Designing a Virtual Reality Nyungar Dreamtime Landscape Narrative

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1 Introduction

This article demonstrates the use of Virtual Reality simulation as a new pedagogical tool for cultural landscape preservation and education. The case study examines an Australian Aboriginal landscape conception known as the "*Dreamtime*". To many Australian Aboriginal nations, the Dreamtime is an important religious concept that describes the meaning and creation of the cosmos; it is a complex system of signification. The prototype virtual landscape focuses on the Dreamtime narratives from one nation, the *Nyungars*, who are the indigenous nation from the southwest of Western Australia. Many forms of Dreamtime narratives exist, and this project focuses on those that explore the landscape and its creation. One narrative in particular, that describes the formation of the *Gabbee Darbal* (Swan and Canning River) by an ancestral being called the *Waugal,* helped to inspire the author to design and code a virtual reality landscape within the Cave Automatic Virtual Environment (CAVE™) at the National Center for Supercomputing Applications (NCSA™) at Urbana Champaign. This Nyungar narrative aided in creating a virtual landscape narrative that helps to visualize Nyungar sacred landscapes severely affected by colonization. A crucial principle explored by the author, was how to represent the Nyungar culture, a culture nearly erased by colonization in a sensitive and accurate way. This exploration, in conjunction with landscape narrative practices found within Nyungar narratives, assisted in creating a set of design guidelines for forming the virtual landscape. Furthermore, the methods of creating the scenes within the virtual landscape are explained.

2 Who are the Nyungars?

The Nyungars are the Aboriginal nation located in the southwest of Western Australia. In an attempt to understand Nyungar concerns, perceptions and knowledge of the southwest area, the author selected a specific landscape region known by the Nyungars as the Gabbee Darbal and focused on the Whadjuk sub-nation area. Located centrally within these landscapes is the city of Perth and its surrounding suburbs, where approximately 2 million people currently live. Colonization has destroyed many Nyungar sacred sites/landscapes and only a few survive. For many years, Nyungars and others have been fighting for acknowledgement by the Australian government and the public concerning their cultural heritage. The purpose of this project is to visualize a specific aspect of Nyungar culture, Nyungar Dreamtime landscape narratives, in particular, the formation of the Gabbee Darbal river landscapes. Many of these concepts are physically impossible to create and difficult to explain without being *immersed*. To re-create these landscapes and concepts, the author has created a computer program and designed a virtual landscape that allows users to

experience immersion using the CAVE™. The virtual landscape design is not a replication of the contemporary or past Gabbee Darbal landscapes but rather, a design that encourages users to conceptualize these Dreamtime landscapes.

To discuss and represent Aboriginal issues and concerns as a non-Aborigine inherently raises many complex issues, and to address all of these is beyond the scope of this paper. To represent Nyungar culture, it is critical for one to challenge prejudices and stereotyped beliefs. Ideally, the approach of this project would be to work with the Nyungar community, to make personal connections and exchanges at all stages of this project. Due to logistical constraints, this project relies on the published information that Nyungar people have generated and shared with other communities, focusing on narratives that relate to the Dreamtime. Furthermore, this project examines ways to represent these narratives in conjunction with the author's perceptions and experiences of growing up within the study site region. It explores the interplay of the author's cultural identity of what it means to be 'Australian', with the Gabbee Darbal landscape being a fluid space for negotiation. Presently, the stories seen and told amongst the Gabbee Darbal landscapes are predominantly non-Nyungar. These landscapes have both cultural and natural history implicit to Nyungars and non-Nyungars, and are continually generating narratives for further and new types of narratives. Multiple narratives with objective and subjective elements that interconnect at places throughout the Gabbee Darbal landscape are yet to be told. These places are continually engaged in symbiotic and ongoing relationships with people and the landscape. These extend well beyond its specificity and the borders of our past and present 'versions of time'. They are Dreamtime narratives.

