.2 below shows an explanation of the comparison of using different materials and its advantage and disadvantage:

Materials	Advantage	Downside
Silicon	▪ Highly mouldable into different shapes ▪ Soft and squeezable ▪ Easy to clean ▪ Sensors will be highly protected ▪ Looks professionally made	▪ Needs more time to design ▪ Needs more time on manufacturing process ▪ High cost ▪ Will not resume normal shape immediately
Squeeze ball or something similar	▪ Soft and squeezable ▪ Easy to clean ▪ Better affordance for the action of squeezing ▪ After pressing, will resume its normal shape ▪ Less time required ▪ Low cost	▪ Less freedom for shaping ▪ Need to find a way to fit sensor inside ▪ Uncertainty about the final result ▪ The affordance could also be associated with picking it up and throwing it like a ball
Wool felt	▪ Highly mouldable into different shapes ▪ Soft and squeezable ▪ An easily available textile, less time required to create ▪ Better for time management	▪ Not easy to clean ▪ Unsure of durability

of its intended use. Norman explained when affordances are taken advantage of, a user can know what to do just by looking, without the need to read a picture, label or instruction (Norman 1988).

- Low cost - Will resume original shape immediately - Final result can look professional and appealing	

Table 3.2 Material comparison

As addressed in Table 3.2, wool felt is more manageable, has more advantages and less downsides when compared to silicon or a squeeze ball. The use of silicon can provide a more professional look, however the unfamiliarity of the use and manufacture of Silicon made it a less attractive option as an interface material. Considering the time limit and budget constraints, wool felt was the final decision for the material in terms of better management in time, cost and freedom of design. Silicon material might be pursued in future development. According to requirement 6, the issue of hygiene and infection control in hospitals, the controllers had to be cleaned after every use of the installation by using a hospital-grade spray alcohol and a disposable towel.

In the second stage, the form of the controllers was delivered. Starting with sketching the possible forms for the controllers. I first drew forms of a dome, ellipse, petal, intersecting circles and cube. Based on requirement 3, that the controller should be intuitive, the visual appearance of the controller needs to encourage users to press from a Z direction (top down) in order to trigger the force sensor (Section 3.4.1) correctly. Forms of a dome, intersecting circles and cube were then chosen (Figure 3.44). The form of cubes was most easily manufactured and would cover the force sensor without interrupting the data sent to the computer (see the sensor in Figure 3.43), and therefore the final decision was made to use the cube as the visual appearance of the controllers.
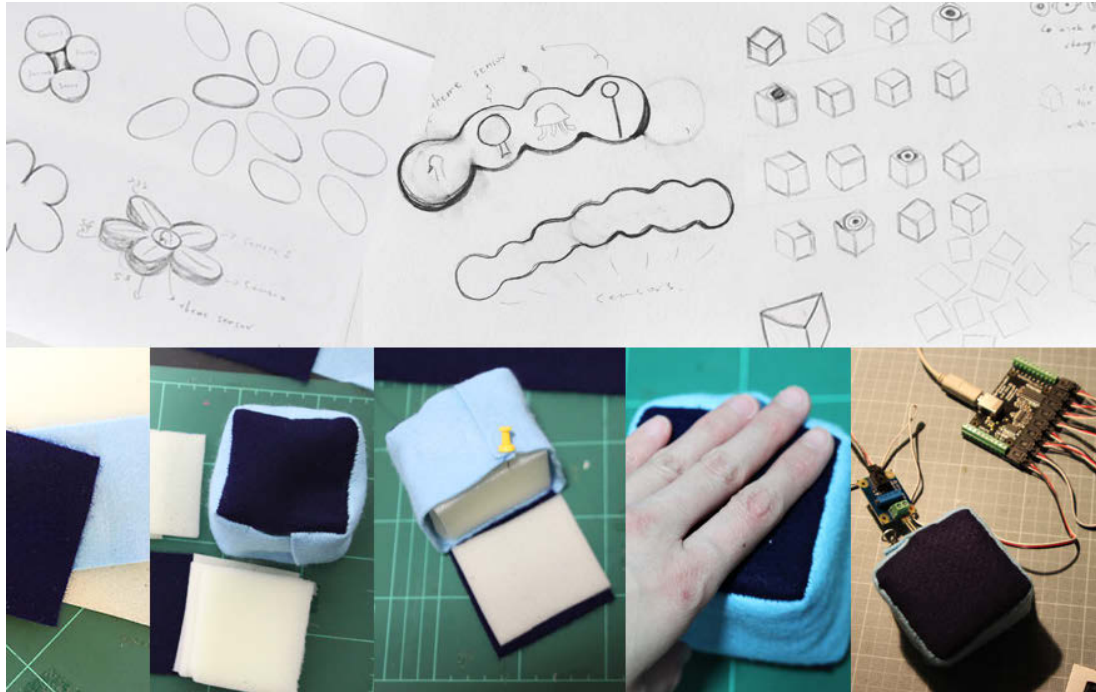
Figure 3.44 Sketches and the first prototype of the controllers

3.4.3 Display Layout and Finishing

To achieve a therapeutic effect, the user needs to stay within a theme and discover the different interactive elements within a certain amount of time. In doing so, the user will be watching the beautiful and soothing image, listening to the relaxing music and interacting with the calming interactive elements by pressing the object-change controllers, leading them to be more engaged and immersed with the installation. Therefore, the display layout is crucial in enticing users to play with certain controllers more often than the other controllers. The mechanism addressed here was when a theme-change controller was triggered - users should then naturally press the object-change controller rather than pressing another theme-change controller straight away. Two issues arose here: one was to predict (by location) which among the thirteen controllers, including four theme-change controllers and nine object-change controllers, users would press first and which ones would then be pressed next; the second was to differentiate the theme-change controllers from the object-change controllers.

I first drew thirteen squares simulated digitally for different display possibilities. Five kinds of layout were created (Figure 3.45). In August 2010, a small-scale

informal survey was conducted among 5 research students in FASS and DAB to gather feedback about the possible orders in which to press the controllers. Layouts 3, 4 and 5 clearly differentiate the theme-change controllers and object-change controllers, whereas layout 1 and 2 were found to confuse users about the difference between the two types of controllers. Based on the requirement 4 – to be used from the seated position, users tended to interact with only the controllers closest to them in layout 1, these being the first half of the controllers, and layout 2 again seemed to encourage interaction with the controllers closest to themselves including only the first two theme-change controllers and the nine object-change controllers. Layout 4 seemed to encourage interacting with the four theme-change controllers rather than object-change controllers. The design options then were narrowed down to layout 3 and 5.
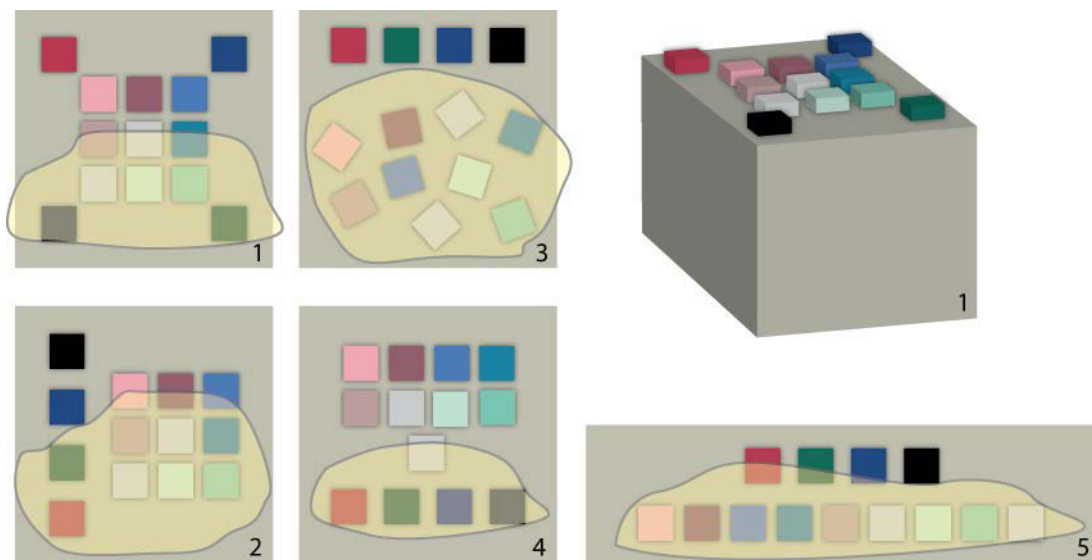
Figure 3.45 Five layout choices for controller display

I then implemented both layout 3 and 5 with actual felt controllers. At this stage, the theme-change controllers had also been created with a raised iconic pattern on its top surface that represented the themes. For example, an image of a swan was used to represent the Garden Theme, ferns for the Forest Theme, fish for the Marine Theme and dandelions for the Night Theme. An informal user test was conducted in September 2010 in the Interactivation Studio with a mixture of HCI experts and non-expert users, about 10 people. I first explained the nature of the project and described that it needed to be used from a seated position, I then asked the users to interact with the controllers and discussed the layouts. The real display allowed users to easily

experience the interaction and to determine the better options. With layout 5 with all the object-change controllers placed in one line, users tended to expect that the object-change controllers would directly link to the interactive elements in front of them. Whereas in layout 3, the object-change controllers were randomly displayed, and there was less anticipation as to their linked animations, and it also helped to encourage users to discover the nine object-change controllers separately. The layout 3 thus was the final display for the controller table. A durable wooden surface was also built on top of an existing wooden table to house and protect the controllers. Figure 3.46 presents the process of sewing the cube controllers and building the controller table.

Figure 3.46 Process of making the felt cube controllers with their sensors and constructing the table[31]

3.5   Evolution of Visual Melodies

Spring semester 2007
Literature review

Autumn semester 2007
Concept development
and literature review

June 2008
Initial interactive
prototype: Night theme

Autumn semester 2008
Initial design and continuing
literature review

March 2009
Initial interactive
prototype: Garden theme

March 2009
Visual Melodies graphics were
presented as part of the
sharing workshop at the
Practice-based Service Design
and Innovation Course

April 2009
Initial interactive
prototype: Marine theme

April 2009
Visual Melodies graphic
elements were exhibited at
the Up & Coming Design Expo
in Sydney

April 2009
Final choice of interactive platform
between Max/MSP Jitter and Flash/AS3

July 2009
Visual Melodies: Interactive Marine
theme was presented at the FASS

August 2009
Demonstration of Jellyfish at
the Interactivation studio UTS
as part of the Sydney Design
Festival 2009 in Sydney

September 2009
Interactive Marine theme was
presented at the 2nd Arts and
Health Conference in Newcastle

November 2009
Interactive Night theme and Marine
theme were presented at the OZCHI
conference in Melbourne

December 2009
Visual Melodies website was
established -
www.visualmelodies.org

to 2010

Figure 3.47 Evolution of Visual Melodies 2007 - 2009

to 2009

March2010
Initial interactive
prototype: Forest theme

April 2010
Visual Melodies: Interactive Forest
theme was presented at the
Community of scholars in Sydney

May 2010
Redesign: Garden theme

June 2010
The Forest theme's interaction modality was
presented at the Analysing modes of
communication in interaction:
Visuals/Sounds/Language/Touch workhop
in Sydney

June 2010
Visual Melodies: Interactive Forest
theme was presented at the FASS
research student conference in Sydney

August 2010
Finalised Visual Melodies for exhibition

October 2010
Visual Melodies pilot study was
conducted at the Interactivation
Studio in Sydney

October 2010
Visual Melodies was exhibited at
the St Vincent's Hospital in Sydney

October 2010
Visual Melodies Audience
Feedback Study conducted at the
St Vincent's Hospital in Sydney

November 2010
Visual Melodies was presented at
the Art of Good Health and
Wellbeing international Conference
in Melbourne

to be continued...

Figure 3.48 Evolution of Visual Melodies 2010 - 2011

3.6 Conclusion

The development of the Visual Melodies interactive installation was presented in this chapter. The interactive multimedia installation is a novel combination of art, music and technology, drawn from scientific research findings in the therapeutic potential of visuals, colours, sounds and interactivity, as discussed in Chapter 2. The promotion of a relaxing experience and stress reduction is the key consideration. Visual Melodies consists of a series of original landscape artwork and interactive animations, accompanied by music specifically composed for the installation. The animated images are projected directly onto a wall, with users sitting comfortably on a sofa, and interacting with the images and sounds using custom-made controllers. The beautiful natural scenery and soothing music for the four themes were all designed to reduce the feelings of stress and vulnerability for the users. The physical setting including a comfortable sofa, inviting and easy-to-use controllers were also all carefully considered and designed to make users feel comfortable and to evoke positive emotions.

As Dallow (2003) stated, the creative act is a mixture between rational theory and irrational experience. Through the creative practice, I not only created the installation based on the studies discussed in Chapter 2, but I also included my own experiences and childhood memories within the interaction to elicit positive and relaxing emotions, such as skipping stones near the waters surface and blowing dandelion seeds away. According to Sebba (1991), the outdoors were identified as the most significant environment for almost all adults in their childhoods and this overall preference was not related to individual personal variables and social characteristics but to the child's experience of physically being in the outdoor environment. The study also showed that these outdoor environments include: the sky, the sea, trees, grass and flowers, light phenomena, birds singing, rocks, stones and so on. Due to Principle 3 (something with which people associate positive experiences), I included my childhood memories of being in nature in the creation of the artwork, with the hope that these memories that had evoked positive emotions for me may also elicit memories for the users and evoke some positive emotions. In the next chapter, I will

describe the set up of Visual Melodies in the hospital and present the audience feedback evaluation results from hospital visitors, patients and staff.

Chapter 4

Evaluation in the Hospital

In the trajectories of practice-based research, evaluation plays an important role in assessing the practice and reflecting on the individual practice. In this chapter I present the results of the audience feedback evaluation. I begin by presenting the physical set-up of the installation in the waiting area at St Vincent's Hospital in Section 4.1, followed by details about the ethics approvals obtained. The evaluation involved two methods – the researcher's own observations and video-recorded interviews with participants, which are elaborated in Section 4.3. In Section 4.4 - the results from my observations, I describe who chose to use the installation and the ways in which they interacted with the installation. In Section 4.5 - the results from the video-recorded interview, I describe how participants felt after using the installation and which design themes and elements accessed by the participants were most generally effective for producing feelings of relaxation and calm. Participants' suggestions for the improvement of the installation are also included. Section 4.6 presents the four main therapeutic factors of the installation. I then conclude with the results from both the observations and interviews to assess its therapeutic potential, as well as to identify the aspects that might be particularly effective at encouraging relaxation.

4.1 The Visual Melodies Exhibition in St Vincent's Hospital

The Visual Melodies interactive installation was presented by the Sydney St Vincent's Campus Arts Committee as part of their healing arts program, and exhibited from 12 October to 12 November 2010 (see the flyer in Appendix F). The work was installed at the Mezzanine Lounge, in St Vincent's Hospital. The exhibition area is a public waiting area where visitors could wait while their friends or relatives had an appointment, treatment, or an operation, where patients could rest before or after their consultations or treatments, and where staff members could gather during their breaks. Over the five weeks of the exhibition, around 200 people participated in the interactive multimedia art installation, of which 53 agreed to participate in a video-recorded interview.

