Doing Cultural Heritage Using the Torque Game Engine: Supporting Indigenous Storytelling in a 3D Virtual Environment

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Digital Songlines (DSL) is an Australasian CRC for Interaction Design (ACID) project that is developing protocols, methodologies and toolkits to facilitate the collection, education and sharing of indigenous cultural heritage knowledge. This paper outlines the goals achieved over the last three years in the development of the Digital Songlines game engine (DSE) toolkit that is used for Australian Indigenous storytelling. The project explores the sharing of indigenous Australian Aboriginal storytelling in a sensitive manner using a game engine. The use of the game engine in the field of Cultural Heritage is expanding. They are an important tool for the recording and re-presentation of historically, culturally, and sociologically significant places, infrastructure, and artefacts, as well as the stories that are associated with them. The DSL implementation of a game engine to share storytelling provides an educational interface. Where the DSL implementation of a game engine in a CH application differs from others is in the nature of the game environment itself. It is modelled on the ‘country’ (the ‘place’ of their heritage which is so important to the clients’ collective identity) and authentic fauna and flora that provides a highly contextualised setting for the stories to be told. This paper provides an overview on the development of the DSL game engine.
1. Introduction

Digital Songlines (DSL) is an Australasian CRC for Interaction Design (ACID) project that is developing protocols, methodologies and toolkits to facilitate the collection, education and sharing of indigenous cultural heritage knowledge. This paper outlines the goals achieved over the last three years in the development of the Digital Songlines game engine (DSE) toolkit that is used for Australian Indigenous storytelling. The project explores the areas of effective recording, content management, and virtual reality delivery capabilities of culturally sensitive stories involving indigenous Australian Aboriginal custodians, leaders and communities. It provides a toolkit where players, in a serious gaming sense, can experience Indigenous virtual heritage in a high fidelity fashion with culturally appropriate interface tools.

Cultural Heritage (CH) is concerned with the preservation of historically, culturally, and sociologically significant places, infrastructure, or artefacts for current and future generations. Most recently the use of virtual technologies to reconstruct, and thus explore in a non-intrusive manner, sites of CH significance have become an important tool in their preservation and investigation. More particularly, 3D real-time interactivity with these ‘virtual’ sites offers a new educational program for sharing the knowledge and information gathered about these sites. Many applications for real-time interactivity include the use of a game engine. A number of research institutions have explored the efficacies of using game engines to provide convincing reconstructions of places of cultural significance (MiraLab, VRLab, LandLab, HitLab, MIT MediaLab, the Ikeuchi Crest Project, the JSA Bayon Project, MVS lab (The Virtual Room), iCinema, and ACID, among others).

Most of the reconstructions that inform the CH of these projects is the modelling of past civilisations [1]. They also tend to address built environments rather than the landscapes that envelope these buildings. Most built environments follow an orthogonal format. Game engines and their associated modelling packages are particularly well suited to simulating orthogonal built environments [2]. Where the DSL developed game engine differs significantly from these more typical CH implementations of the game engine is in its re-presentation of non-orthogonal environments. The DSL game engine supports embedding of Indigenous Australian storytelling (an important and central component of indigenous Australian CH) in its natural landscapes. As such, the focus is on authentic organic landscapes, fauna and flora rather than built environments per se.

This paper includes a brief background on the DSL project and Indigenous virtual heritage, overview of the DSE toolkit, how the virtual environments are constructed, and implementation of the toolkit in consultation with indigenous Australian clients.

1.1. Introduction to Digital Songlines

The Australasian CRC for Interaction Design (ACID) is a collaborative research organisation formed with a number of Universities and industry...
partners. Within the Virtual Heritage program the Digital Songlines project is developing protocols, methodologies and toolkits to facilitate the collection, education and sharing of indigenous cultural heritage knowledge across Australian communities, cultural institutions and commercial businesses.

The Australian Aboriginal and their culture are known to be some of the oldest in the world. Aboriginal occupation in Australia has been dated at over sixty thousand years, with recent advances and scientific discoveries continuing to change this time frame [3, 4, 5, 6, 7, 8]. As such, the DSL project objectives are to protect, preserve and promote Australian Indigenous culture (an ancient and alive culture), its practices, myths and legends, expanding and re-vitalizing a culture through the visualization of its most prized asset—the land. The project has developed a virtual landscape of oral histories and mythological stories based upon the eternal sense of land and spirituality understood by the Aboriginal people. Research to-date has been focused on investigating how the design of virtual environments can capture the spirituality, significance, cultural importance and heritage values of Indigenous people and impart these in an empathic way so that indigenous and non-indigenous people alike throughout the world can understand the significance and cultural heritage of these areas.

