

# The role of technology in rock art preservation, education and cultural storytelling

Joanne Marston

Department of Computer Science  
University of Cape Town

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## Abstract

The preservation of heritage is an important concern throughout the world. Rock art is a unique part of heritage, which offers many research and educational opportunities. Technologies such as laser scanning and 3D modeling techniques provide a way of accurately documenting rock art, as well as aiding in its preservation. Additionally, technologies such as virtual reality and Web based systems, also have applications towards educating people with regards to rock art, as well as further applications for incorporating rock art with traditional stories from different cultural groups.

The focus of this literature review is rock art heritage, its preservation and its educational properties. The traditions of storytelling are also reviewed, with a focus on digital storytelling. The conclusion is that technology is aiding the advancement of rock art documentation, preservation and education, as well as providing new and unique ways of telling various traditional stories from different cultural groups, in particular those of the San people of South Africa.

## 1 Introduction

Rock art is found throughout the world, with the greatest variety and some of the oldest art being found in Africa (Clottes 2007). Unfortunately, rock art sites are in danger of disappearing (Wasklewicz et al. 2004). New technologies

are providing ways of accurately recording these sites, not only for research purposes, but also to create a virtual record. This virtual record is a way of preserving these sites and of allowing access to information that could otherwise only be obtained by visiting the site itself (Rajan & R  ther 2007).

The focus of this paper is on rock art, with a particular interest in art located in the Western Cape of South Africa. Rock art heritage and preservation is dealt with, as well as rock art education. Furthermore, the traditions of storytelling are investigated and linked to the images that are often depicted in rock art. The aim of this is to create a form of digital storytelling that uses both the stories and the images of the rock art to create a unique storytelling experience.

## 2 Rock art heritage

In South Africa the term ‘heritage’ is more often associated with contemporary art, music and dance than with the nation’s rich archaeological past (Meskell 2005). However, this rich archaeological past, which includes rock art, is an important part of the nation’s history. The department of rock art at the National Museum in Bloemfontein states that the term rock art refers to images that are painted onto, engraved into or sculpted out of a rock art surface. Furthermore, it is an archaeological artifact that can help us understand more about its creators (National Museum 2012). Rock art therefore pro-

vides a unique and striking way of learning about the early history of South Africa.

Rock art sites are scattered throughout South Africa, but the focus of this project will be on those located in the Western Cape, in particular those found near the town of Clanwilliam. The rock paintings in this area range in age from 8 000 years to 100 years (Khoisan Rock Art in the Cederberg Conservancy 2012) and depict art of the San people, who lived throughout South Africa for tens of thousands of years before European colonisation (Vergnani 1999). The art ranges from that of animal scenes to scenes of humans hunting, gathering food or dancing in procession. Images of therianthropes (half-animal half-human figures) are also present and are thought to have important religious meaning (Khoisan Rock Art in the Cederberg Conservancy 2012).

### 3 Rock art preservation

Rock art is an important aspect of heritage, one that needs to be preserved. Nelson Mandela, writing for the Trust of African Rock Art (TARA), emphasised that for future generations to experience, study, and contribute to our understanding of Africa's history, the rock art of the continent must be preserved and protected (Clottes 2007). Unfortunately, rock art sites are being destroyed, not only in South Africa but throughout the world, and thus there is a need to not only protect, but also assess and record sites in order to preserve the information for future generations (Wasklewicz et al. 2004).

There will always be a need for the preservation and conservation of rock art sites. Technology provides a means of creating an inventory of the increasingly threatened cultural heritage

of the world (Ogleby 1995). Laser scanning is a technique that is being used to record rock art sites. Its main advantages are that it is accurate, non-destructive and scalable. The scanned data can be used to create 3D models, which can be used to identify any impacts to sites over time (Wasklewicz et al. 2004), as well as aid in planning and management of restoration efforts (Rajan & R  ther 2007). Rock art sites can thus be preserved in a digital form that is unaffected by the issues that actual sites face, namely impact from the elements, vandalism and mass tourism. Furthermore, the accuracy of the data provides information that is sometimes difficult, especially to the untrained eye, to see or experience at the site itself (Martinez 2001). This is aided by the advancement of digital image processing. Rock art images can be enhanced to show more detail and features can be automatically extracted for easier analysis and identification of archaeological characteristics (Gonz  lez-Aguilera et al. 2009).

Aluka<sup>1</sup> is an online digital library of scholarly resources from and about Africa. The African Cultural Heritage Sites and Landscapes content area is an attempt to use 3D visualization and spatial documentation technologies (such as laser scanning) to create an online archive of information about African cultural heritage sites and landscapes (Rajan & R  ther 2007). The aim is to advance research and conservation efforts, while at the same time creating a permanent record of Africa's diverse heritage. Among the information collected there is an immense collection of images of rock art, as well as scans and documentation of five rock art shelters and caves in the Cederburg Mountains (Rajan & R  ther 2007).

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<sup>1</sup><http://www.aluka.org/>

## 4 Rock art education

Rock art education is one way of trying to ensure rock art preservation (Clottes 2007). Information on rock art is widespread and freely available. Online digital libraries, such as Aluka, have a wealth of information on the topic. The digitisation of the information is allowing many people access to resources that would otherwise be out of their reach (Rajan & R  ther 2007). Furthermore, it provides useful features such as text searching, filtering options and the display of related information.