3 The Dreamtime and Landscape Narratives

Australia's landscape is ancient and unique. As one walks through such a landscape, one can start to perceive a rich history and traces of one of the longest living civilizations, the Australian Aborigines. Australian Aborigines did not build temples, but instead, they revered the landscape by creating elaborate narratives about their culture and their connections to the landscape. The Arrernte Aborigines 'shared' concepts about their religious practices and values with anthropologists Spencer and Gillen, who translated these concepts into the English language and conceived the term "Dreamtime"(Spencer). Dreamtime reflects Aboriginal cosmologies and religions, and in particular, the creation of the universe. Also known as "spiritual" or "mythical" beings, the ancestral beings epic journeys created the universe. Many Aboriginal narratives describe the ancestral beings' ability to transform many times into other forms, such as humans, animals, or inanimate objects. A common ancestor amongst Aboriginal nations is the "rainbow serpent". As the rainbow serpent and other ancestral beings created the world, the process was 'mapped' onto the landscape. The Dreamtime realm is independent of linear time; rather it is another dimension of reality (Morphy). For many Aborigines, the Dreamtime has never ceased to exist, with no beginning and no end. The Dreamtime is the basis of the present, and influences the future. With this belief, the present is as much a feature of the future as it is of the past. The Dreamtime relates to space and time, referring to the origins and powers that are located in places and things; they can be described as landscape narratives.

3.1 Landscape Narratives

The Dreamtime connects events, sequences, memory, space, and other abstractions to the more tactile aspects of place. They order and configure experience of space into significant relationships, offering ways of knowing and shaping landscapes. To truly experience the Dreamtime is to transcend boundaries and resonate with other dimensions of experience. In a sense, the Dreamtime represents stories that all Australians participate in and these stories shape the Australian landscape. They are a process of remembering and interpreting the landscape; they give form to space and experience. To participate and follow the Dreamtime is more than just listening to a story. As it tells of origins, explains causes, marks the boundaries of what is perceivable and explores the territories beyond (what is told), it is a narration (Potteiger). Furthermore, the Dreamtime consists of stories expressed (means of telling) through the landscape, orally and through other forms of art media (dance, paintings and film). For many generations, Aborigines have practiced mapping landscapes into the very texture and structure of stories. Many of these Dreamtime narratives discuss how the ancestors shaped the landscape, and in turn how places configure narratives, as opposed to considering the landscape as only the background setting. Thus, in the Dreamtime, the landscape is integral to the narrative and hence they are landscape narratives (Potteiger).

3.2 Following Nyungar Dreamtime Narratives

To understand these narratives is to read the landscape through association, events and stories that are part of the physical and non-physical form of the Australian landscape. To 'read' the landscape requires guidance. One way to navigate or follow an established hierarchy within the Dreamtime in a spatial manner is through what some Aboriginal nations refer to as song cycles or songlines. Songlines weave the 'dreamer', through the landscape following ancestors' events, enabling the dreamer to recount specific tales, allegories or social narratives. As Aborigines (re)-create songlines, they place elements to form sequences, plus they interpret empty spaces and create meanings; thus, Aborigines become authors. In addition, the landscape informs Aborigines about cultural and natural processes by recording these changes; in effect, the landscape tells a story. These changes or effects may or may not be 'natural'. For example, Nyungars used fire to hunt kangaroos and have narratives describing such events (Bates). With fire, Nyungars changed the landscape, creating places that tell new narratives. Often these narratives discuss the progressive stages of actions or events of nature. Water, being essential for life, dominates many of these narratives. The Waugal ancestor is the protector of water environments and there are many Nyungar narratives describing how it creates water features (rivers, streams and aquifers) that constitute and shape the Gabbee Darbal landscape. For example, the following describes characteristics of water flow: "Noongar from out around Brookton and York talk about how the Waakarl came out of the earth. It went different ways, making tracks through the hilly country. Sometimes it went kardup boodjar (under ground) and sometimes it went yira boodjar (over ground). The Waakarl's kaboorl (stomach) pushed the boodjar (earth) and boya (rocks, stones) into kart (hills). You can see the Waakarl's path in the shape of the boodjar (ground / land)" (Collard 2000).