1.2. Background: indigenous cultural heritage

Traditional Aboriginal culture was passed on to others through oral traditions, art, dance and rituals. Aboriginal Legends have served an important purpose in the teaching and learning for Aboriginal people, adding to their understanding, connection and interpretation of the world in which they live. Stories are a means by which knowledge and understanding is passed from generation to generation. As they live with such a close connection to the country and seasons, know it so intimately, the stories, songs and culture are inextricably linked to the land. Aboriginal culture is still alive today with older people from the country still able to tell their stories [9].

In the Digital Songlines project we aim to communicate the culture, history, rituals and stories and their association with the country through 3D virtual environments, by re-presenting these in the context of the originating country. The importance of this work is in the way it demonstrates an appreciation of the natural environment and the Aboriginal affinity to this land. The game-based virtual environments seek to explore the spiritual, mythic, magic and superstitions of the landscape as a traditional hunting ground and hallowed place of worship. To-date, the Digital Songlines project has been used to illustrate a number of significant Aboriginal spaces within Australia [10] [8].

1.3. The Digital Songlines toolkit

A core component of the Digital Songlines project is the ongoing development of a digital toolkit. The aim of the toolkit is to allow communities of Australian Indigenous peoples to create their own virtual
cultural landscapes through story telling in a 3D gaming environment. As well as being available for indigenous heritage storytelling, this toolkit can also be used to communicate issues of sustainability, land use, water use, explain development issues and contested narrative issues for a number of different uses. The toolkit can be used to facilitate asset management over a large geographical area. While the primary use of the tool has been in the area of cultural history, a wide range of potential installations have been identified including: museums, science centres, cultural centres, interpretive centres, community consultation, local councils, forestry, water resources, development organisations, schools, mining, safety training, media and data fusion capabilities.

The DSL software developed to-date is based on the display and manipulation of arrays of 3D objects recreating landscapes populated by indigenous flora and fauna. These assets have been imported into the game style application based on the Torque Game Engine (TGE) [see 11]. The active features include sound, animations, weather and daylight simulation. An established mechanism to import digital terrain models has been modified for importing satellite based geo-spatial data, or data that is prepared for use in GIS software, for accurately mapping the cultural heritage landscape.

Many issues arise from the creation of virtual spaces representing vast rural lands and its reliance on the computational capacity of real-time hardware and visualization technologies. Some are difficult to resolve in a suitable way to communicate the presence required within the virtual space. For example, how to convey immersive narratologies such as, while in place, indigenous knowing pauses at each rock, knows the cycles of the winds, can track underground water, find food and medicine, and uses of the land to speak its stories and keep its history. The kind of knowledge represented and the ‘field’ in which it is held by local indigenous peoples is often deep, subtle and most intimate [12].

Although some of these issues remain unresolved, most have been addressed by a ‘tiered’ model of development. ‘Layers’ of content are created, accessed, and linked back to the virtual model of the physical place. With such a model, we are able to conceive of the (virtual) land as an interface through which the more traditional dynamics of software creation can be accessed. Moreover, this layered model allows the creator to participate in indigenous knowing and being-with, at the most basic level, as the tool is used.

The content can be layered to support virtual heritage applications and narratives (such as land ownership issues, spiritual knowledge, historical and oral stories) and as a community content development and archiving tool (re-populate the virtual spaces with indigenous content). These can be used in entertainment, display, community consultation and education, such as museums, cultural centre displays, as an indigenous language walk, ‘bush tucker’ walk, or oral history lesson. These are all developed with the notion
of land-as-interface where the (virtual) land is layered with information and practices that arise from that very landscape.

Most of the clients for the development of a DSE-supported virtual heritage simulation are groups of Indigenous Australian people who have a strong desire to maintain and share local cultural knowledge. The features of the landscape and the fauna and flora contained must be faithfully reproduced in such a manner that the stories to be told in this medium are closely linked visually and experientially with their ‘country’ of origin (the local landscape environment which may extend beyond view—literally and metaphorically). The underpinning philosophy of the DSL game engine and content development work is to provide an accurate, affordable solution to a community that is directed and owned by that community and meets their needs [13].