Figure 4.1 Exhibition space of Visual Melodies interactive installation at St Vincent's Hospital Sydney 2010

The installation set-up consisted of a space of approximately 3 square metres, including a 1.85 metre by 3.2 metres projected canvas, a Macintosh mini computer that runs Adobe Flash/AS3 and Phidget WebService, a projector, two active speakers, a three-seater sofa and a controller table (see the list of equipment in Appendix C). The computer was placed in the ceiling ledge, the projector that projects images onto the canvas was mounted on the ceiling above the sofa, and two active speakers were placed above both sides of the sofa where a participant would sit. This was designed to give a stereo surround sound effect.
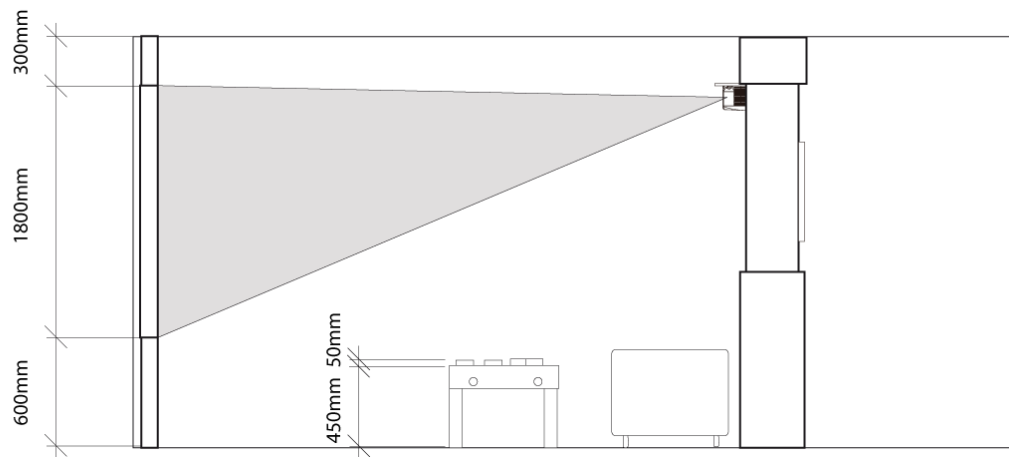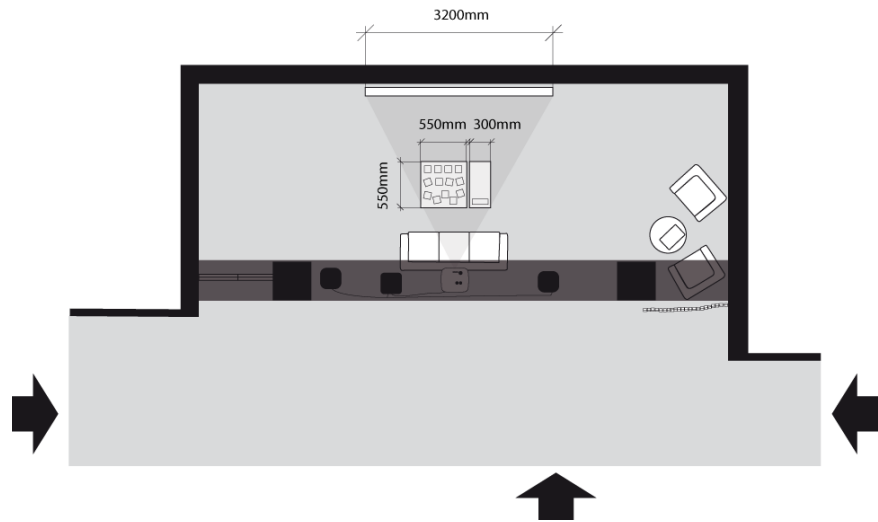
Figure 4.2 Dimensions of the installation space

speaker   computer   speaker

projector

Visual Melodies

Garden Theme
Forest Them
Marine Theme - lake - jellyfish - fish
Night Theme

Controller Table

projection
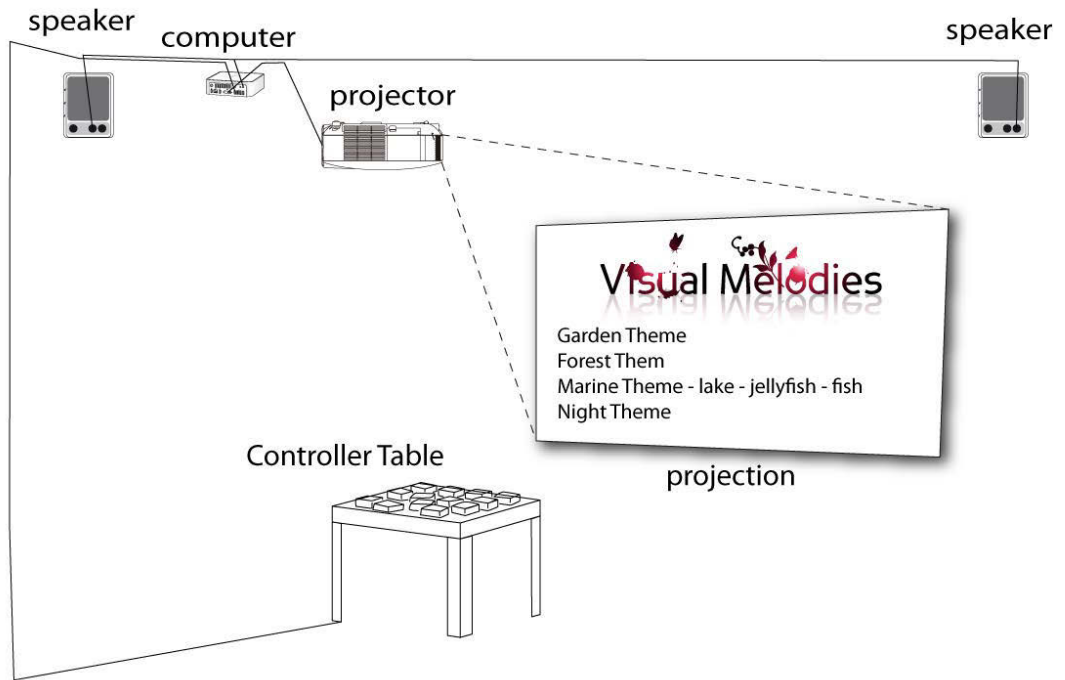
Figure 4.3 Installation equipment set-up

4.2 Ethics Approval

The audience feedback evaluation process received ethics approvals from both the human research ethics committees of the host hospital, St Vincent's Hospital in Sydney (Ref No. 10/142), and the University of Technology Sydney (Ref No. 2008-313A).

4.3 Methodology

The evaluation study aimed to explore participants' experiences of using the installation in order to assess its therapeutic potential, as well as to identify which aspects might be particularly effective at encouraging relaxation, in order to make recommendations about the design and location of such installations in health settings generally. The evaluation involved two methods – the researcher's own observations and video-recorded interviews with participants. The evaluation presented in this exegesis is in the interpretive tradition of qualitative research and is part of the practice-based research.

The observations and interviews were conducted by myself as the researcher. Brown *et al*. (2011) discussed that participants intend to adjust their behaviour to fit into the ways that their perception of what investigators expect them to do. They suggested that the investigators should avoid controlling the user trials with an orientation towards the success of systems and the method sections should be more explicit about the natural contingencies and how participants was orientated to investigators. Therefore, to avoid interfering in participants' behaviour with the installation, I generally sat behind the column in the corner at the exhibition site to observe (Figure 4.6). When I started a conversation with participants, I did not introduce myself as the designer, unless the participant asked. In general, I did not approach the participants, especially when they looked tired or anxious. I interacted with the participants only when they had shown an interest in having a conversation. The majority of the time, I sat in the corner, observing and taking notes. A more detailed

method in how I conducted the observations and interviews as well as how I interacted with participants will be discussed later, in Section 4.3.2 (Data Collection and Analysis).

As the permitted timeframe for exhibiting the art installation at the host hospital was from 12 October to 12 November 2010, the evaluation study was conducted over the whole period of exhibition. Over the five weeks of the exhibition, I was at the installation site most of the time, from Monday to Friday, 9am to 5pm from October to November. The total hours I was on site conducting the evaluation study was about 200 hours. This was to receive as much evaluation data as possible. When I was on site, my tasks included conducting the observations and interviews, opening and closing the gate at the installation space and maintaining the equipment. There were only a few occasions I was not on the site, for example during a short absence for lunch breaks.

Figure 4.4 Installation and evaluation site layout

4.3.1 Sampling and Recruitment

Eight A2 size posters (see Appendix G) were posted near the site within the hospital, advertising and pointing to the direction of the installation. Hospital visitors, patients

and staff were all invited to participate. The intention was that a diverse range of participants should have the opportunity to engage with the installation. For the observations, the sample of participants was dependent on self-selection, and for the video-recorded interviews, the participants were randomly chosen and invited to participate. Recruitment for interviews was based on participants' willingness. Neither gender was specifically targeted. Those who declined were still able to interact with the installation if they wished to. A flowchart of the evaluation procedure is presented in Figure 4.5 below:
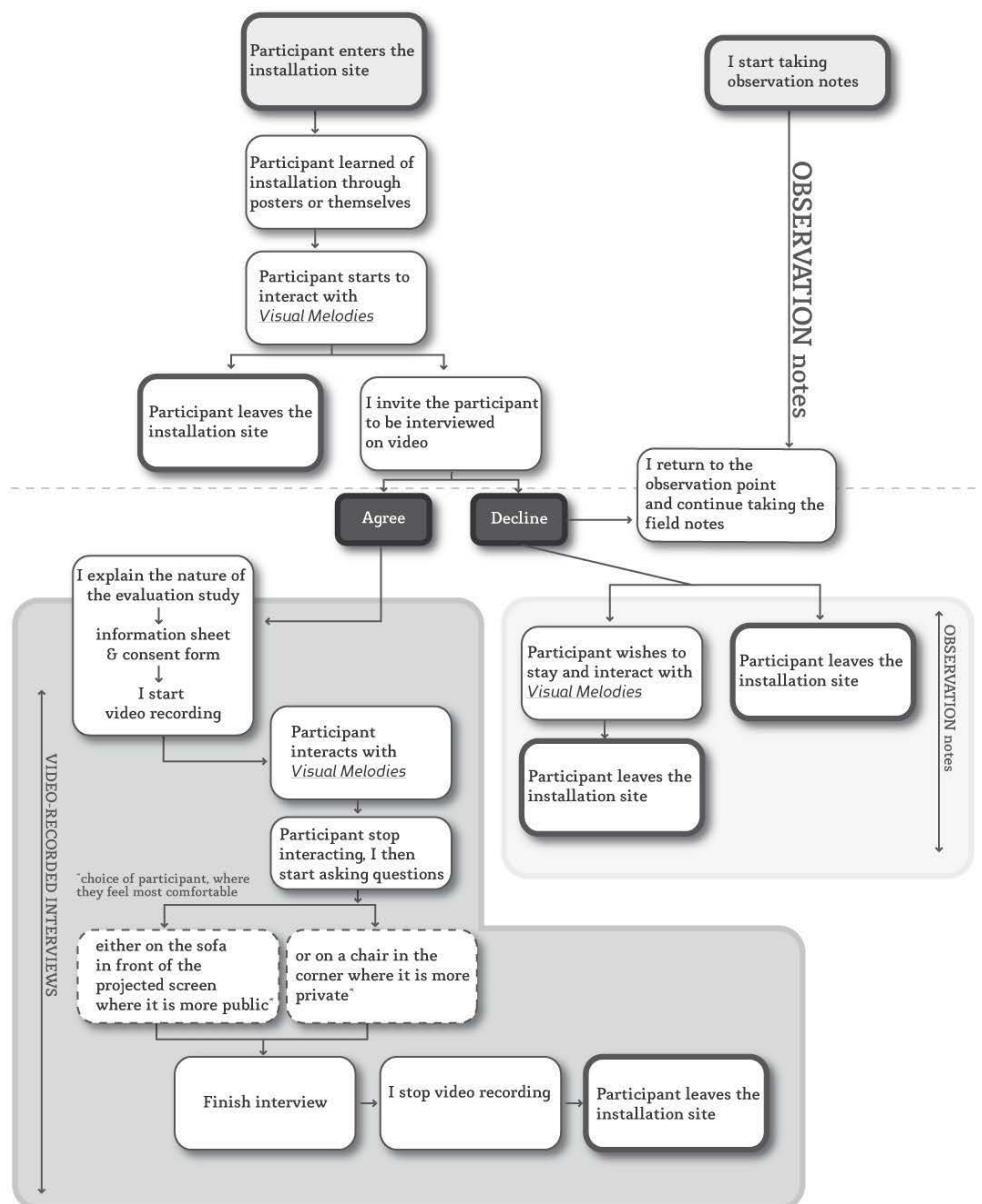
Figure 4.5 Observation and interview procedure

4.3.2 Data Collection and Analysis

4.3.2.1 Observation

A total of 193 people were observed. The aim of the observations was to record who chose to interact with the installation and their reactions to the installation. Once a person entered the exhibition space, I immediately started to observe by taking notes (See Figure 4.5 for the observation and interview procedure). Only when the person interacted with the installation for more than two minutes, was the person then included as a participant of the installation and the field notes were included in the final observation notes. On the observation notes the participants were also marked with their age group, being either: child, adolescent or adult; their gender: female or male; and their category: staff, patients or visitors. Staff were defined here as a person who works in the hospital, generally wearing a uniform or having a staff identification card on their waist or collar. Patients were defined as a person who attends the hospital for consultation, treatment or an operation. Hospital visitors were defined as a person who is not working in the hospital, nor a patient, but temporarily visiting the hospital. The data presented here including age, gender and category was determined through observation and estimation, therefore the results should be considered as preliminary. Each participant was also given a identification number; for example a staff participant who was the 18th person to be observed interacting with the installation, would then be named as [Staff, 18].

The observation notes mainly focused on describing how the person discovered and interacted with the installation, the person's body movement and speed of movement, the person's facial expressions when each interactive animation occurred, and also the order in which they pressed the controllers; for example, pressing the Garden Theme-controller then pressing the frog object-controller. If the person found me sitting in the corner typing and expressed their interest in having a conversation, I would then approach them and discuss the installation or answer their questions. For example, the most common informal questions were "how much does it cost?" and "is it possible to install one at home?" During these informal conversations, I mainly let participants lead the conversation, and listened to their opinions and thoughts, rather than questioning participants. After the dialogue, I would then return to the

observation space and continue with the field notes, including recording the dialogue that had just occurred with participants.

4.3.2.2 Interview and Video Recording

From 193 observed participants, 53 agreed to participate in the video-recorded interviews. All 53 participants were informed in appropriate detail of the aims and procedures of the interview process and were then provided a consent form to sign (see Participant Information Sheet and Consent Form in Appendix D). With their permissions, I then started using a digital camera to video them using the installation and during the interview (see Figure 4.5 for the interview procedure). A few of the participants were not recorded while they were using the installation because they had come to play but were in a hurry to leave and returned later for an interview. When the participants stopped interacting with the installation, I would then start the interview questions. The initial set of open-ended questions is shown in Table 4.1, which was designed to encourage participants to express their feelings openly.

Initial set interview questionnaire
1. Could you please describe your experience of using this installation?
2. Which theme did you like the most? Why?
3. Which theme was your least favourite? Why?
4. Would you like to see anything changed? Are there other kinds of images that you would want to see in the future?

Table 4.1 Interview initial questionnaire

The 53 participants were interviewed within 35 interview sessions. The majority (26) of the interview sections were conducted one-to-one and in-depth. The other 9 interviews sessions were conducted with groups, due to the participants visiting in pairs or in a group with two or more participants together. The largest group of participants interviewed was a group of five.

Following the naming scheme adressed in the previous section, each interview participant was given a sequential number that incorporated the number from the observations, and assigned with their age group, gender, and category that was confirmed with the participant.

The video-recorded interviews were first transcribed verbatim and then systematically and thematically analysed into different categories, including participants' experiences of using the installation, their emotional responses, their thoughts on the four themes and interactive elements, their suggestions, and its future applications. After the first separation of categories, the next step was to label the different components that were mentioned within each instance in the data. For example, an interview quote, *"I love this one, that is for night time. I love the seeds and the land [Staff, 94]"*, was first categorised into "favourite theme" and then was marked with the components of "Night Theme" and "dandelion". I then excerpted each component from the description and collated them into three major categories of "what participants said about the design", "emotional responses" and "main therapeutic factors". The data collected was then also analysed to calculate the most and least-liked themes and the number of emotions that were elicited. The analysis provided an insight into which design elements were most generally effective for producing feelings of relaxation and calm, which emotions were elicited from using the artwork, and the factors that contribute to therapeutic effects. The interview process protected the privacy of participants at all times.

This creative research project focuses on creating a relaxing and soothing interactive artwork, which is a new and relatively untested approach. According to Stebbins (2001), researchers explore when there is little or no scientific studies about the activity or situation (p. 6). The aim of exploratory research is to search and develop patterns, hypotheses or understandings rather than testing or confirming a hypothesis (Vogt & Johnson, 2011, p. 134). Stebbins (2001) also addressed the importance of the exploratory approach in the information age as its character being rapid and widely changeable (p. 59). A decision was made not to include a control group in this evaluation study. Therefore, the key objective at this stage of the evaluation study was to explore and develop an understanding of participants' feelings and experiences of the novel installation, rather than to generate a comparison with other therapeutic or placebo interventions.

4.4 Observation Results

In this section I present the observation results that describe who chose to use the installation and the ways in which they interacted with the installation.

4.4.1 Who Played

A total of 193 participants (131 female, 62 male) were observed. The participants were mainly adults (181), with 2 adolescents and 11 children who participated with the interactive installation whilst accompanied by their parent(s). The 193 subjects were comprised of hospital visitors (32%), patients (16%) and staff (52%) (see Figure 4.6). Twice as many females used the installation as males. As shown in Figure 4.6, in both the staff and visitors categories there were more female than male participants. Only in the patient category, was the male to female ratio closer to 1:1.

Half of the participants who approached the interactive installation were staff. This was understandable due to the location of the interactive installation. Staff walked by the interactive installation everyday and had more opportunities to approach the installation, whereas visitors and patients were more temporarily visiting the hospital. Out of the 193 participants observed, 26 of the participants used the interactive installation more than once[32]. Those who returned were mainly overnight patients and outpatients who regularly came to the hospital to receive treatment. A few were staff.

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[32] While taking observation notes, I numbered each participant. Once I recognised a returned participant I would refer to that participant by that participant's first recorded visit number and record multiple visits.
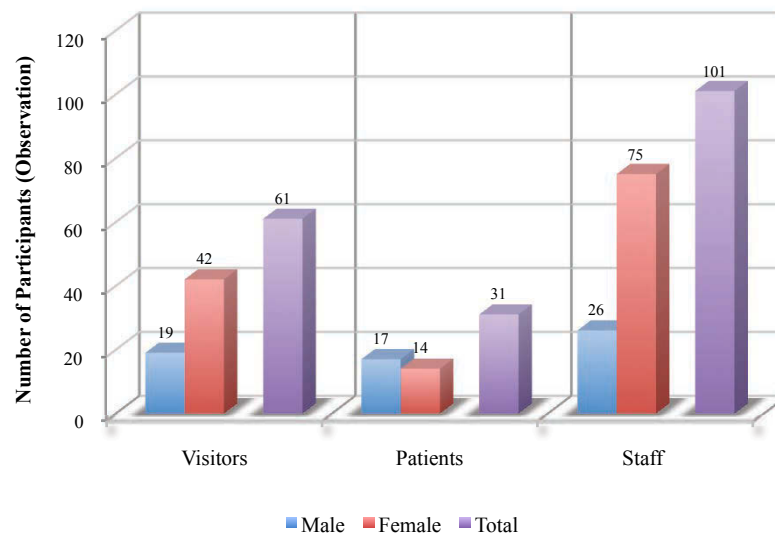
Figure 4.6 Gender and categories of participants by observation

4.4.2 What People Did

In this section, I describe my observations of participants' engagement with the installation. In general, participants would sit on the sofa, look at the projected images, find the interactive table in front of them, and then they would press one cube controller first and wait to see what happened. Then they would start to discover different controllers to their linked themes or elements. Personal preferences of the themes and elements were also then established, as they would stay longer with the theme and play more, or they would press one particular controller more often than the others in order to interact with the particular elements more. The vignettes presented here were mainly selected based on their description of participants' interaction and for the different categories of participants. I include here notes from observing a visitor, a patient and 2 staff members.