4 Design Strategy

Actions by the Waugal formed the basis to develop a design strategy, however as the author is not a Nyungar, it became crucial to investigate ways to 'represent' Nyungar culture. An essential and difficult task was to discover personal and others' perceptions about Australian people and place, and to question various versions of information portrayed. It was important to reveal racist discourses and seek answers to questions in an accurate, non-racist, and sensitive manner from the images and text that 'represent' Aboriginal culture. This project represents the 'final' stage of many such processes that the author explored and developed. Briefly, in an attempt to be 'accurate', information represented and used focused on the micro and specific interests of Nyungar culture, keeping in mind the following limitations: (1) That information is interpretive and is an artifice. (2) That the designer has a role and impact on guiding users' perceptions, only being able to represent information from a selection of Nyungar accounts that is *perhaps* similar to other viewpoints. (3) To recall and critique that, at times some resources are the result of individual subjectivity. (4) To beware of the hazards of the audience perceiving specific experiences as 'typical' of an entire community, or how an individuals' voice may be perceived as the voice of the whole community. In this project, Nyungars appear linguistically as agents in the production of knowledge and as an inspiration for creative activity and interpretation. This project is part of an ongoing process of understanding the ways Australian people create culture and history. It derives from and reacts against historical representations and symbols of Aboriginality: finding new ways to 'view' and understand the Gabbee Darbal landscapes using virtual reality, rather than emphasizing the differences or the contrasts between people. The project aim is not to construct a replication of the Gabbee Darbal landscape as it was before colonization or how it is today. Rather, the aim is to explore the entangled memories of the past, the present and ultimately the future and their relationship with the inter-subjective state of experience.

The methodology to formulate ideas or guidelines to design the virtual landscape was based on 5 landscape narrative practices as discussed by Potteiger: Naming, Sequencing, Revealing and Concealing, Gathering and Opening. The majority of participants using the CAVE™ version of this project are likely to have limited knowledge about Australian culture. Thus, it was important to create a strategy to introduce users to this knowledge. The final design strategy consists of 7 distinct scenes to form the following sequence and purpose: (1) Introduction to 'Australia' (Fig. 1), (2) Introduction to 'Aboriginality' (Fig. 2), (3) Introduction to southwest of Western Australia (Fig. 3), (4) Abstraction of Nyungar nation (Fig. 4), (5) Introduction to Gabbee Darbal landscape culture (Fig. 5), (6) Abstraction of Waugal's beginnings (Fig. 6) and (7) Interpretation of the Waugal's influence on the Gabbee Darbal landscape. The following discusses the application of sequencing, revealing and concealing practices in the final scene of the virtual landscape.