2. The project cycle

Once a client has determined that they wish to proceed, a project is formulated. Each project follows an iterative cycle. Initial planning is done in consultation with the community onsite. Planning which occurs offsite, is returned for comment. Consultation continues throughout the project’s development. A project cannot be finalised until this authentication process is completed. The typical process includes:

- visiting a remote community;
- members of that community are shown the main features of the DSE toolkit environment; and,
- their needs are discussed.

This may take several days. In the mean time, other members of the team may collect photographs, video, sounds, and samples of local materials, such as bird noises, grasses, and notes on and photographs of local landscape features with the permission of the community custodians. These are then used in conjunction with satellite and aerial photography of the region to build the toolkit. From this, a 3D ‘snapshot’ of their country is created. In prototype form, it is returned for comment. From this, more information is provided by the clients about what they would like to see in their simulated country, the stories, what animals are needed and so on. A collection of agreed fauna and flora is modelled and animated. From here a core version of the stories in the virtual environment can be generated. This is again returned for further consultation, and so on, until consensus is reached on levels of authentication. Once the authentication process is completed the developed toolkit is handed over to the custodians of the client community for their express use and distribution.

3. The DSE torque game engine features

In order to develop the toolkit in its current form, a number of game engines were evaluated by the DSL group (Unreal Tournament II, Ogre, and
The popular Torque game engine (TGE) was chosen because it contained most of the features needed to develop cultural heritage artefacts in a real-time 3D environment. It is also inexpensive. It allows for the production of unlimited licensed versions for on-sale, and the DSL group retains complete control over the code developed. The DSL development team have actively worked with the TGE developers’ community to make improvements to the base engine that suit our specific needs. The standard TGE remains a flexible and easily configurable game editing environment.

3.1. Standard torque game engine features

The standard TGE uses the first-person metaphor. It is a visualisation environment that supports the importing of animated geometry. It is a scriptable environment. All the code necessary to control these scripts is included. It has specific functionality for controlling characters in a 3D terrain. It has a water metaphor, but its water system is quite limited. Its basic in-game editor allows one to instruct one’s environments, work with them, and mine information directly from the system. This is more efficient than many other game engines that require cycling of the more typical compile and debugging process to solve problems. It has a console window, and a scripting engine that enables direct access to the variables in the system. The scripting environment and the game engine are multi-user aware and secure. The server is responsible for controlling the world. Client applications have little control over server functions. The DSE adapts the TGE to use OpenSceneGraph as a more flexible and robust renderer.

3.2. DSE improvements to the standard torque game engine

Where the DSE implementation differs from the standard TGE is in the use of a ‘terrain painting’ metaphor. Terrain painting involves using bitmaps as information containers which inform the TGE where to place certain objects, behaviours, audio files, procedures and so on. These bitmaps have at their core, aerial and satellite imagery. These core bitmaps are registered against actual GPS coordinates which can also provide other significant real-time environmental information, such as geography, climate, daylight hours, seasons, and so on. At its most basic level landscapes can be painted with the features and components needed to create authentic [C] scenes. All of the components developed by the DSE—replicators, and their functionality, ‘audioscape’ functionality, expansions to the collision systems so a world’s scope can be limited, and so on—are based on the same principle of using bitmaps to encode the information needed to drive them. The advantage in this procedure is that components can be rapidly processed in any graphics program (such as Photoshop, GIMP, or Irfan). These files can then be saved in standard image formats that are well compressed, thus reducing the overall packed final game file size. The system developed is able to generate rich 3D vegetated landscapes from these bitmaps. The ‘terrain painting’
metaphor has significantly reduced development times such that projects can be completed on budget, and on-time.

The capabilities of the standard GUI environment have also been expanded, by adding graphical features into the standard TGE implementation. The ‘skinability’ of the GUI has been redeveloped to rapidly achieve a range of interfaces suitable for the vagaries of each project. This has involved programming a more flexible and extensible range of in-game GUI components used to support a number of multimedia tasks. These include: audio-video playback (with client’s describing a particular feature of a story at its location in the landscape), and rich media pop-ups that include functionality such as, the display of 3D objects (artefacts such as spears, boomerang, carrying baskets), a picture viewer with zoom and pan, and panorama support (for modelled panoramic rock art [D]). These can be placed in the world, thus making it as interactive as the project calls for.