The vignette 1 below is an example of how a patient and a visitor discovered the installation, the speed of their movement, and their experience of the different themes.

⚜

Vignette 1 – Theme changed along with movement speed changed

Mother and daughter. The daughter is a patient, in her early 20s and her mother was with her, aged around 50 or 60.

The mother was attracted to the projection, and the daughter was attracted to the "making of" poster. The mother stood in front of the installation and she pressed the Garden Theme controller. The image instantly changed. After she found the image had changed she seemed very excited about it. She then called her daughter to come. Then they sat together on the sofa. She pressed the Forest Theme controller. The image immediately changed to the forest background. She said, "That's better". Then the daughter encouraged her to play a little bit more. She then pressed the Marine Theme controller. I was sitting in the corner observing them and typing. They looked at me and smiled. I then encouraged them to press the white felt cube, which is the thunderstorm and rain effect in the Marine Theme. The mother said, "Wow, very clever!" Then I encouraged them to press the green cube, which is the clouds transforming animation in the Marine Theme. When they saw the clouds changing to a rabbit and to a rooster they laughed. I then continued typing my observation notes. They kept going through their discovery journey. The mother pressed the Night Theme controller. The image changed from the Marine Theme to the Night Theme. They then sat back on the sofa and watched the image, seeing the light changing from blue to orange to dark. They watched it until the dandelion grew. The mother seemed to know it was time to press. She pressed one object controller and found the dandelion seeds had been blown away. She smiled. At this time, the daughter seemed to be more interested and she started to join in the interaction play. The daughter pressed one cube controller and saw how the dandelion seeds were blown away and then pressed another one, and another one and another one. I could see from the screen that sometimes she pressed harder to make all the seeds blow away and sometimes she pressed more gently and blew fewer seeds away. They both smiled to each other.

They interacted with the installation for 10 mins from 17.55 to 18.05. They stood up and said thank you to me, then left.

Excerpt from observation note, 28/10/10
[Visitor, 77-1] & [Patient, 77-2]

The mother in the situation presented in Vignette 1 was attracted to the installation first. She pressed a cube controller and found out that she had made the image change. She then called her daughter (the patient) to join her in discovering the installation. I found their movements were quite rapid at the beginning. The mother

would raise her arm and press quickly on a cube, and then return her arm quickly to her side. They started from the Garden Theme, which raised their interest in exploring. When discovering the Forest Theme, the mother seemed to feel more comfortable with the image of the Forest Theme. The mother then changed the theme to the Marine Theme. I could see her interactions seemed to slow down substantially, as she started to look at the animations more rather than actively interacting with different interactive elements. When she changed the theme to the Night Theme, both the mother and daughter sat back on the sofa, resting, and just watched the colour and animation changing and listened to the music. Even when they started interacting with dandelions in the Night Theme, I could see their movements had become very gentle and slow in comparison to their movements at the beginning with the Garden Theme.

I observed that they gradually understood the relationship between controllers and projected images. Since their involvement with the Marine Theme, they seemed to realise more the connection between each controller and each interactive element - when they were in the Night Theme, they seemed to have learnt to press the controllers with different pressures to trigger a different level of interaction. I could see that they attempted to make a difference in blowing the dandelion seeds. They both interacted a little bit, then sat back on the sofa and watched, seemed to rest and think. The situation presented in this vignette also supports the stress recovery timeline for the four themes I addressed in the previous chapter (Section 3.2.1) that the Garden Theme would be a cheerful and attractive start and the Night Theme would lead to a feeling of rest and relaxation at the end of the experience with the installation.

The next vignette is an example of how a staff participant interacts with the installation.

✂

Vignette 2 – Mapping the controller with its element

Female staff, nurse, aged around 30 or 40

The nurse came and sat on the sofa. She seemed to know straight away to press the cube controller to make things change. Once she pressed, she found she had changed the screen to a different image. She waited a bit and then pressed the cube again. She is pressing a cube and then watching, then trying something else. She seemed to try to discover the differences within the theme and tried to understand how it worked systematically, for example which cube controller to trigger each different interactive element. After experiencing the Marine Theme, she then changed the theme to the Garden Theme. She smiled when she triggered the interactive frog elements. She pressed it several times and smiled. After about 5 minutes of interaction, she stood up and walked towards to me. She said to me "This is so relaxing, I want to suggest that our hospital has this here permanently." She said "I think it is playful, relaxing and personal, because people can choose what they like".

Excerpt from observation note, 20/10/10
[Staff, 44]

The attempt to map the controllers to their elements was observed in the situation presented in Vignette 2. For example, in the Marine Theme, the participant realised that different controllers trigger different animations. She then started to explore the relationship between controllers and animated elements. It seems that this process led her to think more systematically about the interactivity. When she found one element she liked more, she would press the controller again and played more with that particular element, for example the frog. As such, it seemed to help her become more engaged with the installation.

In the previous two vignettes, I discussed how participants became increasingly engaged with the installation; in the following vignette, I highlight the facial expressions that I observed while two participants were interacting.

�

Vignette 3 –Interaction and emotional response

Mother (staff) with her two daughters (young children)

The mother is a staff member. She has just finished her work and on the way to leave the hospital. They approached the installation and straight away sat on the sofa. They seemed to know immediately how to use the interactive interface. The mother (staff) pressed one felt cube controller and found the animation immediately changed. Both the mother and her daughters seemed happy to see the result. They then started to discover the installation beginning with the Marine Theme. The mother pressed one object-controller wanting to see the animation change and her daughters were keen to press the theme-change controllers. The older daughter pressed the Forest Theme controller, she found the image changed, she then pressed the Garden Theme controller, saw the animation had changed again, then she pressed the Night Theme controller, found the image had changed again.

When the theme changed from the Lake Scene to Jellyfish Scene in the Marine Theme, the mother was very amazed and she looked at me sitting in the corner. She said "wow!!! I love that!!!" I could see by her face that the mother was extremely impressed by the theme moving down to the underwater, and she was even more impressed by the theme moving down again to the Fish Scene. They seemed very much to enjoy playing with the installation.

The two daughters were very happy playing together with the installation. The older daughter was keen to discover more of the interactive animations now. The younger daughter who liked the Garden Theme wanted to stay within the theme and play with its interactive elements. Whenever the older daughter changed the theme to something other than the Garden Theme, the younger daughter pressed the Garden Theme controller to change back to the Garden Theme again. The older daughter said to her mother, "Can I see the rain again?" the mother said "yes" and she then stopped the younger daughter from pressing the Garden Theme cube. And so the older daughter could press the rain cube controller within the Marine Theme. She was so happy and satisfied after seeing the rain effect again. She smiled. Then when the mother released the younger daughter, she went to the table and pressed the Garden Theme controller again, and played with different interactive elements within the theme. Then, the younger daughter smiled.

After their first visit on 19 October 2010, they returned to visit again on 28 October 2010. The younger daughter was still keen to play with the Garden Theme, more so than the others.

It can be seen in the situation presented in Vignette 3 that firstly they were happy to see that they could make changes on screen. Then they started to feel curious about what else they could change and wanted to discover the different themes and interactive elements. When they were using the Marine Theme, the mother looked very impressed by the scene that could be moved up and down, from above the water to underwater. After discovering all of the themes, they started to develop their favourite theme, for example the older daughter preferred the Marine Theme and the younger daughter preferred the Garden Theme. The older daughter and younger daughter took in turn to play more with their favourite themes. As such, once they played a little bit more with their favourite, they seemed to be satisfied and happy.

With respect to the use of the controller table, as mentioned in the situation presented in the 3 example vignettes above, most participants knew straight away how to use the controllers - they would press one and wait to see what would happen. During the whole period of the observations, very few (3 of 193) were observed that tried to pull out the cube controllers from the table.

In sum, participants' interactions and speed of movements seemed to slow down substantially along with interacting with the themes, beginning with Garden Theme to Forest Theme to Marine Theme and to the final Night Theme. The participants also learnt to use the installation in a natural way and were able to map the controllers to their linked interactive elements. Several phases of participants' facial expressions were identified here; from the first discovery of the installation, participants looked delighted and excited about the control over the interactive elements. Once they discovered all of the installation, personal preferences were also developed, and so when they were able to play more with their favourite element or theme, facial expressions of satisfaction and happiness were observed. The interactivity that enables participants to choose and interact with the animated elements seemed to help to increase the engagement with the installation and foster the feeling of immersion.

Time Engagement

Regarding the time spent with the installation, patient and visitor participants generally interacted with the installation between 10 minutes to 1.5 hours. For example, one visitor [Visitor, 65] was waiting in the waiting area for her father who was undergoing a day procedure. She stayed in front of the installation for most of the day, for different periods of time. During her first visit, she interacted for about 1.5 hours; her second visit was around 1 hour, and for her third visit, she came with her father [Patient, 69] and played for another 15 minutes. She said to me that she was so glad that she could sit here and spend some time with the installation while waiting for the completion of her father's procedure. Another example was a male adult patient [Patient, 62] who needed to stay in the hospital for a few weeks receiving treatment. From the moment he had discovered the installation during his stay in the hospital, he returned to visit the installation on four different occasions on different days, each time interacting with the installation for about 1 to 1.5 hours. Similarly, another hospitalised patient [Patient, 71] visited the installation on two different occasions and each time he stayed and played with the installation for about 30 minutes. On the other hand, most of the staff participants tended to stay for a shorter period of time. Their interaction time was normally between 2 to 10 minutes if they visited the installation during their break period. If it was in the evening, after they had finished for the day and on the way home, they tended to interact a bit longer, between 10 to 30 minutes. With the examples given above, most of the visitor and patient participants interacted much longer time than staff participants and they returned to visit more often. The results of participants' time engagement with the installation matches with the engagement times proposed by Parsons *et al.*(1998) and Ulrich *et al.*(1991), that a therapeutic effect of viewing a beautiful landscape can be achieved within 5 minutes (Section 2.3.1), as well as the review in music therapy by Cooke *et al.*(2005) that a single successful session of music therapy engagement can be around 15 to 40 minutes (Section 2.3.3).

4.5 Interview Results

In this section I present the results of the video-recorded interviews. The results are divided into three main sections: the most and least favourite themes, the discussion about the design of the installation and the overall emotions that were elicited. The key objective for the interviews was to explore participants' experiences of using the installation in order to assess its therapeutic potential, as well as to identify which aspects might be particularly effective at encouraging relaxation.

4.5.1 Which Themes Were the Most and Least Favourite

Of the 53 video recorded participants, 8 were visitors (6 female and 2 male), 5 were patients (1 female and 4 male), and 40 were staff (33 female and 7 male). This could have been because staff members were more comfortable with the environment and so were more open to a video-recorded interview. The Night Theme was reported most often as the favourite theme, followed by the Marine Theme, the Forest Theme and the Garden Theme. 14 of the 53 participants chose two themes as their favourite themes and 2 participants chose more than two themes. For the least favourite theme, only 23 out of 53 participants identified a least favourite theme, the rest of the 30 participants did not choose any theme as their least favourite.

Figure 4.7 presents the favourite themes broken down by type of participant and gender. The Night Theme and Marine Theme were the most popular themes, chosen by 24 and 22 participants, respectively. The majority of female participants chose the Night Theme and Marine Theme as their favourite, whereas male participants were more evenly spread across each theme. This may because only a few male participants were interviewed in contrast to female participants.
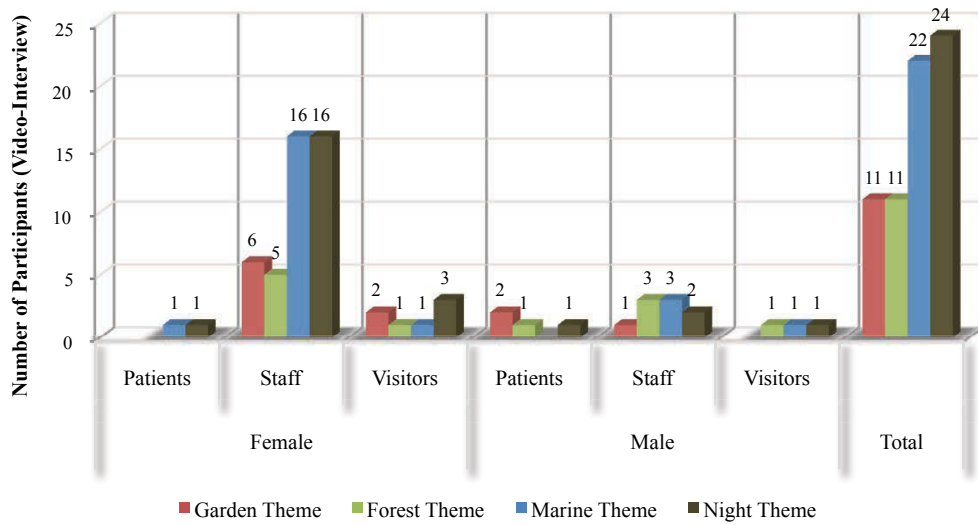
Figure 4.7 Most favourite theme
*Total is greater than 53 as some participants nominated more than one favourite

Figure 4.8 below presents the data for the least-liked theme. The Marine Theme was chosen most often as the least favourite, 11 out of the 53, whereas only 2 of the 53 chose the Night Theme as their least favourite. This was surprising, as the Marine Theme was also the second most favourite theme. It seems that the Night Theme was the most popular theme as most of the participants chose it as their favourite and the least amount of participants chose as their least favourite. A more detailed description about what participants said about the themes and their interactive elements is discussed in the following sections.
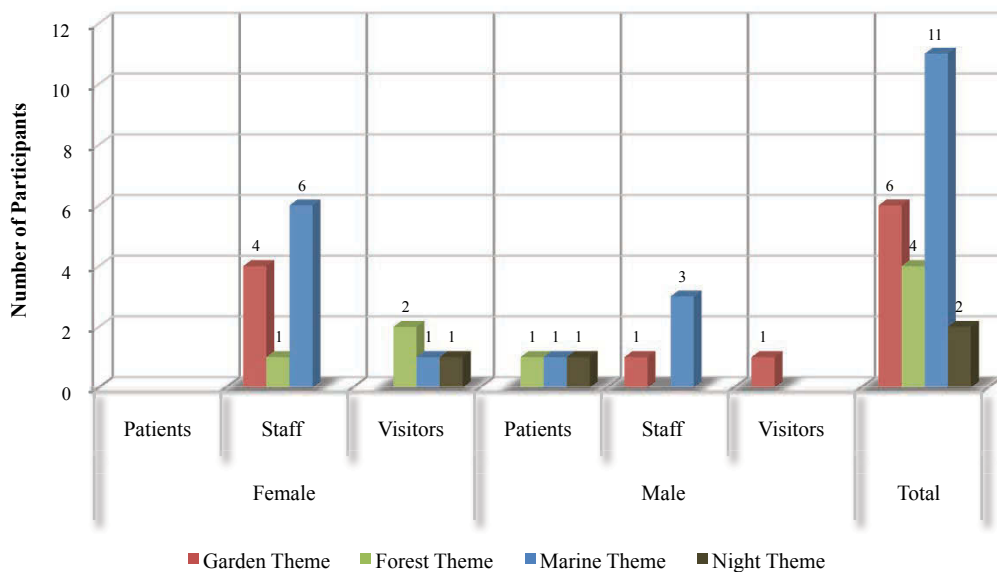
Figure 4.8 Least favourite theme

4.5.2 What Participants Said About the Design

4.5.2.1 The Themes and Elements

Overall, participants were highly positive about the design of the interactive multimedia art installation and there was a general consensus that it was beautiful and relaxing. In general, the Night Theme was reported as peaceful and gentle, evoking a loving feeling and rest; the Marine Theme was reported to be dreamy and imaginative, and creative with the three different levels and movement between the scenes; the Garden Theme was reported as colourful and serene and evoking feelings of being lively; and the Forest Theme was reported as playful and peaceful.