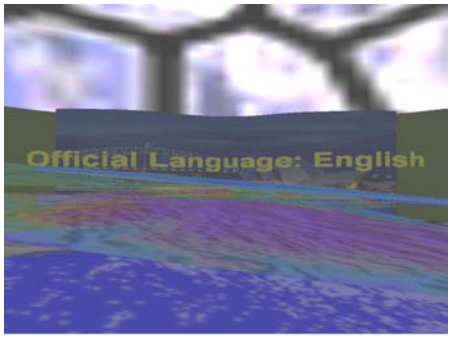

Fig. 1: Scene 1

Fig. 2: Scene 2

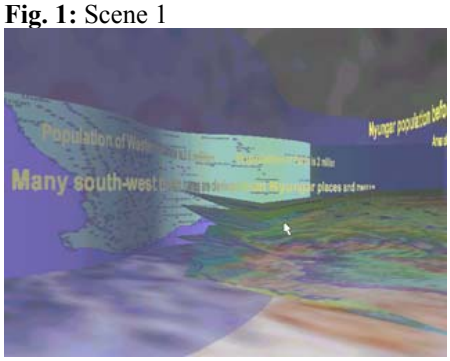

Fig. 3: Scene 3

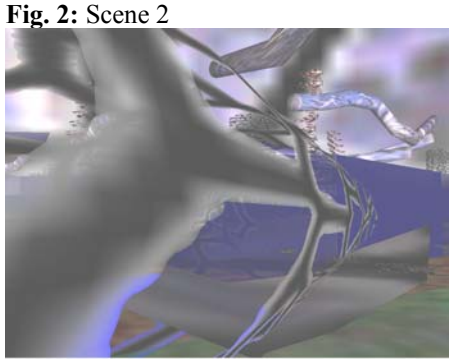

Fig. 4: Scene 4

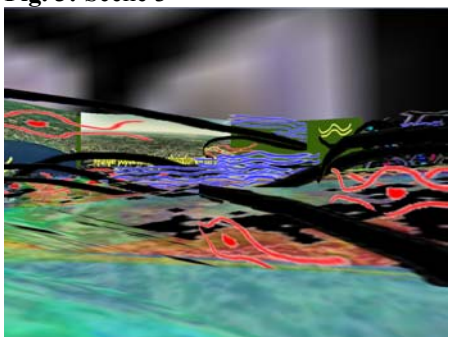

Fig. 5: Scene 5

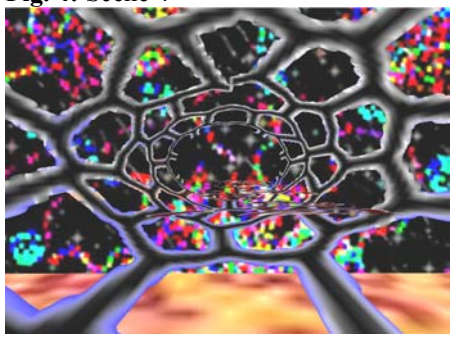

Fig. 6: Scene 6

The main plot and navigation through the final scene of the virtual landscape follows the formation of the Gabbee Darbal by the Waugal. The sub-plot of this narrative provides meaning and orders events and actions that are part of a complex network of landscape elements. The arrangement of such events within a sequence is important as it affects how the reader interprets them. Due to the complexity and great number of actions and events, some of them were 'captured' using symbols of concentric circles that denote sites in close proximity to their geographic location (Fig. 7). Another concept behind the arrangement of these symbols is to show layers of information that overlap, intersect and combine with transparent layers to create and reveal a deeply complex and ambiguous narrative. For example, in the final scene, the Waugal's path is used to expose the above and below drainage systems of these landscapes, to make transparent what is concealed. These spaces

are divided further with 6 layers (representing the Nyungar seasons) to create a complex space that reveals and conceals seasonal contextual information. Therefore, not only do these strategies create an interesting space, but they also increase the complexity of interpretation and meaning for the user (Fig. 8).

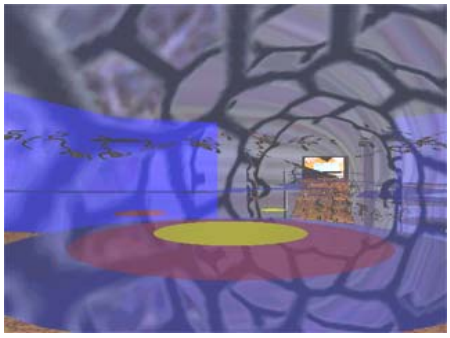

Fig. 7: Concentric Circles

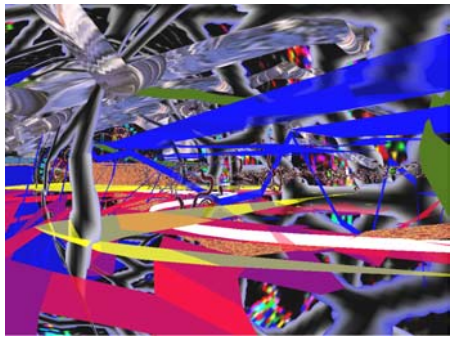

Fig. 8: Season Layers

Before designing and modeling any part of the virtual reality landscape, it was critical to evaluate and establish a set of limits for the capabilities of the CAVE™ hardware. To maintain high frame rates, the virtual landscape needed to be constructed in a way that required minimum polygons, using computer graphic techniques and effects to achieve the same visual effects as one would with higher polygon rates. In brief, some of the techniques used include: (1) An octree structure for space partitioning and frustum culling to reduce the amount of faces rendered at each frame. (2) Reuse of textures applied within scene models. (3) Use of simple world model designs (planes for example) as opposed to complicated geometrical structures. (4) Collision detection to restrict user movement within the world. The virtual landscape consisted of 50,000 faces in its construction (created using 3D Studio™), and the average real time display frame rate is 50 fps, a slight frame rate reduction from the ideal 60 fps (30 per eye). The computer program was written in C++ language and with the use of OpenGL® and CAVE™ libraries. As this project was approached as a prototype, the program was purposely written using C++ and with the use of OpenGL® to create a computer program that could not only work in the CAVE™ but also on typical computers, thus making it accessible to a greater number of people.