Development of the DSE’s features and its content are two separate production processes. The content development team develops those components that need to take into account community consultation, authenticity and so on. They include the creation of the correct plants, animals, camp lay outs, and so on. The engine development team, on the other hand, works on optimising the engine to support the content development team. The content development team feeds information back to the engine development team on potential further optimisation strategies as part of the DSE evaluation cycle. The engine development team also follows a charter for an engine that has wider implications than that necessary for virtual heritage projects alone. The separation of content and engine development has assisted in the overall efficiency of each production run.

4. The key features of the DSE

The key features of the TGE developed and extended by the DSE for cultural heritage authenticity includes:

- the use of SpeedTree® for the foresting of specific regions in accordance with GPS and satellite imagery;
- audio functionality, localised sounds, such as birds, grasses, winds, and so on;
- artificial intelligence (AI), for controlling behaviours and interaction with users; and,
- the modelling process, based on biological research specific to Australian faunas and floras.

These features assist the ability to rapidly produce authentic and functional scenes.

4.1. SpeedTree

SpeedTree allows for the rapid production of forested terrain. However, this is not due to SpeedTree alone. SpeedTree is used in conjunction with
the terrain painting process. A combination of traditional tools are used—such as Photoshop—to create bitmaps for terrain painting. In the DSL implementation, the engine uses these bitmaps to generate the environments. As discussed earlier, the terrain painting metaphor is used to procedurally generate the environments guided by layers of bitmap information that can be easily generated from data from either satellite or aerial images. As the generators are seeded, the same results are achieved each time the program is executed.

SpeedTree can be used to procedurally generate animated trees that can be rendered in real-time. The advantage of this over normally modelled trees is that they also respond to procedurally generated effects, such as wind. For example, trees can be made to sway in the wind. Whereas traditionally modelled trees have to be animated for wind effects manually on a solid object, limbs can now be made to move independently of each other. This action is performed by the graphics card, hence there is little CPU overhead. The terrain painting replicator is used to place the trees, and determine what types of trees, heights, and so on (see figure 1). Individual trees can also be placed manually.

4.2. Audio functionality

The core DSE ambient audio environment consists of more than 150 individual sound files. At 40 Mbs, it typically includes the ambient sounds of 77 large birds, 63 smaller birds, 6 frogs, 6 crickets, and wind, among others. Sounds are placed in the scene using the terrain painting system described earlier. This is further enhanced by an audio quilt system.
The audio quilt system divides the scene space into a series of cells recreating region-specific sounds. The cellular format allows specific actions to be performed in relation to an avatar’s movement through the various cells. It uses a ‘checkerboard’ quilt design method to adjust the surrounding cells’ audio arrangements—both density and 3D location within constrained random variables. Audio files are randomly selected from a sound bank and used to aurally populate the surrounding cells. The type of audio assets used to populate surrounding cells is dependant on the time of day and any additional required parameters (see figure 2). This audio ambience ‘blanket’ follows the user as they move around the environment, selecting random sounds as it goes. What is outside a predetermined radius is culled to reduce CPU overhead. The time of day is coded to create animated effects, such as the sun moving over the sky and different bird sounds for the morning and evening (an important and recognisable feature of the Australian outback)[F].

The quilt algorithm generates requests for sound files through an audio databank. The audio databank’s time of day contingency is used to set these different effects. As sounds are driven by particular colours coded into the terrain painted bitmap, the landscape can be ‘painted’ with different sounds. These painted zones are assigned rules depending on what colour has been
painted on it. Hence, the more colours one has in their palette the more rules one can assign to the audio databank.

Sounds are an important feature of the Australian landscape experience. Different regions have different, highly recognisable, sounds associated with them (birds, insects, grasses, winds, and so on) as distinct sounds and combinations. These sounds change at different times of the day. Together, these effects, as used in the DSE, create an authentic aural immersion in the DSL environment. This aural immersion is crucial for the authenticity of stories told. This is particularly so where Yurdis (animals of special significance) are present. These sounds and noises animate the narrative in ways that text alone cannot.