24 of the participants chose the Night Theme as their favourite theme. 15 participants indicated that while they were experiencing the Night Theme, the engagement with its ambience and interaction provoked feelings of intimacy, peace and rest; three stated especially that the peacefulness of the music helped to achieve that effect:

> "My favourite image is night time, I like it, it's quiet and peaceful and invites quiet contemplation. I think the way it's constructed it leads me in a quietly assertive way, just to take time and pause and to take stop. It is very gentle and restful." *[Staff, 135]*

> "I particularly like the music for the night time scene. The music is fantastic. […]. Yep, so if I had in my hospital bed, put it in my ear, fine and go to sleep. It is bit relaxing and all the noises you know around in the hospital." *[Visitor, 113]*

> "I think with the dark the black background (Night Sky), I thought that was kind of romantic for some reason to make me think of it makes me feel quite kind that emotion when I tend to have when I with my boyfriend just that very relaxed and loving feeling so I think that is my favourite out of 4 images." *[Staff, 126]*

Many participants who preferred the Marine Theme said that this was mainly due to the interaction of the scene moving up and down. Three reported that they liked the waterscape and rain. Nine stated that they were attracted to the theme due to its moving down from the lake surface to underwater, and even deeper to an ocean scene. They found it very creative and beautiful, which encouraged them to engage more and to discover more:

"I quite like the fact you can go under the lake as well as over the lake, um I just think it is very interesting. It has this lovely effect where you just want to slow down and stay with it which I find very appealing." *[Staff, 118]*

Some participants commented that seeing the flowers and plants growing with sunbeams shifting through leaves in the Forest Theme provoked feelings of peace and calm which also reminded them of life. They also said that it was visually busy but beautiful to explore, and it created a magical moment and provoked happy childhood memories and past experiences of being relaxed while walking in a forest. The experience of interacting with the theme is intimate and that makes them feel like they are part of it:

"This is growing and it's beautiful exploring, and very peaceful, a real relaxation. That is nice I like the sun coming through the rain forest I've walked through many rainforests I love them I always feel a sense of cool peace and the walk." *[Staff, 125]*

"I am watching the Forest scene at the moment and the way the sunbeams are coming through, for me that was very magical. It signified a brightening up of my day." *[Visitor, 85]*

"I think my favourite was the woods, the forest, I enjoyed the most. I think seeing the plants grow. It was quite busy. Seeing the rain coming down and hitting the leaves. It was quite realistic." *[Staff, 84]*

Participants also pointed out that the music and visuals are well presented in the Garden Theme. For example, they mentioned that the tree branches blowing gently in the breeze was very serene. They also liked the image of leaves reflecting on the water, seeing the movement of butterflies, frog and koi fish evoked lively feelings, and they reported that the waterlily and lotus in the pond was a very lovely and peaceful image. Finally they also mentioned that the background music with the flute was very relaxing.

"I think I like the water one the best the pond one, because there is a lot of life in it, is a lot of life going on there, fish, birds and that frog, trees that is all very serene. It's nice and peaceful." *[Staff, 125]*

Finally, a number of design elements from all four themes were also reported to elicit feelings of calm and relaxation, including: the colour green, water droplets on the leaves, natural birdsong, rain, skipping stones on the lake surface, the jellyfish floating animation, blowing dandelion seeds, the shooting star, the sound of the owl, the dark colours and night environment, the sound texture of a flute, and the gentle piano music.

> "I like the flute with the little lake and the swan and all that, I like wind instruments when you are dealing with nature, because it is very close to the nature, also the piano can be very soothing." *[Patient, 61]*

> "I am surprised I found this relaxing, because I wouldn't think, like within the jelly blubbers, that is really really relaxing. It wouldn't have crossed my mind." *[Visitor, 113]*

> "I just find the rain is relaxing and is all the elements of the water and what's under there, and being able to just be calm, and its like being at the beach or lake or you sit at home and you listen to the rain on the roof." *[Staff, 136]*

In addition, the animation of the frog and mushroom were also reported frequently to be amusing by many:

> "The toadstool in the forest theme, they are cute, they are kind of good animation, that makes me laugh." *[Staff, 84]*

A few reasons were also reported, to explain participants' choice of least favourite themes. For example, for the most commonly chosen least-favourite theme, Marine Theme, one participant commented that the background music provoked feeling of sadness and that water could be associated with tears; two responded that images relating to a lake or ocean did not appeal to them; four mentioned that the colour and composition of the Lake Scene did not look natural and it contained too many imaginary features; and two felt less connection with the Lake Scene, as the view of the mountains with the blue lake placed in front created a huge emptiness and distance. For the Garden theme, there were two main criticisms in particular: one was that the image quality was pixelated, and the second was that various animated elements performing at once with a simple interaction was a less peaceful effect.

Two reasons were also given for the Forest Theme: it was not as colourful as the Garden Theme; and it was much more active than the other themes. This could be because the interaction in the Forest Theme focused on growing animations, which differed to the other themes which focused on moving. Only 2 out of 53 participants chose the Night Theme as their least favourite. One of the reasons given was because the blowing sound did not flow well with the image and another reason given was that the image was tedious:

> "Not the least liked, but the most confusing if you like, the least peaceful because so much is happening in the garden theme with the water with the frog and flower, yep I really like it, but it's more happening, so it is not as relaxing as the underwater or the night one, because it is more complex I suppose." *[Visitor, 113]*

> "The open space with the lake in front of it, I didn't find relaxing until I started adding in some of the sounds and animations into it, for me, it is too much distance and a huge empty space, with the water, nothing on the water, the empty hill behind of it." *[Staff, 84]*

> "...not so much the night one, It is probably very calming but I thought it is bit repetitive, I didn't get it to do much. […]. The stars and the moon and the bird, and I didn't get to do much, and I know my mum got bored in it. She said "It doesn't do anything else" and so she didn't say that to the others." *[Visitor, 92]*

In addition, two participants thought that the changes between the four themes were too sudden. They recommended some transitional visual effects to ease the changes between themes.

4.5.2.2 The Controller Table

In general, participants described their experience of using the interface as surprising and intuitive. Once they sat on the sofa and discovered the cube controllers, most of participants at first were unsure what it was about and how it worked. Once they realised that the sounds and animations would change according to their interaction with the cube controllers, they started to discover more and desired to explore all the differences:

> "Look I really enjoyed the installation. When I sat down I didn't have many
> expectations of it. I just thought that looks like a really nice image and I found as I
> sat there my mood changed once or twice from fairly passive to I'll see how this
> looks, see what happens. It sorted felt like I opened up to wow there is lot of
> opportunity to play here. It was partly play but also a realisation that I could change
> what was happening, so when I found things I enjoyed I went back and did them
> again. I like that sound and I like that image then I thought I need to look at them all
> and I became a little more systematic about how I worked my way through the
> interaction. […]. It doesn't require any literacy, any language, It is universal medium
> that music and colour and movement, that just seemed to get into very easily
> (pointing at her heart)." *[Staff, 82]*

Many participants considered the interface of felt cubes as being easy to use, friendly
and inviting, especially for non-technically-minded people. They also said that the
interface helps to shift people away from the usual situation of interacting with a
computer by clicking on the mouse or keyboard:

> "I also really enjoyed the felt buttons. That is just the sweetest detail and the tactile
> stimulation is really interesting too. Like from the occupational therapist perspective,
> for even it may not be geared to young children, but even for adult, it doesn't matter,
> it takes you out of everyday, it's not just press the buttons on the keyboard." *[Staff,
> 111]*

However, one participant questioned whether the interface would last, as it was a felt
cotton material. He indicated that the textile was good, but questioned the durability
especially after repeated use and cleaning. He suggested that the material could be
improved to something that was soft but more durable. He also suggested that the
object controllers could have some abstract patterns on them to be more
recognisable, such as symbols of a cross, a box or a circle; it would not need to mean
anything but it would make it easier for users to remember and to find the controller
with which they wanted to interact with more.

One participant described interacting with the installation as like playing a video
game of nature:

"You know my kids love video games and I hate them. This is first time now it likes a video game you know of nature that something I can praise. […]. It had things for TV you know like scenery like this like we go on now in forest or fish. Fish playing on the TV it is proven to be relaxing so an interactive one would be a step above. […]. You know its not like a video game video game which I believe will make you tense but this one with nature and interacting could relax you." *[Staff, 123]*

4.5.2.3 Participants' Suggestions

During the interviews, participants also suggested a few aspects of the installation that could be improved. I discuss these briefly below.

Physical Setting

The installation was set up in a waiting area where three hospital buildings intersect. The installation site received a lot of visiting traffic but also human-generated noise, as it was also a major waiting area where people normally sit, talk and rest. Some participants mentioned that sometimes the human background noise was too loud and drowned out the music from the work. Thus, the environment could be improved, for example by setting it up in a semi-enclosed and quieter space.

Something that Features Australia

One participant suggested that the installation could include more items that featured the Australian environment, such as gum trees, magpies or a kookaburra. She suggested avoiding images that were too symbolically Australian, such as a kangaroo or koala but rather elements that are more gently suggestive of the local Australian environment. She also suggested that someone who grew up in this environment might benefit more if they could relate to that environment in the healing process.

Psychological Assessment

One participant also suggested that it could be good for a psychologist to assess the installation in order to discern how the emotional aspect of the installation that was elicited could help to heal and if the installation could be blended into a normal healthcare environment.

4.5.3 Emotional Response

"It is helping people deal with their frustration, their fears and their angers."

[Staff, 118]

51 out of 53 (96%) interviewed participants reported positive feedback about the interactive installation. Table 4.2 is an overview of the emotional responses reported by participants. These responses were collected through the video-recorded interviews. Each time a participant gave an emotional description of the installation or a description of their feelings during and after using the installation, this emotional description then counts once in the emotional responses. If one participant gave the same description twice referring to the same object, this emotional description then counts once only. Some of the participants described the same emotion twice when referring to different themes or different interactive elements, in this case the emotional descriptions count twice. These emotional descriptions were thematically analysed and grouped by categories to form a common list of descriptors. For instance, feelings described as "distraction" or "it takes me into another place", or "it almost draws you in" were grouped into *diverted*; and feelings of exploring and discovery were grouped into *curiosity*; and feelings such as "it makes me a bit brighter and woke me up" or "it signified brightening up of my day" were grouped into *happy*.

Description of emotional reposes participants reported	Grouped emotions
"it's a relaxing atmosphere to sit and to immerse yourself into your images", "very relaxed", "you can go into there and relax", "it adds to the feelings of relaxation"	Relaxed
"take time and pause and to take stop", "where you just want to slow down and stay with it", "restful", "I just have no desire to get home now I just want to stay here", "it sort of brought me down", "make you rest", "it actually makes me slow down"	Restful
"I am more able to focus on my attention on that", "I feel I am part of the environment", "it seemed like you are really in the garden", "it kinds of sucks you in", "it almost draws you into it", "I can imagine […] like I can see the outside the window", "I feel able to relate to being in the bush", "invites quiet contemplation"	Immersive
"forget about your worries", "it kind of takes you away from everything else", "stop worrying", "you don't really think about anything don't wanna move", "associate another feeling or thought when they are within the hospital rather	Diverted

than just bad news", "took me to another place", "it takes my mind off", "I don't feel like I am in the hospital", "it is very distracting in a good way", "it focuses your attention and distracts you", "I feel diverted"	
"calm", "peaceful", "very soothing", "tranquil", "feel extremely calm", "chilled out", "she doesn't wait as anxiously"	Calm
"the rain forest, I walked through many rainforests… I always feel a sense of cool peace and the walk", "it actually reminded me of my home", "a lot of memories that came out of walking through a beautiful forest as a child", "it took me back to that time", "evoking the memory of walking by the lake with my dad when I as child", "as a child it will blow them away", "helping us to read that page and bring the page back from our memories", "that feeling of childhood getting back", "as a child you grab it and you blow it and it goes everywhere spectacular", "new growth reminds me of life"	Evoke memory
"it has its magic moment like the magic dream", "dreamy", "mysterious"	Dreamy
"romantic", "loving feeling", "almost caring"	Loving
"I got the feeling to make it more meaningful", "we can have some control over it", "It is not constantly coming out at you", "it is not in your face and it is not dominating", "she stops worrying, because I was making things happen", "I liked how it was interactive, when I pressed the buttons and something different will happen"	Sense of control
"it makes me a bit brighter and woke me up", "happily surprised", "pleasant", "surprised", "amusing", "makes me laugh", "enjoyable"	Delightful
"was a great comfort to me", "with rain especially when I drink coffee I feel like 'oh' (with a big smile)"	Comfort
"you don't exactly know what you are expecting so you want to try more", "felt like I opened up, wow there is lot of opportunity to play here", "curiosity", "I'll see how this looks see what happens", "just go with it and explore"	Curiosity
"bored"	Bored
"open space I didn't find relaxing'', "annoying"	Not relaxing
"sadness"	Sad

Table 4.2 Overview of emotional categories elicited

Following the grouping in emotional categories, I then calculated the numbers of each response reported within each category to identify which emotion was the most often mentioned by participants. Figure 4.9 shows the numbers of the responses reported within each emotional category. As we can see in the figure, the majority of the participants describe their emotions to the installation as being relaxed. The next most elicited emotions were feelings of being calm and followed by feelings of diversion. Many other positive emotions were also identified here, including feelings

of immersion, delight, evoking (happy) memories, restfulness and a sense of being in control. There were three negative emotions recounted by participants, and these were described as sadness, being bored and feeling annoyed (see Section 4.5.2.1). The participant that described the emotion of sadness was referring to the Marine Theme. One participant expressed a feeling of boredom when she was experiencing the Night Theme. Another participant recounted being annoyed by the sound of the swan in the Garden Theme and the image composition of the Lake Scene in the Marine Theme. A further breakdown of participant categories and their emotional responses to the installation will be described in the next section.
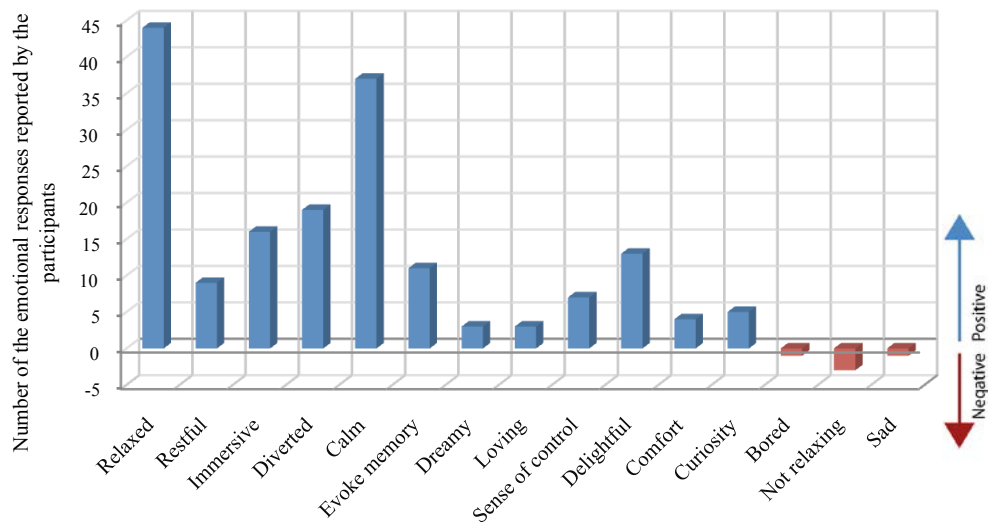
Figure 4.9 Overview of emotions that were elicited

4.5.3.1 From a Visitor Perspective

Most of the visitor participants found the interactive installation evoked feelings of peace, calm and relaxation. Through engaging with Visual Melodies they were able to be less stressed about their particular situation and for the time they were using the installation, it helped them forget their worries and their anger. One explained that she found it to be very soothing; and it also distracted her mother (a patient) from waiting anxiously and helped her to stop worrying:

> "For a start, I was interested in the concept, and so I wanted to play and see what happened, but sitting and watching it, I think it is fairly restful and peaceful. My mother is having treatment, before the treatment she often gets quite anxious, she

watches the clock and waits. And I noticed that this is good for her. Because she stops worrying, because I was making things happen. It was distracting her and so she doesn't wait as anxiously. 'Cos it's not me that needs treatment it's her. I think it's good for a variety of people." *[Visitor, 92]*

One participant who had returned to visit the installation two weeks after the first visit, mentioned that the previous time he was angry before he arrived at the hospital, and that using the installation made him feel peaceful and calm:

"Last time I came here, I waited with this stuff, and my mum was not well. We got here for the therapist and I was having a very bad day. And I came here by chance. I sat in front of your beautiful art work and it gave me a lot of peace. […]. If you bring a person with high blood pressure, I tell you it will at least drop 5 points. I suffer from high blood pressure, but I feel extremely calm when I do this." *[Visitor, 85]*

One participant described her feeling of using the installation as being relaxed, and she also used her past experience of being in a hospital bed to point out how the installation could be beneficial for hospitalised patients as it is calm, slow moving and interactive:

"I have been in hospital a few years ago, and I had television on, but I was so nauseous from the drugs, I couldn't watch TV, because it was too fast, too bright and too loud. And I needed something to do with my thoughts, because I was feeling a bit toxic, depressed and a bit stressed. So I would really like something like this slow and calm and interactive and it would take, fill some time for me I think, you know while I was waiting to go home. […]. I feel pretty relaxed. I wouldn't have thought something like that could make me feel relaxed." *[Visitor, 113]*

With the examples provided, engaging with the installation helped visitor participants to release their stress, as it was an engagement with a peaceful and relaxing interactive artwork. This engagement also improved the quality of time visitors spent waiting in the hospital. The installation was also found to help visitor participants with comfort or to distract their family members (patients) from their worries and anxieties caused by waiting for or facing their consultations or treatments. Some positive emotions that were reported by visitor participants include soothing feelings, peacefulness, feeling in control and diversion.