5 Virtual Dreamtime / Dreamtime Machine

After finalizing a set of design strategies, the next step was to develop a master plan. The plan involved the creation of symbols based on and followed by some Aboriginal groups to tell a narrative or paint a ‘landscape map’. The purpose of these symbols was to reveal to the user in an abstract expression, the transferal of information that takes place within the Dreamtime landscape or, metaphorically in this project, a *Dreamtime machine*. Symbols were created to designate landscape features and significant areas, and to map sequences. Figure 9 illustrates the final design. There are 4 regions, (1) the Australian continent, (2)

southwest of Western Australia, (3) Gabbee Darbal landscapes, and (4) the Universe web connection.

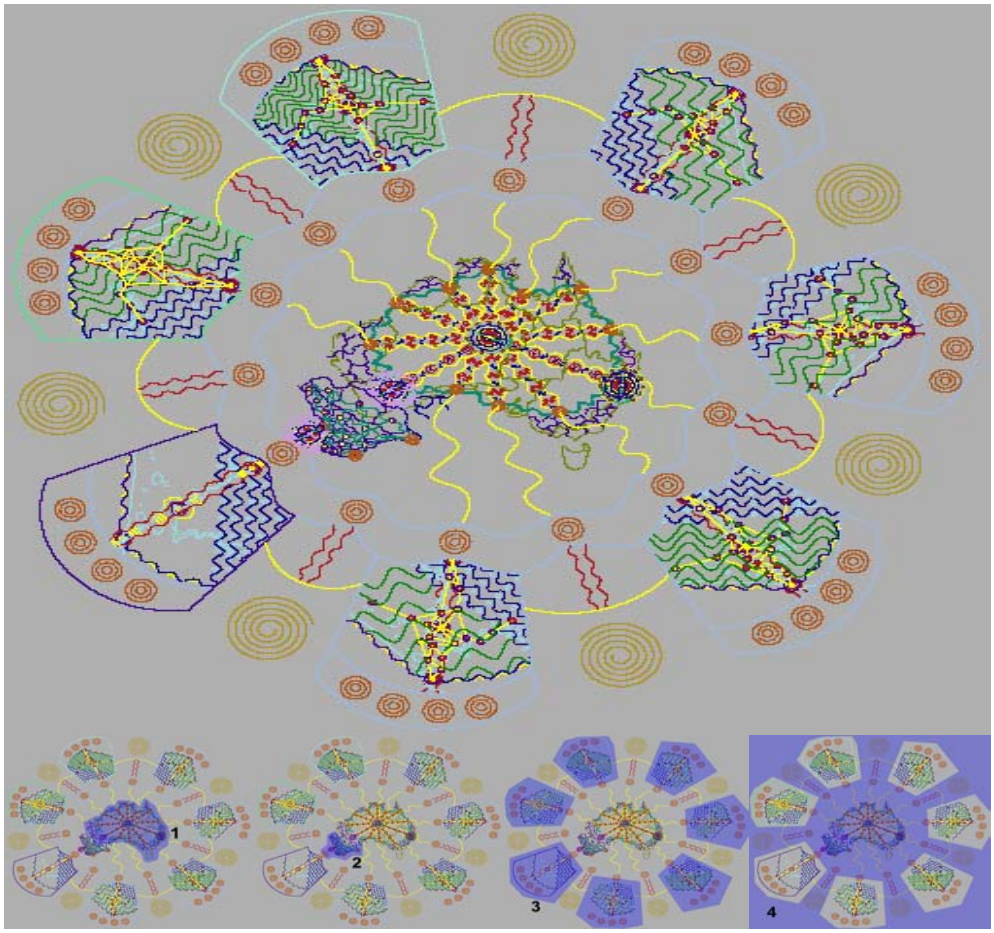

Fig. 9: Master Plan Design of Virtual Landscape

Within the region representing the Australian continent (1), a path guides the user from the Sydney and Canberra region ('the center of power in Australia') to Uluru. Uluru represents the center of Australia and is a significant symbol of Aboriginality. Next, the path guides the user to the southwest of Western Australia (2), the area of the Nyungar nation. Change of scale is common in Aboriginal paintings and has been adapted to scale the Nyungar nation area in the master plan. The expansion allows more events and details to be included in the design. Next, the path leads the user to a 'leaf', 1 of 7 leaves that constitute the Gabbee Darbal landscape (3). The leaves form a circle, with the center being Uluru, 'the center of Australia' and symbolic of its importance. One leaf indicates each Nyungar