4.3. Artificial intelligence

Artificial Intelligence (AI) is a strong feature of any serious game environment [14, 15]. While the Torque game engine supports basic AI, this has been extended to support more active functionality. It is still ‘weak’ [G] AI, which means it provides the heightened illusion of some intelligence behind actions such that the user thinks they are real—characters behave in the way one would expect. Another form of AI developed by DSL is the Non-Player Character [H] (NPC) class. Any non-play characters—characters in the scene driven by programs rather than users—is centrally controlled by this NPC class.

The NPC class allows the creation of statements about content creation beyond the normal array of behaviours and animated objects in a scene. The NPC class extends the AI class. For example, an animal’s AI includes a model that informs what the animal should look like and describes how it should behave. This is done for each different type of animal (Kangaroo, Eagle, Goanna, and so on). The NPC class, on the other hand, is written once for all NPC-linked objects or characters. All animated models can use the NPC class to create more detailed specific instances of behaviours for a particular event. The standard TGE has only basic AI code primitives built-in and controlled by a script. The NPC class is a level above this. It is an AI implementation with a framework that has a structure of its own. It has its own instruction set that can be used to control all the AI functions in the standard TGE.

In its basic form, AIs can be described as reactive agents. Animals are like agents, whereas NPC objects are scripted individually. Agents and their scripted behaviours are usually copied into every animated object in the scene (animal and character person) (see figure 3); where the NPC class differs is that it includes a list of tasks executed in a particular order by a particular character in the scene following a particular stimulus from the user. Generally NPCs are people characters, but an NPC class object can also be an animal. For example, a Dingo Yurdi can be used to walk around and visit different animals behaving in specified ways. That dingo does not act like any other dingo in the scene because it has an NPC class.
attached, and a path that it follows. Animals that do not normally interact with the users, other than as an indirect response, are agents. Those that are interactive, or respond to user inputs, other than proximity alone, are NPC-functioned.

NPC-controlled animated models are important in creating specific behaviours necessary for concise storytelling. They can be the behaviours of animated humans or animals. They make the experience of 'being in' the 3D environment more real, thus memorable [16].

4.4. Modelling

Modelling is a core activity in the construction of realistic 3D scenes. At the beginning of the DSL project, an extensive search for models of Australian animals that could be purchased was conducted. However, no suitable
models were found. Instead, they have all been individually modelled by the
DSL team. As a result, a range of Australian fauna and flora artefacts have
been modelled in as realistic a manner as possible. The biological details of
each individual creature or plant has been researched to make them as life-
like as possible. While new animated models are always being created, a
core set of animated objects has been amassed that allows the rapid
generation of realistic populated environments (see figure 4). Each region
has specific requirements for types of fauna and flora.

The modelling process
The modelling process follows traditional methods. A range of appropriate
images of the objects to be modelled is collected, measured, and
proportioned. Each animal, plant, rock tree and so on, is different. The
modelling itself is also an individual process. Individual modellers go about
the process in slightly different ways. Thus, there is some artistic license in
the artefacts created. Videos or pictures of the things to be modelled may
be used as a backdrop—modelling being performed in the foreground. Most
modelling occurs in Maya or LightWave. Models are then exported as a dts
file (native Torque file type). Some objects may be modelled in one package
and animated in another. Kinetic actions may be exported separately from
the object itself. One of the advantages of the TGE is that it supports dts
exporters for most of the popular 3D modelling packages (Maya, LightWave,
3DSMax, Blender, and MilkShape, among others).

Models are imported into the DSE and are either replicated using the
terrain painting process (such as for trees, rocks, grasses, sounds, and so on)
or have AI assigned to them (such as for people and animals). The accuracy
and authenticity of this process is paramount in providing for a convincing
populated simulated natural environment.

Figure 4 Examples of Australian native fauna modelled in Maya (Echidna, Dingo, Opossum, Kookaburra).
5. Implementation of the toolkit

With the specific DSE implementation of the TGE in the context of country-embedded Australian indigenous storytelling, the DSE toolkit assists the rapid authentic and inexpensive creation of 3D scenes in a cultural heritage template. Moreover, the DSE toolkit assists and fosters the maintenance and sharing of indigenous Australian storytelling through its accessible, flexible, and intuitive interface (see http://songlines.interactiondesign.com.au/).