4.5.3.2 From a Patient Perspective

According to the feedback from patient participants, the interactive installation elicited feelings of diversion, pleasure, comfort and contentment. One patient participant found that via interacting with the installation his mind was shifted into another place – '*home*', which was alleviating for him:

> "Yeah um I'm in a rather difficult stage of my life, where I'm suffering from a lot of pain and I was attracted to this little exhibition because of the peacefulness of the music and the gentle animation which took me to another place. It actually reminded me of my home and was a great comfort to me. Um, the idea of it being interactive I found somewhat interesting especially some of the sounds but I got the feeling to make it more meaningful I would need to understand each of the sounds in the interaction to make it a nicer melody perhaps than it already is, so, I loved listening to the way it had been composed and I tried to feed on that, yeah." *[Patient, 83]*

On the 12th November 2010, this hospitalised patient participant returned to visit the installation for his fourth visit. He had just finished having his voice box removed during crucial surgery, and so he was not able to communicate orally. This time, he came with his daughter. After experiencing the installation, he was crying and writing on a clipboard to communicate, he wrote:

> "This is where I have been all my life, close to nature and nothingness. Sometimes crying is a healing experience, openness and honesty." *[Patient, 83]*

One patient participant identified that the images and music elicited positive emotions, such as contentment, which could change people's usual negative associations with the hospital. Through the engagement with the installation, it also relaxed him and eased his pace:

> "What this [installation] does would be amazing. How it affects people in a very subtle kind of way. The other good thing about this is they can associate another feelings or thoughts when they are within the hospital rather than just bad news. They can associate a moment where there was contentment. That would be nice, because hospital is such a sterilised and cold, emotionally cold places really. I feel very relaxed and as simple as that, really. It sort of [he made a gesture of moving his

arms from up and down]. I have a very busy morning, and it sort of brought me down, which is good. It soft of flattened me out a bit." *[Patient, 63]*

The engagement with Visual Melodies helped patient participants divert their feelings and thoughts. It also helped them to forget the bad news they were worrying about and alleviate their fear and pain. The interactive installation empowered patient participants to take control of the animated elements and sounds, this seemed to enhance the empowerment of the patient participants. Some positive emotional responses have been highlighted here, these include diversion, comfort, contentment, pleasure and rest.

4.5.3.3 From a Staff Perspective

Most of the staff participants described their emotional feedback after using the installation as calm and relaxed. They stated that it was a help to focus on interacting with the installation and that it made them feel calm and comforted, which helped them forget their worries:

> "I have been here for almost an hour, just looking at it. […]. It is very relaxing and comforting. Once you see the fish in the sea, it's just a calming sensation. If you have a very stressful day, the image is just so beautiful; you just want to follow the fish, which is very relaxing. […]. It is calmer now, it is relaxing, you just kind of let it go and just watch. It changes how you're feeling, if you feel stressed in the morning or you have been working so hard, just sit down and forget everything, and just concentrate on this. It's lovely, just listen to the music and watch what the butterfly is doing. It is calming." *[Staff, 94]*

Some of the staff participants also identified that emotions of energy and happiness were elicited after using the interactive multimedia art:

> "It is instantly relaxing, it does make you relaxed by taking just few minutes out of your day. I am healthy, I work in this environment, and I know a little bit about the installation, but actually just sort of coming and sitting down for 5 minutes makes you feel quite relaxed, makes you feel quite happy when you sort of find things. It puts a little bit of happiness in your day." *[Staff, 110]*

Many of them also indicated that the installation has the tendency to draw people into it and entice them into exploring different things:

> "I feel diverted, like there is a lot going on, that what's just been doesn't matter, It doesn't matter, just all about the now (she pointed the screen), it's all about the now, relaxing, you know you don't really think about anything, don't wanna move, I'd say if it was just TV or music, it would just be noise, this isn't noise, it kind of sucks you in." *[Staff, 72]*

Other staff participants also explained that the interactive engagement process helped to change her emotions from being active to less agitated:

> "For me sitting on my back to a very busy space that this is, corridor passing, the scale of image was really helpful, and it was very tranquil And it is a very slow pace that things move, things didn't change very quickly, so it took some time to realise what was happening, when I touch certain things I was thinking I am not really sure what is happening here take sometime, so that in itself didn't make me anxious, or speed it, it actually makes me slow down, it makes me relaxed into that mood that this is something sort of just go with it and explore. And the music as well, it is really peaceful and tranquil I was attracted to that. […]. It brings you about a very gentle shift in your mood, from probably energy or agitation depending on what's happening in a day to one of quietness and solitude sort of very peaceful, peaceful feeling I came away with." *[Staff, 82]*

The engagement helped staff participants to concentrate on interacting with the design elements rather than being worried about other things. Playing with the installation also elicited not only calm and relaxation but also happiness and energy. The installation also invites staff participants to stop by, pause and take a short break from their busy working environments. It can be seen that the installation helped to generate some positive emotions for staff participants; a few important emotions elicited included being energised, happiness, diversion, relaxed, and tranquillity and rest.

4.6 Main Therapeutic Factors of the Installation

From the interview data, I identified that many different participants had made similar points while they were describing their experience of using the installation. Four main therapeutic factors emerged:

- the multisensory experience enables positive distraction;
- familiarity and memory;
- the feeling of being in control; and
- a holistic healing environment.

In the following sections I will discuss these main therapeutic factors.

4.6.1 Multisensory Experience to Enrich Positive Distraction

The first main therapeutic factor addressed here is the combination of visuals and music helping to distract participants from their worries. One participant claimed it covered all her senses. Some staff participants considered the interactive multimedia installation to be an innovative and unconventional way to relax:

> "…just compared to I guess the conventional way of doing relaxation for example closing your eyes and doing focusing on your breathing because I find that I tend to get more easily distracted whereas because I have an image in front of me and also I think the music is quite going well with the image I find that I am more able to focus on my attention on that, […], I really enjoy that aspect that being able to visualise and focus on something." *[Staff, 126]*

Many participants noted that positive distractions were elicited while they were interacting with the installation. Many different terms were used here, such as "It draws you in", "It sucks you in", "I got very involved in it", "It takes you away from everything else", "It was very distracting in a good way", and "I don't feel I am in the hospital". One visitor participant claimed the combination of visuals and music plus the power of control over these elements, helped in distraction from other things and maintaining focus on interacting with the installation:

"When I started to play with it I really like the combination of the music and the imagery and the fact you can control it. It's quiet hmm… I can't think about the right word but in the busy environment it kind of takes you away from everything else. And you can go into there and relax." *[Visitor, 113]*

Many staff participants also pointed out that the installation encouraged them to discover, that this exploring process enhanced the engagement with the installation and that resulted in providing positive distraction:

"I think it's really gentle and really engaging and draws you in, because you want to explore and find out what it is about. Especially finding more themes so I didn't know about that, or didn't know I could do that, so it is interesting. But I think it is a beautiful installation for a healing environment." *[Staff, 110]*

As discussed above, the interactivity encouraged participants to explore and to engage with the installation more, supporting my observations mentioned in Section 4.4.2 that interactivity helps to increase engagement with the installation. This finding is consistent with the argument by Sternberg (2009) that a multisensory experience, using sight, hearing and touching, enhances the therapeutic effect, as well as the suggestions by Malenbaum *et al.* (2008) and Malkin (2006) that a healing setting may involve interactive multimedia art to provide positive distraction for the users.

4.6.2 Familiar Scenes and Memory

The second main therapeutic factor identified in this evaluation is that the view of a natural landscape seemed to connect many participants to their past experiences or childhood memories. Participants found that they associated the natural scenery with places that they had been to or that they were familiar with:

"What you have chosen it makes it easy for people to relax with because they are familiar scenes so each of those was just a lovely place where I could just feel like I was there and in the midst of it and so." *[Staff, 122]*

"All these images are all in our age, you are not putting something you have not experienced before. Just helping us to do, read that page and bring the page back

from our memories, focus on that rather than what's around, that is the beauty of your art." *[Visitor, 85]*

Objects such as the frog, dandelion, shooting star, the action of skipping stones on the water and the forest scene in particular were reported frequently by many to remind them of childhood memories:

"You know the frog noises did something to me. Growing up here in Sydney there used to be a lot of frogs around. A lot. We had a park and with creeks. And lots of frogs, so part of my growing up with frogs so that reminded me of my childhood. […] Maybe that feeling of childhood coming back. I haven't seen one for a while." *[Staff, 123]*

 "There were a lot of memories that came out of walking through beautiful forests as a child. There was a ladybug crawling on the leaf and it reminded me of being young and free spirited. And for the time, I didn't have shoes, or problems, somebody else was caring about us. It took me back to that time, and makes me feel better about myself. […] I am watching it 2nd time around, and I am seeing the details more on the mushrooms and growing on the forest floor, and the lady bugs are crawling around, new growth, reminds me of life." *[Visitor, 85]*

"You have the moon, and you have the stars as well, and the shooting star, and the dandelion, as a child, I would blow them away. This is evocative of memory, blowing trouble away. Each of this is something causing your life stress, and I looked at it, I see it blow away and away and it takes the stress away with it. That is what I said to them and that is what I said to me. […] Shooting star always means good luck, you wish upon a star, and your dreams will come true, […] to wish upon the shooting star and blow your troubles away. I find it touches the God somewhere. And a peaceful God at that." *[Visitor, 85]*

As argued by Singer and Salovey (1988), our mood is deeply affected by the recalling of a memory. For example if a person is recalling a memory that is pleasant and that person is in a happy mood at the time of remembering, then it is easier to recall that positive emotion. As such, when presented with something that is likely to trigger happy memories from childhood such as finding a frog, blowing dandelion seeds away or skipping stones, it may ease the participant into a more pleasant mood,

thus making it easier for them to recall happy memories. This finding confirms and extends the literature discussed in Chapter 2 (Section 2.3.1) that memory and familiarity where there is a positive emotion involved can promote healing.

4.6.3 Feeling of Being in Control

Many participants pointed out the value of how the installation enables users to choose and interact, which helps to enhance the feeling of being in control. Patient and staff participants both mentioned this frequently, statements such as:

> "What I like about it is it is not in your face. It is not brash, it is very subtle and elegant which I think is very sort of almost caring. It is not loud, it is not dominating, over-taking, which obviously if someone just had bad news in the hospital situation, that would be great, it is exactly what you need!" *[Patient, 63]*

> "So often, our attention to a public space is intrusive dictated by somebody else, we have no control over it, and it sucks out attention, a moving image I find to look at it wether we want to or not. What's different about this, is that we can have some control over it, and it's essentially very peaceful and relaxing, and ultimately positive." *[Staff, 82]*

> "If you choose to just look at the image and not press any buttons, it is very calming. You can just close your eyes and listen to the music or just watch the image and when you start to add the buttons, obviously, and it gets a little bit busier. But it is good, because participants can choose it. So it's not constantly coming out at you." *[Staff, 111]*

The empowerment of users with choice and control is highlighted here. Visual Melodies provides different theme options and interactive elements options, and participants are able to select what theme they would like to experience and what elements they want to play with more. Participants' feedback also confirms the literature arguing for the importance of being able to feel in control as a means to reducing anxiety (Hamilton, 2006; Leske, 1992; Marcus, 2006).

4.6.4 Holistic Healing Environment: Psychological Benefit and Physical Benefit

The final main therapeutic factor mentioned by participants was the emotional aspect of the installation, as part of a holistic healing experience. Two visitor participants and one patient participant stated their need for something to support their emotions in their time spent in the hospital. Another visitor participant said that to heal a person, the emotional is equally important as the physical:

> "In mainstream medicine, there is a lot of research are happening, a lot of work are happening. People who work in the cell cancer or people who try to find a new way to do heart surgery, new ones and new techniques for making people feel better, but this [Visual Melodies] is focusing on the emotional aspect of therapy, and the emotional aspect of curing a person is as much important as the physical aspect of healing a person. […] this will change people's life because the techniques it has, […] you need to heal people emotionally, you need to touch people emotionally, because unfortunately Western medicine doesn't do that." *[Visitor, 85]*

During interviews with Katarina Cvitkovic and Kim Vaughan from the Sydney St Vincent's Campus Arts Committee, they both stated that at the hospital they endeavour to create a holistic care environment, and they identified the arts as one of the important components:

> "At St Vincent's we are committed to holistic care for us, arts are an important component of that, the opportunity to interact with an artist is a special privilege. On the broader question of arts in health, we believe we need to participate and contribute to research into innovative works. We hope our contribution along with others leads to government acknowledgement and an appropriate funding for us, so installations like this we hope will be the norm." *[Kim Vaughan, Sydney St Vincent's Campus Arts Committee]*

4.7 Conclusion

The evaluation study evaluated the therapeutic potential of the interactive multimedia art installation by drawing on participants' experiences of using the installation. The findings are as follows: a majority of participants from both observations and interviews understood in a natural way how to use the installation and a majority of the video-interviewed participants reported positive emotional responses after using the installation. The emotions most often reported were that of being relaxed, followed by calm, diverted, evoking memories and happy. There were slight differences in the emotions that were most often mentioned by the three types of participants. Most of the visitor participants reported feeling soothed, peaceful, energetic, diverted, and gaining a sense of being in control. The most common responses from patient participants were feelings of forgetting worries, comfort, contentment, pleasure and feeling restful. Most of the staff participants reported feelings of being energised, happy, diverted, relaxed and restful. Although many of the emotional responses overlap between groups, the differences might have resulted from different reason for being in the hospital and different moods when interacting with this therapeutic artwork.

A number of elements were also highlighted that might be particularly effective at encouraging relaxation: growing flowers and plants, sunbeams shifting through leaves, the tree braches blowing gently in the breeze, scenery of a forest, the colour green, natural birdsong, music with sound texture of the flute or piano. These elements are also in line with the studies by Ulrich (1984), Biederman (2003), Birren (1950) and Cooper & Foster (2008) that visual exposure to natural landscape, colour of greens and blues, and slow and gentle music enhance relaxation responses, as defined by Benson & Klipper (1975), and promote restorative effects. Other elements that had not been addressed by others, but that have been reported to be relaxing by many participants in this evaluation included: seeing the waterlily and lotus in the pond, skipping stones on the lake surface, seeing jellyfish float gently, making dandelion seeds being blown away, seeing a shooting star, hearing the sounds of the owl, dark colours and the night environment.

The experiences and elements described here were essential to understanding the therapeutic potential of this interactive media installation as well as contributing practical recommendations about the design and location of such interactive multimedia art installation in healthcare settings. A few recommendations were also made by participants for improving the installation, such as its physical setting requirement and local cultural context. Overall, the Visual Melodies interactive installation provides a relaxing and playful experience for the participants. Through engagement with the installation, users are led to positive distraction, to forget their worries and to reduce their anxiety. It also offers a novel and important therapeutic avenue as a service for hospital visitors, patients and staff. In the next chapter, I will discuss how these evaluation results reflected my design goals and development described in Chapter 3 and the literature reviewed and design principles discussed in Chapter 2.

Chapter 5
Conclusion

The creative practice described in this exegesis was focused on creating an interactive multimedia artwork with therapeutic potential that engenders a relaxing experience and stress reduction for visitors, patients and staff in healthcare settings. In order to create such an interactive installation a practice-based research approach was utilised. The main objectives were:

1. to create the interactive art installation engendering relaxation and stress relief;
2. to evaluate the therapeutic potential for users in a hospital setting; and
3. to identify the semiotic dimensions of multimedia art that are most generally effective for producing therapeutic effects.

In my review of the literature in Chapter 2, I proposed to bridge art therapy, colour therapy, and music therapy through an interactive multimedia installation. Inspired by the techniques discussed in the three therapies (see Section 2.2), my design practice was created according to natural scenery images (art therapy), aligning with the concepts promoted in colour therapy, accompanied with a soundtrack of composed relaxing music (music therapy), and including interaction with animated elements and sounds for the purposes of distraction and positive and relaxing engagement. Eight design principles were developed according to the findings of the literature that specifically addressed the kinds of image, scenes, colours, music, interaction technology and components that help to enhance users' experiences of relaxation. The development of this interactive installation was detailed in Chapter 3,

and the therapeutic potential of the installation as well as the particular elements that encouraged relaxation were identified and discussed in Chapter 4.

In the trajectory of practice-based research, three elements are particularly highlighted: theory, practice and evaluation (Candy & Edmonds, 2011). In the following sections, I draw together the theory developed in Chapter 2, the creative practice described in Chapter 3, and the evaluation study described in Chapter 4. To do this, I draw upon the fundamental eight principles (developed in Chapter 2) that framed the development of the creative practice, as a framework to give an insight into the relationship between my creative practice and the evaluation of the installation.

Principle 1: To be beautiful, pleasurable and usable (Section 2.1)

A top priority in the design goals was the aesthetic quality of the content (Section 3.1). During the design process, I carefully created images and colours that are beautiful and pleasurable and created the interaction and interface to be usable and enjoyable. In Chapter 4 (Evaluation), a majority of the participants reported the installation as being beautiful and relaxing (see Section 4.5.2). When participants referred to the use of the physical interface, the ease of use was described by many, and confirmed by observations (see Section 4.4.2 and 4.5.2.2).

Principle 2: Realistic or representational image style for the natural landscapes and avoid ambiguous and abstract images (Section 2.3.1)

The image content of the interactive multimedia installation was created as a combination of actual landscape footage and representational vector images (Section 3.3). For example, in the Forest Theme the background footage is actual footage of a forest and the interactive elements are vector image drawings done in a representational style. In the Jellyfish Scene which is the second layer of the Marine Theme, the background footage of the underwater world is computer-generated imagery in a representational style and the interactive jellyfish are actual footage of jellyfish. In terms of user experience, participants in the evaluation study described

some of the animations as very realistic, for example the water drop hitting the leaves and mushrooms (see Section 4.5.2.1). However, the lake scene in the Marine theme was reported as not looking natural and having too many imaginary features, for example the smoke animation on the lake surface; which resulted in the Marine Theme as being rated the least liked theme (see Section 4.5.1 and 4.5.2.1).

The four themes created were based on the scenes that have been described to have restorative effects (see Table 2.2 in Section 2.5 for the four major themes). The Garden Theme delivered a scene of a garden with some water features (Section 3.3.1), the Forest Theme was a view of trees (Section 3.3.2), the Marine Theme was a series of waterscapes (Section 3.3.3), and the Night Theme included rolling hills (Section 3.3.4). In the evaluation study, participants described loving the images in the Garden Theme of the tree branches blowing gently and the leaves reflecting on the water; within the Forest Theme participants reported enjoying watching the images of the forest, plants growing, and sunbeams shifting through leaves; the Marine Theme was described as creative and beautiful as the theme could be moved through several different scenes from the lake surface to underwater, and for its animation of the waterscape and rain; and the Night Theme was ranked the most favourite theme out of the four themes; as the atmosphere it created was peaceful and intimate (Section 4.5.1 and 4.5.2.1).