season (a total of 6) while one leaf represents an accumulation of all seasons. The main concept of the leaves is to distinguish characteristics of the Gabbee Darbal landscape during each season, and to visualize connections and associations with Nyungar nomenclature. In addition, woven through all levels of the landscape was a web structure representing the connections of the Universe (4). The landscape-painting layout consisted of symbols that denote place (circles) and journeys (wavy lines). Each scene combines, expands, merges and morphs two basic symbols to form unique spaces that resemble symbols found in Aboriginal motifs. The next step in creating the virtual landscape was to create models from this plan without exhausting the available hardware resources required to operate the computer program at ideal frame rates. The first approach in this step was to simplify the original design and to remove parts of the model seen for short periods only, or not seen at all by the user. In addition, the design entailed using many curved shapes, requiring the use of many polygons to maintain a smooth edge. Many of these shapes were not integral to conveying important information to the user. Thus, the shapes were simplified, using less curves and the use of textures to achieve the same effect. The following describes how these techniques were applied to scenes 6 and 7, the journey of the Waugal ancestor.

Scene 6 is positioned at the highest point within the virtual landscape model to symbolize the part of the journey where the Waugal came down to form the hills and rivers. Having this scene at the highest position not only symbolizes the magnitude of the Waugal's journey but also gives the user an impression of a story climax and a new path to follow in the virtual landscape (Fig. 6). The final scene is an interpretation of the Waugal's influence and force upon the Gabbee Darbal landscape. Rather than modeling all 7 leaves from the landscape plan design, the 7^{th} was symbolically modeled as it represents all seasons, and combines information in a way that is easier for users to understand. To aid in this process, the Gabbee Darbal path was modeled and placed in the upper portion of the scene to symbolically denote not only the Waugal's journey, but also to encapsulate the scene's contents (Fig. 10). In addition, multiple paths that are textured with a warped serpent image, intersect many significant places in the virtual world to demonstrate and characterize to users the complexity of the Waugal's actions and relationship with the Gabbee Darbal landscape. These places of significance were marked using concentric circles to denote sacred places (Fig. 11). The use of these symbols was an important design strategy as it allows users to visualize the complexity, symbolism, and relationships between people and place. Within this scene, the largest concentric circles denote important stages of the Waugal path. The circles are color-coded: Blue represents people, red denotes landscape features, and yellow refers to place names. The markers are placed relative to the Gabbee Darbal rivers and according to their seasonal context. Another design strategy was to model the seasons using ribbons to create new spaces by dividing the river landscape and symbols into context of seasonal influence (Fig. 12). Each season layer was assigned a unique rainbow color that merge at the scene's ending to form a rainbow configuration at the resting place of the Waugal (Fig. 13). Surrounding the Waugal's resting place is imagery of the Milky Way galaxy and a rendered image of the virtual reality landscape design to symbolize the heavens of the cosmos. As the user moves forward, they return to the first scene of the virtual reality world symbolizing that their journey is one of many, and a never-ending cycle or rhythm of the Gabbee Darbal landscape.