The DSE toolkit is based on the notion of a strict landscape metaphor with editors that allows one to alter that environment using a game editor—add objects and place them, and alter their behaviours from a large gallery of components (see figure 5). With a licensed toolkit, one is presented with a complete simulated environment with all their needs. The various community groups are able to find their region and associated forests, and the sorts of trees and animals with behaviours already attached and characters and camps they need. They can then add dialogue to those characters, and rich media components, such as pop-up media: videos, images, and voice over. All of this is served by a central portal that supports the development and traditional communities alike.

The implementation in DSL of a networked structure of community-based content creation is a powerful paradigm model for research in interaction design, ambient, or serious gaming. The sociologist Manuel Castells [17] describes such networks as consisting of knowledge-based information technologies which enhance and accelerate the production of knowledge and information, in a self-expanding, virtuous circle. The network represents the divergence of production, access to, and display of nodes of knowledge. While traditional models of production in the field of display-based technologies tend to concentrate on either the product (the game), or the hardware (display), DSL sees workflows and methodologies that incorporate and evolve the two in a constant communication for the life of the product. For DSL, this communication begins with the recognition that the landscape is the ideal and essential metaphor for addressing indigenous cultural heritage issues, and provides a rich base for branching development and production.

The networked toolkit, as represented by DSL, becomes an empowering model of research and production—at once a site for capturing, archiving, developing culturally-appropriate virtual environments, and a site for sharing, collaboration and community content development. In the networked environment, knowledge becomes more powerful as it is shared and deployed [18–23]. DSL has grown through this network model. The umbrella of digital content and database development has provided a rich sandbox of opportunities for researchers, communities, educators, archivists, government and non-government organizations alike.
Figure 5: Screen shots of the Digital Songlines project interface showing net-making, grain grinding, and spear-making.
How we see, store, integrate and serve knowledge across the network is vital. Rather than merely seeking to refine and consolidate existing forms of knowledge—film, 3D animation, or game technologies—DSL has sought to provide methods of access and creation across combined knowledge bases, as it concentrates not only on the tool, but shapes itself to support and enable the voices which are carried upon and create the tool.

6. Conclusion

This paper outlines the development of protocols, methodologies and toolkits to facilitate the collection, education and sharing of indigenous cultural heritage knowledge developed by the DSL team over the past three years. The DSE toolkit used for Australian Indigenous storytelling developed over this period goes some way towards helping to preserve the historically, culturally, and sociologically significant places, infrastructure, and artefacts of many remote Australian Indigenous communities for current and future generations. The use of a game engine has proven to be instrumental in engaging with young and old members of these communities alike. Its 3D real-time interactivity provides an educational platform for the sharing of local knowledge. The three-dimensionality of the game environment also provides an appropriate interface for contextualising Australian Aboriginal knowledge sharing in its re-presentation of their most important cultural artefact ‘country’, embedded with authentic fauna and flora. This work highlights the need to find new ways to communicate diverse cultural understandings. More particularly, how technology can assist in the empowering of cultural identity in an increasingly homogenous world mediated by Western cultural values advanced by the same technology.

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Notes

A. The two key bodies with the primary charter for the preservation of world heritage sites are UNESCO (United Nations Educational, Scientific and Cultural Organization) and ICOMOS (International Council on Monuments and Sites).

B. See also [25] for a more detailed discussion on an example of Aboriginal rock art modelling.

C. Authenticity, in the sense that they are driven by satellite and aerial imagery.

D. For a more detailed discussion on rock art and so on, see [25].
E. Starting with the same seeded random number generator the same
numbers are used to generate the same randomised environments.

F. See [26, 27] for a more detailed discussion.

G. There are two main types of AI: weak and strong. Weak AI makes
animated objects appear intelligent. Strong AI makes animated objects
behave intelligently.

H. Normally each animated object (animal) includes a ‘state machine’
(states in transition between say eating and fleeing). This is the same
for all these types of animals. The NPC class includes a state machine
per agent instance (states in transition between eating or fleeing, or
go to or follow, or some other animation). Each instance is defined
(within a given set) rather than all animals behaving in the same
(predictable over time) manner.

I. There is no notion of a 'world' in Aboriginal culture, hence the terms
scene, simulated country, or virtual environment is used.

J. A dingo is a native Australian dog—often domesticated by indigenous
peoples for hunting and pets.

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