Principle 3: Something with which people associate positive experiences (Section 2.3.1)

I drew on my past experience and childhood memory of relaxation in the creative practice (Section 3.3), hoping that the objects and scenes that elicited relaxing experiences for myself could also bring positive emotions to the users too. The evaluation feedback supported this supposition, with participants indentifying that the scenery and the interactive elements evoked their past experiences and childhood memories, especially the scenery of the forest, the interactive elements of the frog, the interaction of skipping stones and blowing dandelion seeds away (Section 4.6.2).

Principle 4: Colour scheme dominated by a variety of calming greens or blues, decorated with soft pinks and oranges (Section 2.3.2)

In line with Principle 4, a variety of greens or blues were employed in creating the background scenes. The major colour scheme for the Garden Theme is green with partial pinks – e.g the lotus flowers (Section 3.3.1), the Forest Theme is dominated by the colour green with partial pink and orange colours (Section 3.3.2), the predominant colour in the Marine Theme is blue (Section 3.3.3), and the Night Theme involves dark colours with the partial use of green and blue (Section 3.3.4). In evaluation, the colour of green was reported by many to be relaxing and the Garden Theme was reported to be colourful and to evoke the feeling of being lively (Section 4.5.2.1).

Principle 5: Seamless loop sound with slow and stable tempos, gentle timbre, and predictable cadences (Section 2.3.3)

Based on Principle 5, all of the sound elements were composed with a slow and stable tempo, predictable cadences and sound textures, using a piano and sting quartet with some natural elements (Section 3.3). In the evaluation, participants mentioned the tranquil and peaceful quality of the music (Section 4.5.2).

Principle 6: A large scale projection to foster an immersive experience (Section 2.3.4)

Following Principle 6, the interactive installation was set up with a large-scale projection that was projected directly onto a wall in order to create an immersive experience (Section 4.1). The evaluation study confirmed the effectiveness of this set up, with many participants describing the feeling of being immersed in the installation (Section 4.5.3).

Principle 7: Interactivity that offers choices and options to modulate one's sense of control (Section 2.3.4)

The installation was created and developed to be interactive such that a user would be able to interact with a variety of the animated elements they wished to play with as well as to choose any of the four themes they wished to engage with more (Section 3.2 and 3.3). In the evaluation, many participants reported on the value of this freedom to choose and control, which enhanced the sense of being in control and was also useful as a means of reducing anxiety (Section 4.6.3).

Principle 8: Multisensory design – using audio and visual media to enrich the experience (Section 2.3.5)

The sounds of the interactive elements were designed to correspond with the presented visual elements, as well the sounds and visuals of the interactive elements being in harmony with the background footage loop (Section 3.3). Many participants reported that the visuals and music were well combined and it helped them to be able to focus their attention. Through the interaction with the animated elements it encouraged them to play more and distracted them from other things (Section 4.6.1).

The content, interactivity and controller table of the installation was created based on Principles 1 to 8, developed according to the elements of design that were found to be successful at evoking positive and relaxing experiences in the research literature. The evaluation feedback supports these principles, with 96% of the video-interviewed participants reporting positive emotional feedback. The most often reported emotions were: feeling relaxed, followed by feeling calm and having one's mind diverted from worries and stresses (Section 4.5.3) with patient participants in particular mentioning comfort (Section 4.5.3.2).

Overall, it can be seen that the installation realised each principle. In this exegesis, I have demonstrated the therapeutic potential of Visual Melodies, and the aspects in particular that are effective in producing relaxing emotional responses. The response to the interactive installation has been effusive and welcoming from hospital visitors,

patients and staff of all ages. It was found to help users relax, divert and provide a restful calming experience, thus meeting the aims of its development.

5.1 Future Development

In this section, I propose some further improvements for the installation, organised by the following three aspects: the interface, content development and programming development.

Interface

The first consideration for further improvements could be the interface. Instead of felt which needs to be cleaned after each use, silicon could be an alternative material, or a glass touchscreen-like interface - the controller table would then require less maintenance. The controllers also need to be custom-made according to the specific environment and setting, with such requirements as the height and style of the chair and physical space allotted for the installation to be considered. Secondly, the interface could also be developed as a non-touch interactive space, by using camera recognition, sound recognition, distance detection or movement detection. In this case, users would not require any physical contact with the interface, although the sense of touch that enables users to physically contact and interact with controllers would be missing and so lessening the multisensory experience. A wireless interface or wireless sensors would negate the need for physical cabling running through the installation space, however batteries would be needed and may cause a problem with power management and storage.

Content Development

The second consideration for improvement is the content development. In this study, four themes, the Garden, Forest, Marine, and Night Themes, were developed. To provide a greater variety of choices of the content, more themes could be created to enrich the experience. Some images and themes that were suggested by participants to provide a relaxing experience include: the universe/galaxy, a beach and waves, the sunset, a park and grassland, watching clouds and high mountain views.

Programming Development

The final consideration for improvement is programming. As is common with software programming there are often a number of different solutions to one problem. In Chapter 3, a number of problems and solutions were discussed to create an installation that runs more efficiently. I suggest that a better way of programming the installation should be explored, to create a more stable and responsive running platform. In this creative practice, some animations were compiled through the traditional frame-by-frame linear method, and some of the animations were achieved dynamically allowing the computer to animate the images on the go, which allowed for a more randomised effect. I suggest for further development that most of the interactive animations should be dynamically animated through computer coding. This would allow for the file size to be smaller and the interactive elements to run more smoothly.

5.2 Future Applications

In this research practice, the interactive multimedia installation was designed specifically to address the stress, worry and anxiety that can arise in a hospital environment. In the feedback from the evaluation, some staff participants suggested a number of future possible applications for the interactive installation, these being: trauma centres, pre-anaesthetic rooms, dentists surgeries, waiting rooms in Centrelink[33], airports, railway stations, and included as therapy sessions for patients with mental illness.

One of the staff participants mentioned that a waiting room environment where people tend to be agitated by waiting would be a good place to site the installation, such as Centrelink waiting areas, airports, railway stations and other health settings. Many of these places currently only provide a TV, that broadcasts programs that people do not normally watch, and they also often have the sound muted. This can

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[33] Centrelink is the federal Australian government authority that manages unemployment and sickness benefits.

exacerbate people's agitation. One of the staff participants confirmed the emotional value of the installation, that it could change a person's mood to be more positive, which is beneficial in a healthcare environment:

> "...it did make me think of the environment I'm in, in a healthcare environment that the potential for something like this for not just staff, but patients to come with one mood and leave in another mood much more positive mood. So I really really enjoyed it from this perspective." *[Staff, 82]*

One visitor also suggested that this positive mood change in a waiting room environment would help:

> "...people in the hospital, who have a lot of time on their hands, will come through and appreciate the details, because something like this [Visual Melodies] in the waiting area, a waiting room, the doctors would have less jobs to do." *[Visitor, 85]*

One staff participant described her past experience working in mental healthcare at another hospital, where one of the therapies provided was music therapy, limited to a 30-minute session on a piano. However, some of the patients did not play piano or were not interested and so were excluded from the therapy, and most of them would just watch TV or smoke cigarettes outside. She suggested that if the interactive installation could be installed in a lounge room then patients with a mental illness could find themselves to be more engaged with beautiful music, scenery and interaction. One staff participant also described a similar thought, of the benefit of the installation in mental health settings:

> "I think you will have a great application for mental health patients, because people who are mentally ill they are disturbed, anxious and afraid worried and this is something for them to get away from that for a while." *[Staff, 125]*

For future development of the aforementioned applications, the modality of the interactivity will need to adapt to the physical setting to better suit the environment that it is placed in. This can be achieved simply by changing the use of the input devices, namely the sensors, and with a few adjustments in their data value setting in the coding (see Section 3.2.3 Technologies). For example, if the installation is set up in the hospital corridor, a proximity sensor will be the best option to be used, as it

does not require any physical contact with the installation. The animations and sounds can be triggered when people walk by. In a similar context, for a waiting room environment in an airport, railway station or government office, proximity sensors or motion sensors can be applied, such that the interactive animations can be triggered by people walking by or by the time duration of a person waiting and being stationary. If it is in a pre-anaesthetic room, the physical setting can be transformed into a single remote control with multiple buttons for single hand use, such that pre-operative patients can freely interact with the installation on their bed. If it is installed in a dentist surgery, the projection can be projected onto the ceiling for patients to watch while undergoing a procedure. For patients with mental illness, sound detection could also be developed - sound detection could be combined with singing therapy, which is a form of music therapy. The interactive elements can then be achieved through the sound that patients generate for example the sound of a patient singing a note, such as 'C', could trigger the flower growing, singing a 'D' could trigger the plant growing, and this could be an encouragement for patients to be more involved with singing therapy as well as watching the results of their singing through the interactive elements projected.

5.3 Concluding Remarks

Art/Design + Technology + Therapy = The Promotion of Healing

Figure 5.1 The promotion of healing

In this exegesis, I have presented the Visual Melodies interactive installation, its theoretical background, design principles, design goals, implementation, content development, programming development, interaction technology and physical interface. In addition, I evaluated Visual Melodies for its therapeutic potential, as well as identifying the aspects that particularly encourage relaxation. Although much has been created and investigated in this project, there is always more that remains to be explored and answered. It is my hope as the researcher/designer/developer that the development of the therapeutic Visual Melodies interactive installation continues,

and that it will inspire others to explore future applications for similar installations in healthcare. In light of Florence Nightingale's *Notes on Nursing* (2008 [1860]) which advocated the importance of appreciating beauty in hospitals; and today with the increasing advances in technology and design, we can look forward to ever-increasing resources for creating holistic healthcare environments. It is also my hope of that research to continue to extend our understanding of how we can fuse artwork and technology, to transform our healthcare settings from sterile treatment spaces, into healing places where 'care' is built into the environment itself.

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Appendix A:

ActionScript 2 vs. ActionScript 3

ActionScript 2 vs. ActionScript 3

Here I will outline the most important changes between ActionScript 2.0 and ActionScript 3.0. This change in the scripting language necessitated a major overhaul of the programming language used within Visual Melodies. The upgrade of ActionScript 2.0 to 3.0 brings into compliance the core language aspects of ActionScript 2.0 with the ECMAScript (the international standardised programming language for scripting). There have also been some new areas of enhanced and new functionality introduced, as well as new class libraries defined. Some of the major differences between ActionScript 2.0 and ActionScript 3.0 are outlined as follows:

Debug

In AS2 when a runtime error occurred the flash player would not display a dialog box with any intelligible text, this made debug testing of ActionScript programs much more difficult because there were no error reports. AS3 introduces several runtime exceptions for common errors; this enables applications to handle errors better and improves debugging. The error reports can provide source file and line number information, which makes finding a particular problem easier.

Language Differences

Another major difference between AS2 and AS3 is the emphasis on OOP (object orientated programming). This allows for code to be encapsulated into sealed classes by AS3 coding within a Flash file. For example, creating a 'class' and linking an 'event' to that class. This means that only the fixed set of properties and methods that were defined at compile-time are included in that class; new properties and methods cannot be added. This creates a more stable program and improves memory usage.

Event Listeners

As with the change to an emphasis on more object oriented programming, classes and packages have changed. AS3 also introduced the event listener. The event listener allows for interaction within the flash environment. For example, by reacting to a mouse click, keyboard stroke or any other event happening in flash that is being controlled by the event handling system of ActionScript 3.

Reading Resource: http://www.adobe.com/devnet/actionscript/articles/actionscript3_overview.html

Appendix B:

List of the Soundtracks for Visual

Melodies: Garden Theme, Forest Theme,

Marine Theme, and Night Theme

Soundtracks for the Garden Theme:

1. Theme background music (05:09): composed by David Sunderland
2. Butterfly (00:17): edited from string quartet composed by David Sunderland
3. Frog (00:01): sourced from Soundsnap with commercial licence
4. DragonFly (00:06): download from Soundsnap with commercial licence
5. Duck (00:01): download from Soundsnap with commercial licence
6. Swan (00:05): download from Soundsnap with commercial licence
7. Lotus1 (00:04): self generated from GarageBand
8. Lotus2 (00:04): self generated from GarageBand
9. Waterlily (00:08): self generated from GarageBand

Soundtracks for the Forest Theme:

1. Theme background music (01:02): self recorded the sounds in Blue Mountains
2. Mushroom popping sounds (00:04): created by Aaron Wahlen
3. Water drop (00:01): downloaded from Soundsnap with commercial licence
4. Poppy sound (00:02): edited from string quartet composed by David Sunderland
5. Ferns (00:02): edited from string quartet composed by David Sunderland
6. Brown leaves (00:02): edited from string quartet composed by David Sunderland
7. White flower (00:08): edited from string quartet composed by David Sunderland
8. Green leaves (00:04): edited from string quartet composed by David Sunderland
9. Purple flower (00:07): edited from string quartet composed by David Sunderland
10. Pink flower (00:08): edited from string quartet composed by David Sunderland

Soundtracks for the Marine Theme:

Interactive Lake Scene:

1. Lake background music (03:47): composed by David Sunderland
2. Fish jumping from the water (00:06): downloaded from Soundsnap with Commercial licence
3. Ripples (00:01): downloaded from Soundsnap with commercial licence
4. Thunder (00:11): downloaded from Soundsnap with commercial licence
5. Rain (00:14): downloaded from Soundsnap with commercial licence
6. Transforming clouds (00:09): edited from string quartet composed by David Sunderland
7. Transforming smoke (00:09): edited from string quartet composed by David Sunderland

Interactive Jellyfish Scene:

1. Jellyfish background music (05:16): composed by David Sunderland
2. Series of jellyfish sounds (00:01): self generated from GarageBand
3. Seahorse (00:01): self generated from GarageBand

Interactive Fish Scene:

1. Fish background music (04:28): composed by David Sunderland
2. Series of fish sounds (00:05): self generated from GarageBand

Soundtracks for the Night Theme:

1. Theme background music (08:03): composed by David Sunderland
2. Insect sounds blended in the background music (00:22): downloaded from Soundsnap with commercial licence
3. Owl (00:05): downloaded from Soundsnap with commercial licence
4. Series of blow sounds (00:04): recorded by Aaron Wahlen

Appendix C:
Equipment Set Up List for Visual Melodies

Equipment Set Up List

Items	Specifications
Room Measurements	
The installation space	Min. 3.4 x 2 x 2metres (W x L x H)
Projected screen	3.2 x 1.8 metres
Sofa	3 seat
Ceiling Space	to accommodate Projector and computer
Computers & Software	
Apple Mac mini 2.1 2.0 GHz (T7200) Intel Core 2 Duo Mac OS X v10.5.6	Graphics, Intel GMA 950 using 64 MB of DDR2 SDRAM Memory, 1 GB (2×512 MB) of 667 MHz DDR2 SDRAM
Interface/Sensors kit driver	Phidget 2.1 Installer for MAC OS X
Flash Creative Suit 4/ Action Script 3	Programming software
Mac adapter DVI- VGA	From MAC mini to projector
Video Projection	
1x Digital projector	NEC NP3150W LCD Widescreen Projector - 4000 ANSI Lumens with a resolution of 1280 x 720 pixels
Audio	
2 x Active Speakers	Genelec 8020A 20W active studio monitors
Interactive Interface	
1x interface table	51cm x 51 cm x 45cm (W x L x H)
2 x Interface kits	
13 Felt Cubes	Equipped with foam and FSR
13 Sensors	Force Sensor Resistors
Special Cables	
1x VGA cable 20m	to connect the computer to the projector
1x USB hub	to couple the interface kits
1x USB extension 6m	to connect from USB hub to computer

Appendix D:

Participant Information Sheet and

Consent Form

St Vincent's Hospital
Visual Melodies: An Interactive Installation Audience Feedback Evaluation

PARTICIPANT INFORMATION SHEET For Adult Participant

Invitation

You are invited to participate in a research study into the therapeutic potential of a multimedia art installation called Visual Melodies.

The study is being conducted by Amy Yi-Chun Chen, Doctor of Creative Arts student from the Faculty of Arts and Social Science, University of Technology Sydney.

The study is part of my Doctoral Research, which is focused on creating the interactive installation.

Before you decide whether or not you wish to participate in this study, it is important for you to understand why the research is being done and what it will involve. Please take the time to read the following information carefully and discuss it with others if you wish.

'What is the purpose of this study?'

The purpose is to determine whether the installation that I have created can help people to relieve their stress and relax, and if so, which aspects of it are the most helpful.

'What if I don't want to take part in this study, or if I want to withdraw later?'

Participation in this study is voluntary. It is completely up to you whether or not you participate. If you wish to withdraw from the study once it has started, you can do so at any time without consequence or giving a reason.

'What does this study involve?'

Your participation will involve you watching, listening and interacting with the installation. I will then ask you a few simple questions about your experience with using the installation. With your permission, I will also like to film you as you use the installation and during your interview. The video footage will be used as a reference tool to look back on at a later stage and the result of the study may be published for academic reasons, your identity will be kept confidential at all times.

Contact Details:
Amy Yi-Chun Chen | Doctor of Creative Arts Student | Phone:(02) 9514 3895 | Email: yichun.chen@student.uts.edu.au
Associate Professor Bert Bongers | Principal Supervisor | Phone:(02) 9514 8932 | Email: bert.bongers@uts.edu.au
Professor Rick Iedema | Co-supervisor | Phone:(02) 9514 3833 | Email: rick.iedema@uts.edu.au
----

Your involvement will take 25 minutes to use the installation and only 5 minutes for the interview. The whole process should take no more than 30 minutes of your time.