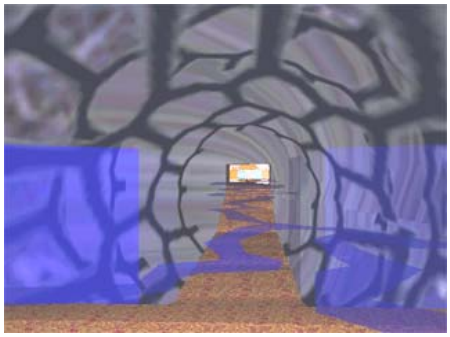

Fig.10: Gabbee Darbal path

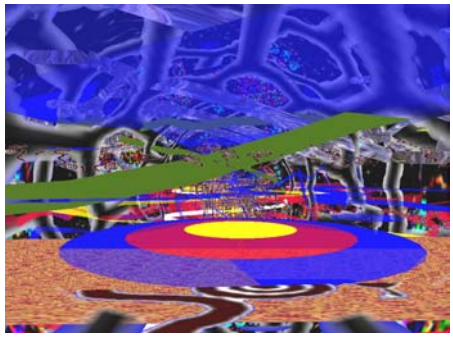

Fig.11: Concentric Circles

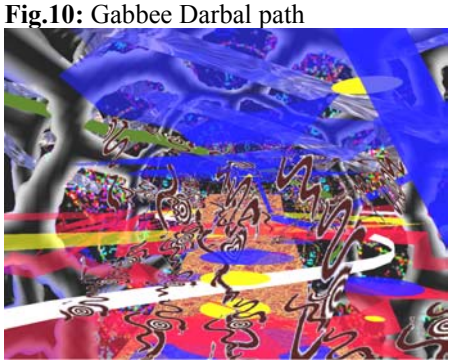

Fig.12: Seasons

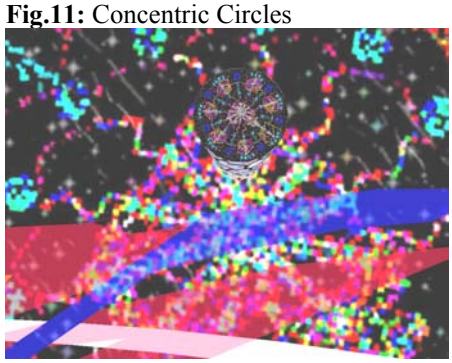

Fig.13: Resting Place of the Waugal

6 Project Future Directions

From initial user comments, it is clear that people felt connected in a spiritual way and immersed in the final scene. Users commented that they felt like they were swimming and/or dreaming. Having users immersed does not guarantee that they perceive the virtual reality landscape scene as a religious concept (the Dreamtime) nor as a complex river landscape network. What users learned and/or experienced was not documented and future projects will consider documenting users' perceptions. The original design of the virtual landscape incorporated multiple songlines, however, the user only had one songline to follow in this prototype. Such a design procedure is similar to the role of a director in filmmaking, in that its aim is to convey meanings and to get users immersed in the narration. However, the advantage of creating a virtual landscape is that the world scene can be setup for users to manipulate the world as desired, to create an open virtual reality landscape that answers the "what if" questions concerning the issues of design, knowledge and experience. The virtual landscape created in this project is not an open landscape; users are not able to manipulate or add to the world. Having such features will not only increase the complexity in experiences and interpretations, but could assist in interpreting how users perceive and experience the virtual landscape (what they learned).

The question of what to model is an important issue to address in future projects. Further dialogue is needed with the Nyungar communities, to inspire further questions and create guidelines that would help clarify what to model. A network structure with nodes that have

a particular detailed landscape may provide more guidance and spiritual experiences similar to those that the Nyungar community communicates through the Dreamtime. The author is currently in the process of updating and creating the necessary tools to incorporate these elements into the virtual landscape. Future projects aim to incorporate the Nyungar community and other communities to create virtual tools to share and educate others about their cultural landscape heritages. Virtual reality can be used to 'map' how these communities interact, experience and understand landscapes. For example, one project the author would like to pursue is to compare and contrast an unknown landscape such as the Gabbee Darbal landscapes to a 'well-known' landscape, such as the Nazca Lines in Peru. Such comparisons and research could assist in answering the following questions.

- How do users create new and/or use previous songlines in a virtual reality world?
- What parts of the landscape would they modify?
- What components of the landscape aid in creating their own songlines?
- When following another person's songline, does the follower understand or mimic the perceptions of the landscape in the same way as the songline creator?

Such a comparison could assist in further understandings the processes of cultural landscape heritage, but assist in improving design solutions of navigation, perceptions, model qualities (i.e. Level of Detail) required by users within virtual reality landscapes.

Note: This article was based on the author's masters thesis. For further information the author can be contacted at leonard@ncsa.uiuc.edu or at lorne_leonard@hotmail.com.

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