'Are there risks to me in taking part in this study?'

There is minimal chance that harm will occur. The installation is based on previous research that soothing music and images are able to help people to relieve their stress and relax. Relaxation is the key consideration. A comfortable three-seat sofa and easy-to-use wireless remote controllers have been carefully considered and designed to make participants feel comfortable and to minimise any harmful risks. This evaluation study should not pose any risk for anyone.

'Will I benefit from the study?'

We cannot guarantee you will benefit from participating with the study but we hope you will feel less stressed and more relaxed after using the installation.

'Will taking part in this study cost me anything?

Participation in this study will not cost you anything.

'How will my confidentiality be protected?'

All data, including the interview and video footage, will be treated as confidential and will not personally identify you except as may be required by law. We will only use the video footage as a reference for future study. The information gained as a result of studying the footage may be published as a journal article or conference paper for an academic purpose. At no stage will the video footage or interview result be used to identify any individual.

'What happens with the results?'

If you request, the researcher will send a copy of your own data to you. The data will be kept in a locked cabinet, or in a password-protected computer at the University of Technology, Sydney. It will be stored for 7 years, after which it will be disposed of.

'What should I do if I want to discuss this study further before I decide?'

When you have read this information, the researcher Amy Yi Chun Chen will discuss it with you and any queries you may have. If you would like to know more at any stage, please do not hesitate to contact her on 02 9514 3895.

Contact Details:
Amy Yi-Chun Chen | Doctor of Creative Arts Student | Phone:(02) 9514 3895 | Email: yichun.chen@student.uts.edu.au
Associate Professor Bert Bongers | Principal Supervisor | Phone:(02) 9514 8932 | Email: bert.bongers@uts.edu.au
Professor Rick Iedema | Co-supervisor | Phone:(02) 9514 3833 | Email: rick.iedema@uts.edu.au

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'Who should I contact if I have concerns about the conduct of this study?'

This study has been approved by St Vincent's Hospital HREC. Any person with concerns or complaints about the conduct of this study should contact the Research Office who is nominated to receive complaints from research participants. You should contact them on 02 8382 2075 and quote [*HREC project number*].

The conduct of this study at the St Vincent's Hospital has been authorised by the St Vincent's Hospital Human Research Ethics Committee (HREC). Any person with concerns or complaints about the conduct of this study may also contact the Research Governance Officer, Julie Charlton on 02 8382 2772 and quote reference number [*insert HREC reference number*]

Thank you for taking the time to consider this study.
If you wish to take part in it, please sign the attached consent form.
This information sheet is for you to keep.

Contact Details:
Amy Yi-Chun Chen | Doctor of Creative Arts Student | Phone:(02) 9514 3895 | Email: yichun.chen@student.uts.edu.au
Associate Professor Bert Bongers | Principal Supervisor | Phone:(02) 9514 8932 | Email: bert.bongers@uts.edu.au
Professor Rick Iedema | Co-supervisor | Phone:(02) 9514 3833 | Email: rick.iedema@uts.edu.au
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Visual Melodies

St Vincent's Hospital
Visual Melodies: An Interactive Installation Audience Feedback Evaluation

ADULT PARTICIPANT CONSENT FORM

1. I,.. agree to participate in the study described in the participant information statement.

2. I acknowledge that I have read the participant information statement, which explains why I have been selected, the aims of the study and the nature and the possible risks of the investigation, and the statement has been explained to me to my satisfaction.

3. Before signing this consent form, I have been given the opportunity of asking any questions relating to any possible physical and mental harm I might suffer as a result of my participation and I have received satisfactory answers.

4. I understand that I can withdraw from the study at any time without consequence.

5. I agree that research data gathered from the results of the study may be published, provided that I cannot be identified.

6. I understand that if I have any questions relating to my participation in this research, I may contact Amy Yi Chun Chen at any time on 02 9514 3895 or email yichun.chen@student.uts.edu.au who will be happy to answer them.

7. I acknowledge receipt of a copy of this Consent Form and the Participant Information Statement.

Complaints may be directed to the Research Governance Officer Julie Charlton on 02 8382 2772.

_____ ____/____/____

Signature (participant)   Please PRINT name

_____ ____/____/____

Signature (researcher or delegate)   Please PRINT name

NOTE:
This study has been approved by the University of Technology, Sydney Human Research Ethics Committee. If you have any complaints or reservations about any aspect of your participation in this research which you cannot resolve with the researcher, you may contact the Ethics Committee through the Research Ethics Officer (ph: 02 9514 9772, Research.Ethics@uts.edu.au) and quote the UTS HREC REF NO. 2008-313A. Any complaint you make will be treated in confidence and investigated fully and you will be informed of the outcome.

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REVOCATION OF CONSENT for Adult Participant

I hereby wish to **WITHDRAW** my consent to participate in the study described above and understand that such withdrawal **WILL NOT** jeopardise any treatment or my relationship with the University of Technology Sydney or with the St Vincent's Hospital.

_____ _____ _____

Signature of participant   Please PRINT name   Date

The section for Revocation of Consent should be forwarded to:

Amy Yi-Chun Chen | Doctor of Creative Arts Student | Phone:(02) 9514 3895 | Email: yichun.chen@student.uts.edu.au
Associate Professor Bert Bongers | Principal Supervisor | Phone:(02) 9514 8932 | Email: bert.bongers@uts.edu.au
Professor Rick Iedema | Co-supervisor | Phone:(02) 9514 3833 | Email: rick.iedema@uts.edu.au

NOTE:
This study has been approved by the University of Technology, Sydney Human Research Ethics Committee. If you have any complaints or reservations about any aspect of your participation in this research which you cannot resolve with the researcher, you may contact the Ethics Committee through the Research Ethics Officer (ph: 02 9514 9772, Research.Ethics@uts.edu.au) and quote the UTS HREC REF NO. 2008-313A. Any complaint you make will be treated in confidence and investigated fully and you will be informed of the outcome.

Appendix E:
Visual Melodies Website

Visual Melodies

Dandelion in Night Sky Theme

About The Installation

Visual Melodies Interactive Art Installation is a practice-based doctoral research project developed by **Amy Yi-Chun Chen** from the Interactivation Studio (DAB) and the Centre for Health Communication (FASS) University of Technology Sydney.

This interactive art installation seeks to engender feelings of calm and relaxation in the user by presenting manipulable environmental art. Its design draws on scientific research in the areas of art therapy, colour therapy and music therapy. It aims to provide an enjoyable, playful and restful interactive art experience to visitors at a health care service. The installation consists of an original series of landscape animations, combined with music compositions produced specifically for the installation. Users will be able to sit comfortably on a sofa and listen to the music whilst watching and interacting with the ani mations and sounds using custom made controllers.

- **Researcher/Designer/Developer:**
  Amy Yi-Chun Chen
  Doctor of Creative Arts Candidate, UTS

- **Music Composer:**
  David Sunderland

- **Supervisors:**
  Associate Professor Bert Bongers
  Faculty of Design, Architecture and Building, UTS
  Professor Rick Iedema
  Faculty of Arts and Social Sciences, UTS

Audience Feedback

"It is instantly relaxing, it does make you relaxed by taking just few minutes out of your day. I am healthy, I work in this environment, and I know a little bit about installation, but actually just sort of coming and sitting down for 5 minutes makes you feel quite relaxed, makes you feel quite happy when you sort of find things. It is put a little bit happiness in your day."
by [Participant, Staff, 110]

Links

- Amy's Portfolio
- Centre for Health Communication
- Interactivation Studio

Twitter News

- SBS's amazing Go Back to Where You Came From, with video, factsheets and an interactive asylum seeker's journey. #goback http://t.co/EzElpXi 48 days ago
- "@smashingmag: A truly remarkable read: You vs. The Data: When to Stop Optimizing and Start Thinking - http://t.co/PD3ExYx" 90 days ago
- RT @KISSmetrics True Colors - Breakdown of Color Preferences by Gender http://t.co/bbPCmz0 118 days ago

GET CLICKY

Appendix F:
Exhibition Flyer
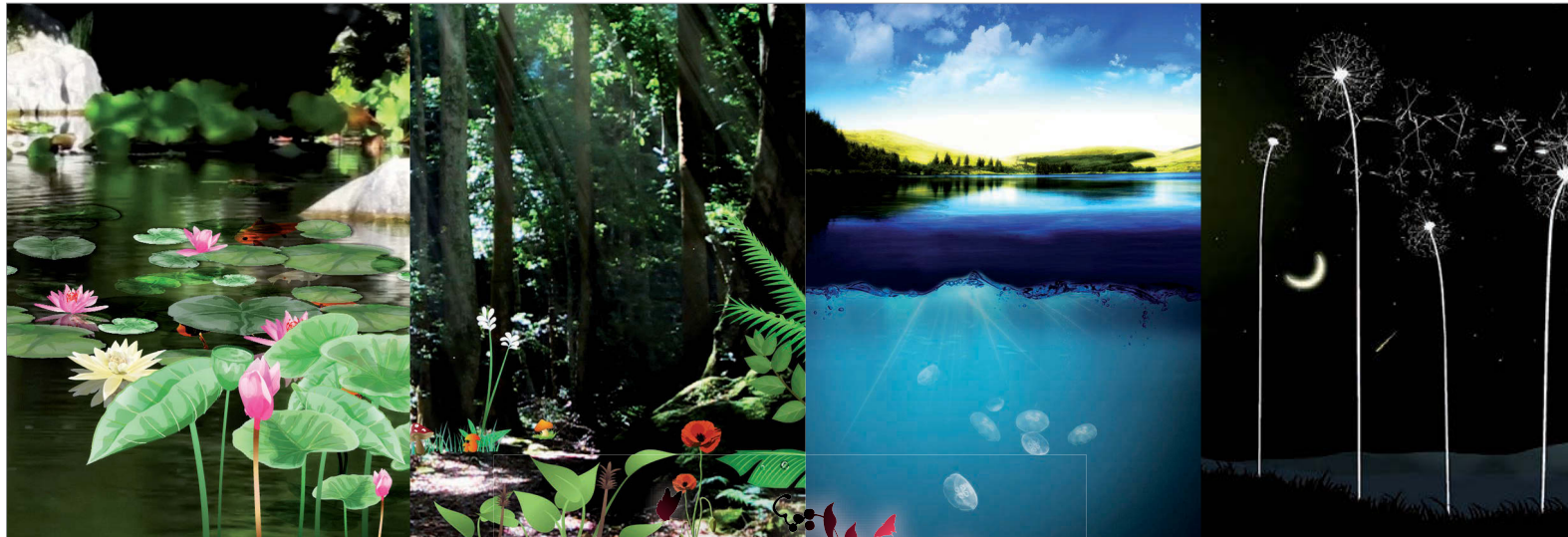
Visual Melodies

an interactive art experience for relaxation

12 October – 12 November 2010 St Vincent's Hospital

www.visualmelodies.org

Visual Melodies Interactive Art Installation is a practice-based doctoral research project developed by Amy Yi-Chun Chen from the University of Technology Sydney.

This interactive art installation seeks to engender feelings of calm and relaxation in the user by presenting manipulable environmental art. Its design draws on scientific research in the areas of art therapy, colour therapy and music therapy. It aims to provide an enjoyable, playful and restful interactive art experience to visitors at a health care service. The installation consists of an original series of landscape animations, combined with music compositions produced specifically for the installation. Users will be able to sit comfortably on a sofa and listen to the music whilst watching and interacting with the animations and sounds using custom made controllers.

Researcher / Designer / Developer
Amy Yi-Chun Chen

Music Composer
David Sunderland

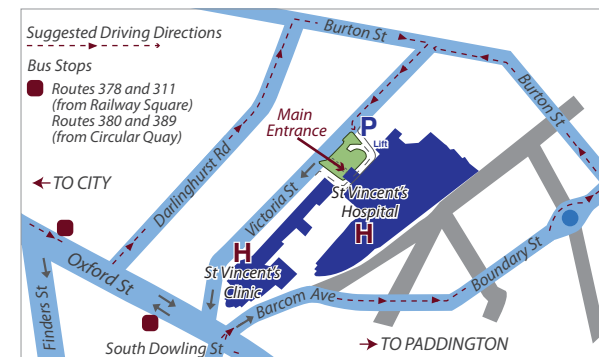**Supervisors**
A/Prof Bert Bongers
Prof Rick Iedema

Opening Wednesday 20 October 6 - 8pm
12 October - 12 November 2010 9am - 5pm Mon - Fri

Level 4 Public Waiting Area, St Vincent's Hospital
390 Victoria Street, Darlinghurst NSW
(Entry through the main entrance off Victoria St, pass the florist, take the escalator to level 4, the waiting area is on the left of the escalator)

www.visualmelodies.org

Suggested Driving Directions

Bus Stops
Routes 378 and 311 (from Railway Square)
Routes 380 and 389 (from Circular Quay)

Main Entrance

Burton St
Burton St
St Vincent's Hospital
H
Victoria St
Darlinghurst Rd
←TO CITY
Oxford St
St Vincent's Clinic
H
Barcom Ave
Boundary St
Finders St
South Dowling St
→TO PADDINGTON

St Vincents & Mater Health Sydney

Interactivation Studio

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Centre for Health Communication

Special thanks to David Sunderland, Bert Bongers, Rick Iedema, Katarina Cvitkovic, Kim Vaughan, Aaron Wahlen, Alison Gibberd, Suyin Hor, Ian Salmon, Suellen Allen, Verena Thomas, Natalya Godbold, Susi Woolf, Alejandra Mery Keitel, Jos Mulder, George Poonkhin Khut, Frank Feltham and Debbie Pryor.
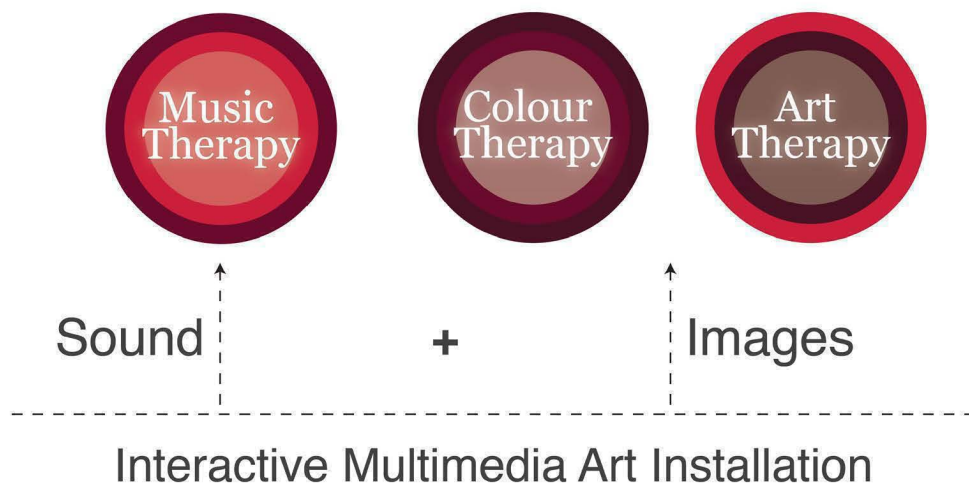
Appendix G:
Exhibition Posters

Visual Melodies

is a multi-sensory experience, drawing from scientific research in the therapeutic potentials of art, music and colour in health care settings.

Concept

Music Therapy   **Colour Therapy**   **Art Therapy**

Sound   +   Images

Interactive Multimedia Art Installation

Therapeutic Use of Images
Nakamura, 2008; Jordens et al., 2009; Evans et al., 2009

Behavioural Effects of Colour
Birren, 1950; lüscher, 1969; Feisner, 2001; Drew & Meyer, 2005; Samara, 2007

Music and Healing
Lefevre, 2004; Labbé et al., 2007; Sanderson et al., 2005; Cooper & Foster, 2007; Mitchell & MacDonald, 2006

Interaction and Therapeutic Approaches
Patel, 2006; Bratton, 2006; Campbell et al., 2005; Yip, 2009

Visual Melodies Design Principles

Music Therapy
Marconato et al., 2001; Myskja, 2005; Clements-Cortes, 2004; Jaber, 2007

Arts in Healthcare Settings
Lane, 2005; Walsh et al., 2007; Cooper, 2006; Finn, 2008; Hume, 2007; Burton, 2004; StaffNurse.com 2008; Naidoo & Naidoo, 2004

Emotion and Relaxing Responses
Denton et al., 2003; Carlson, 1997; Norman, 2004; DiSalvo et al., 2003; Benson, 1975

Colour Therapy
Kopacz, 2003

Art Therapy
Bar-Sela et al., 2007; Lejsted & Nielsen, 2006; Heenan, 2006; Dunn-Snow & D'Amelio, 2000; Favara-Scacco et al., 2001; Wallace, 2004; Walsh, 2007

Relaxing Movements
Jeamsinkul, 2002

Visual Melodies

## Graphics, Music and Animation

The four different environments were developed to become the four core themes, including **Garden, Forest, Lake** and **Night**. Live action filming combined with animation were used to create the themes, using Adobe Illustrator CS4, Photoshop CS4, Flash CS4 and After Effects CS4. Original music composition was inspired by each of the four themes.
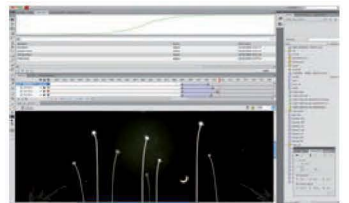

An example of working in Photoshop
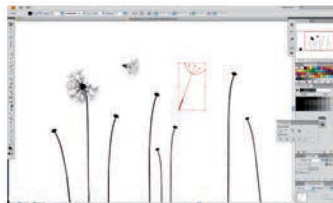
Drawing dandelions in Illustrator
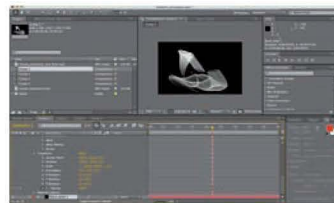

Animating a smoke effect in After Effects

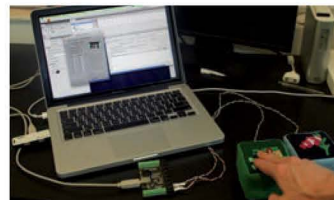Animating dandelion in Flash

Technologies

The engine that runs the installation is ActionScript 3. This acts as a bridge between the installation and hardware interface devices. The Installation hardware includes off-the-shelf sensors, a computer, projector, speakers and hand-made cubes.

Programming in ActionScript 3
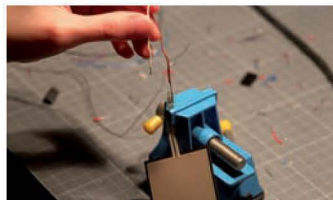
Soldering the sensor

Testing sensor data value

Finishing interface cube

Interface and Table

For comfort, accessibility and ease of use, felt cubes were developed as a means to interact with the installation. The cubes are designed to be attractive with playful colours and sewn patterns to highlight the four main themes.
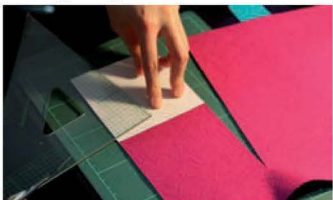
Cutting felt

Sewing the cubes

Stitching minor detail

Stuffing the felt

Cutting interface table

Finishing touches on the interface table

Painting

Table completion

Visual Melodies

an interactive art experience for relaxation

(Entry through the main entrance off Victoria St, pass the florist, take
the escalator to level 4, the waiting area is on the left of the escalator)
www.visualmelodies.org

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www.visualmelodies.org
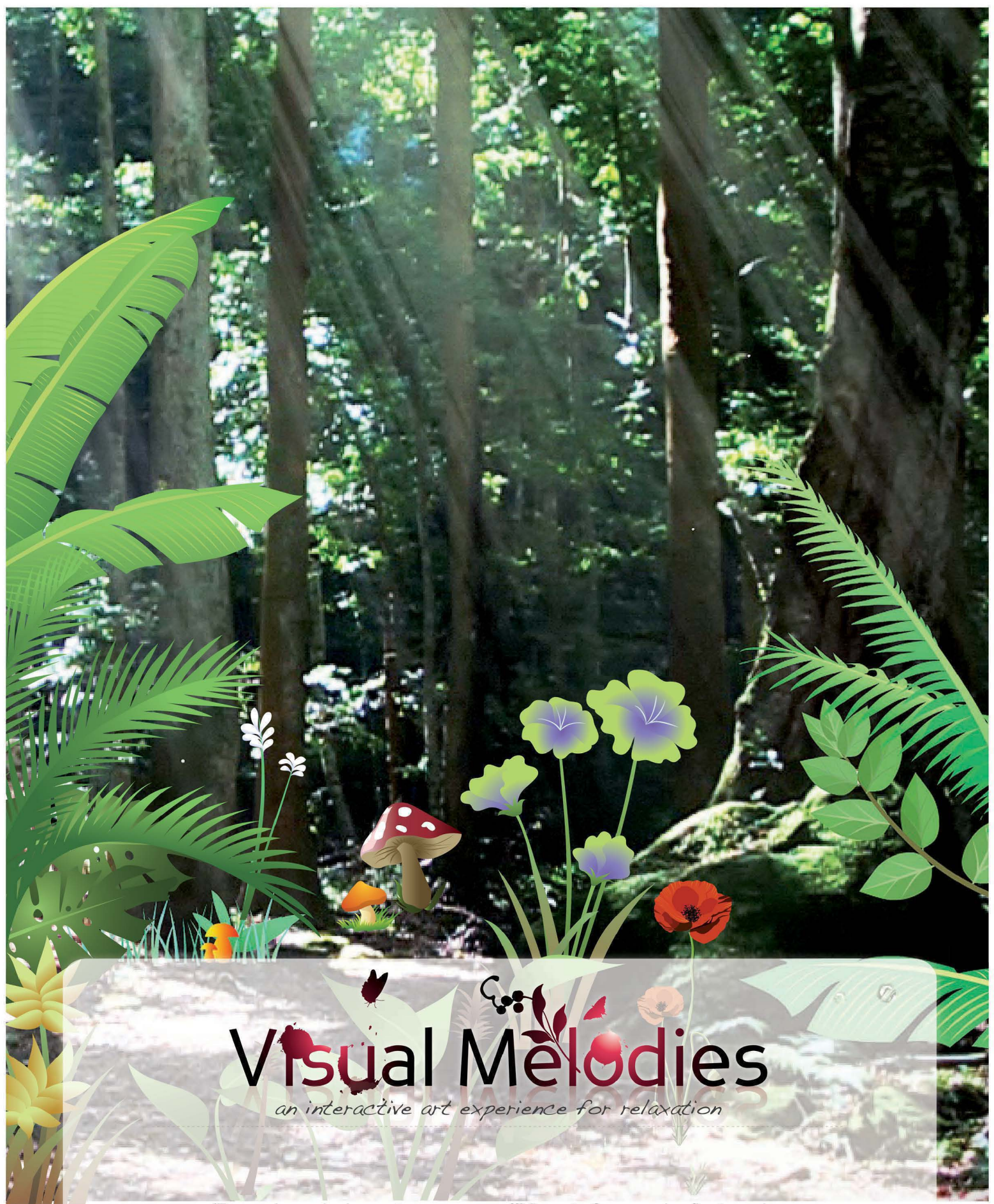
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Visual Melodies

an interactive art experience for relaxation

(Entry through the main entrance off Victoria St, pass the florist, take
the escalator to level 4, the waiting area is on the left of the escalator)
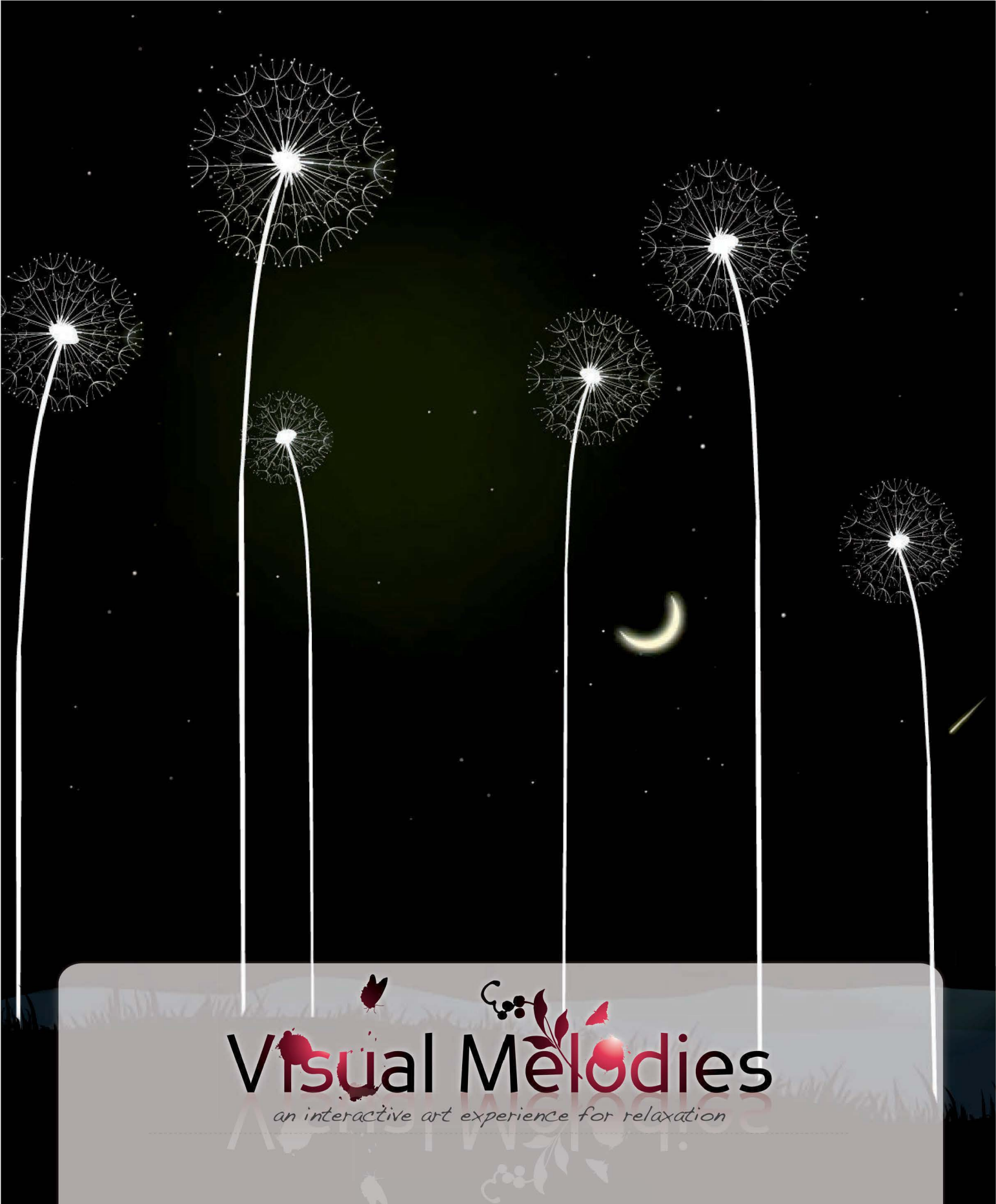www.visualmelodies.org

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Appendix H:

Visual Melodies Exhibition News from St Vincent's Hospital

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St Vincents & Mater Health Sydney

Home

About Us

Clinical Workstation

Bulletins

  Homepage Bulletins

News

Publications

Events

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Mission & Ministry

Hospitals & Group Services

Clinical & Capital Planning

Emergency Response

Garling Inquiry

Environmental Stewardship

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Training & Education

Research

Useful Links

ITSC Help Desk

About This Intranet

Library Resources

Staff Search

Old Intranet

Home   Feedback   Search

Homepage Bulletins

Visual Melodies

Date: 14 Oct 2010

St Vincent's Hospital experiences interactive art with the launch of Visual Melodies in the hospital's Mezzanine. The installation creates a relaxing and calming space through the use of sound and motion. A sensory experience the artwork enables participants to engage and express feelings.

Bringing together the concepts of music, art and colour therapies the installation consists of an original series of landscape animations. The user is invited to sit comfortably on a sofa, choose one of four landscapes and listen to the music whilst interacting with the animations and sounds with custom made controllers.

Creator Amy Yi-Chun Chen explains that the installation seeks to engender feelings of calm and relaxation in the user by presenting a manipulable environmental art. The aim is to provide visitors at a healthcare service an enjoyable, playful and restful interactive art experience.

Visual Melodies is a practice-based doctoral research project developed by Amy Yi-Chun Chen from the Interactivation Studio and the Centre for Health Communication University of Technology Sydney and is presented by the St Vincent's Campus Arts Committee. The installation is open Monday to Friday, 9am to 5pm, until 12 November.

Other Homepage Bulletins

Ride to Work Day

Nominations Now Open for Safety Superstar Awards

SV&MHS Welcomes St Vincents Health Australia Board

Strengthening Local Decision Making

Mundine Donates $150,000 to Gorman House

Cardiac CT Celebrates 500th Scan

The Darlinghurst Campus Plans Ahead

Griffith Community Private Hospital - Rural Health Innovation

Photos Now Available

MedChart Goes Live in ICU

Information Sessions for Finance Policies & Procedures

NRI at Smart Strokes

AAMI donates $20,000

SVH Opens New Unit

SVH Performs First Total Artificial Heart Implant in Southern Hemisphere

New era for gastro-enterology

Inaugural Board Heralds New Era for SVHA

SV&MHS launches environmental logo

Health Spirit Now Available

Centralising Prosthesis Data

The Heart of Our Journey

Roberston Brothers to Entertainment at Staff Ball

The Curran Foundation Calls for Grant Applications

2 girls 2 Kawasakis

National Health Reform

Appendix I:

DVD Documentation: Trailer -Exhibition
and Interviews

Appendix J:
Papers and Presentations from this Research

Papers and Presentations from this Research

Peer-Reviewed Papers

Chen, A. Y., Bongers, A. J., & Iedema, R. (2009). *Visual Melodies Interactive Installation for Creating a Relaxing Environment in a Healthcare Setting*. Paper presented at the 21st Annual Conference of the Australian Computer-Human Interaction Special Interest Group (CHISIG) of the Human Factors and Ergonomics Society of Australia (HFESA), Melbourne, pp.361-364.

Conference Presentations: Peer-Reviewed Abstracts (underline = presenter)

<u>Chen, A. Y.</u>, Bongers, A. J., & Iedema, R. (2009). *Visual Melodies Interactive Installation: Art as Relaxation*, ArtsHealth Conference #2, University of Newcastle, 7- 9 October 2009.

<u>Chen, A. Y.</u>, Bongers, A. J., & Iedema, R. (2010). *Visual Melodies: An Interactive Natural Landscape at St Vincent's Hospital Sydney*. Paper presented at the 2010 The Art of Good Health and Wellbeing, 2nd International Arts and Health Conference, University of Melbourne, Melbourne, 16 – 19 November 2010.

Other Presentations (* = invited presentation; underline = presenter)

<u>Chen, A. Y.</u> (2009). *Visual Melodies Interactive Installation: Sea Theme*. FASS Research Students' Conference, 24-25 July, University of Technology Sydney, Sydney, 2009.

Chen, A. Y. (2010). *Visual Melodies: Forest Theme*. Paper presented at the Community of Scholars Forum, 12th April 2010.

Chen, A. Y. [*] (2010). *Analysing Modes of Communication in Interaction: Visuals/Sounds/Language/Touch*. Invited workshop presented at the 2010 Faculty of Arts and Social Sciences Postgraduate Research Student Conference, FASS University of Technology Sydney, Sydney, 4-5 June 2010.

Chen, A. Y. (2010). *An Interactive Forest Installation for Relaxation*. Paper presented at the 2010 Faculty of Arts and Social Sciences Postgraduate Research Student Conference, FASS University of Technology Sydney, Sydney, 4-5 June 2010.

Exhibitions

2009: *Up&Coming Design Expo*, Paddington Uniting Church, Paddington Markets Sydney, 23 – 25 April. Presenting the graphic element of the Visual Melodies Interactive Installation on a 2 metre * 2 metre oversize display board. http://www.upandcoming.com.au/

2010: *Interactivation Studio Project Demos*, 13th International Design Festival Sydney Design 09, Interactivation Studio DAB Faculty Building 6, University of Technology Sydney, 1 – 16 August. Developing Flash/AS3 and Freescale Semiconductor Accelerometer interfaces. http://www.sydneydesign.com.au/sd09/tours/interactivation-studio-project-demos/

2010: *Visual Melodies: An Interactive Art Experience for Relaxation*, Level 4 Public Waiting Area St Vincent's Hospital Sydney, Darlinghurst, 12 October – 12 November 2010.

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Babbitt, E. D. (1967). *The Principles of Light and Color : The Classic Study of the Healing Power of Color*. New Hyde Park, New York: University Books.

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Benson, H., & Klipper, M. Z. (1975). *The relaxation response*. New York: Avon Books.

Biederman, I., & Vessel, E. A. (2003). *A neurocomputational theory of spontaneous attentional selection.* Paper presented at the Proceedings of the 3rd workshop on Attention and Cognition, Tokyo.

Birren, F. (1950). *Color psychology and color therapy: A factual study of the influence of color on human life*. Secaucus, New Jersey: Citadel Press.

Birtchnell, J. (1984). Art therapy as a form of psychotherapy. In T. Dalley (Ed.), *Art as Therapy: An introduction to the use of art as a therapeutic technique* (pp. 24-35). London: Taylor & Francis.

Bongers, A. J., & Harris, Y. (2002, 22-26 May). *A structured instrument design approach: the video-organ.* Paper presented at the New Interfaces for Musical Expression NIME'02, Dublin Ireland.

Brown, B., Reeves, S., & Sherwood, S. (2011, 7-12 May). *Into the Wild: Challenges and Opportunities for Field Trial Methods.* Paper presented at the CHI 2011, Vancouver, BC, Canada.

Bunt, L. (1994). *Music therapy: An art beyond words*. London and New York: Routledge.

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Burton, J. (2004). Using the visual arts to facilitate emergence in organizations. In D. Kernick (Ed.), *Complexity and Healthcare Organization: A view from the street* (pp. 171-179). Oxford: Radcliffe Medical Press Ltd.

Campbell, C., Hosey, M.-T., & McHugh, S. (2005). Facilitating coping behavior in children prior to dental general anesthesia: A randomized controlled trial. *Pediatric Anesthesia, 15*(10), 831-838.

Camurri, A., Mazzarino, B., Volpe, G., Morasso, P., Priano, F., & Re, C. (2003). Application of multimedia techniques in the physical rehabilitation of

Parkinson's patients. *The Journal of Visualization and Computer Animation, 14*, 269-278.

Candy, L., & Edmonds, E. (2011). The role of the artefact and frameworks for practice-based research. In M. Biggs & H. Karlsson (Eds.), *The Routledge Companion to Research in the Arts*. London and New York: Routledge.

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