Educational software concerning rock art is also available, such as “Exploring Rock Art: A North American Field Trip” which allows students a variety of learning opportunities (Olivier-Hirasawa 2001). The program has different sections, including “Explore Rock Art” in which students can visit different sites in North America to see images of rock art, as well as take pictures of the rock art. There is also a research section with various research tools, including reference books and links to Web sites, as well as a section in which students can develop a rock art museum exhibit (Olivier-Hirasawa 2001).

Rock art education of local communities has the benefit of providing them with both the knowledge of how to ensure that the heritage surrounding them is kept intact (Clottes 2007), as well as the potential for job creation (Parkington 2007). The Clanwilliam Living Landscape Project (CLLP)<sup>2</sup>, for example, is a community based heritage and education project. Its aim is to use archaeological research to develop school curricula that incorporates archaeological materials and exercises. Furthermore, it aims to train local people as guides, craftspeople and heritage

managers (Parkington 2007).

Rock art education does not have to only deal with the art itself, it can also focus on the people who created it. The San (also known as Bushman) are an indigenous group of people from southern Africa whose populations decreased dramatically after the start of European colonization in the late 1400s (Ladeira et al. 2010). The San are famous for their rock art, but also have a rich oral culture that is accompanied by a tradition of storytelling (Guenther 2006).

## 5 The tradition of storytelling

South Africa has a rich heritage of oral tradition, with many African cultures being described as primarily oral: knowledge is preserved by telling rather than writing (Ladeira et al. 2010). San culture has an oral nature, which is evident from studies of San stories and storytelling (Guenther 2006). There are a large number of San tales, which vary not only in the tales themselves, but also in versions and variants (Guenther 1999). Many of these tales can be related to and make use of the images depicted in the San rock art.

## 6 Digital storytelling

Leslie Rule from the Digital Storytelling Association describes digital storytelling as being the modern form of the ancient art of storytelling (Digital Storytelling Association 2011). It can take many forms, such as a collection of still images, joined and overlaid with a voice narrative (Ladeira et al. 2010), text Web pages, an interactive website, a song, a video, a game or a virtual reality world (Xu et al. 2011). Each of these forms has both its pros and its cons. A text-

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<sup>2</sup><http://www.cllp.uct.ac.za/index.htm>



Figure 1: Screen-shot from the Ashes and Snow Website

based approach is fairly easy to implement, but provides a low degree of immersion in the story. According to Search (2009), a user should be able to feel and experience what is being conveyed, as opposed to just reading about it. Additionally, written texts are not able to portray certain aspects of oral storytelling, such as repetition, long pauses, abrupt phrasing, high and low tones of voice, and a general sense of timing (Eder 2007).

An interactive website can provide a higher level of immersion and provide a unique viewing experience. One such website is Ashes and Snow<sup>3</sup> (Search 2009), which features the work of award-winning Canadian photographer Gregory Colbert. The explore function of the website (under the enhanced experience section) presents a unique type of audio-visual narrative that creates an immersive cultural experience for the user. Users interact with the content (photographic content and short film clips of people

and wild animals) by moving the mouse over the screen to create a trail of thumbnail images (shown in Figure 1). These images fade in and out, creating a sense of being immersed in an ethereal world. The addition of poetic voice overlays adds to this effect. These effects allow the user to interact with the cultural experience that is being shown and immerses them in the environment.

Another technique that allows for a high level of immersion is that of virtual reality, which makes use of computer graphics to provide the effect of immersion in the virtual environment (Pan et al. 2006). As virtual reality is interactive, it has the potential of creating an effective way of engaging a user and giving the sense of actually being a part of the story, or the storytelling experience itself, a feeling known as presence (Lesaoana 2004). It also allows for the recreation of realistic sites, including historical sites and artifacts (Lesaoana 2004)(Ladeira et al. 2010), and thus provides a way of creating story-

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<sup>3</sup><http://www.ashesandsnow.org>

telling experiences that are authentic. Furthermore, there is the possibility for direct interaction with the natural world, something that can enhance a story that is being told (Eder 2007).

The paper “Digital Storytelling in Africa” (Ladeira et al. 2010) describes the creation of two virtual reality prototypes that tell the San story of Kaggen the Mantis, the classical trickster figure of San mythology. The first prototype focused on how sounds and visuals can influence a user’s experience of the story. The prototype was simple and featured a group of hunters in a cave sitting around a fire. One of the hunters told the story to the user and the other hunters. San rock art illustrating some of the story events was depicted on the cave wall nearest to the storyteller and as the story was told a light would illuminate the picture relating to the part of the story currently being told (shown in Figure 2). Audio effects were also used in the form of ambient content, such as the crackling of the fire. It was found that both the use of the visual content (the rock art) and the ambient noises increased the enjoyment of users, as well as their sense of presence (the extent to which they felt as though the virtual environment was real).

The second prototype dealt with a more authentic and realistic version of the virtual environment. It dealt with comparing a virtual reality implementation to that of a text-based implementation. The results, based on experiments using high school students, showed that although the text-based system provided a higher level of comprehension of the story, the VR system provided a greater level of enjoyment, less boredom and confusion, in addition to a greater interest in San culture (Ladeira et al. 2010). It can therefore be seen from both prototypes that VR can be a powerful tool for engaging a user in the full storytelling experience.



Figure 2: Screen-shot from the first prototype created in “Digital Storytelling in Africa” (Ladeira et al. 2010). The figure shows rock art depicting events from the story being told.

It terms of creating a form of digital storytelling suitable for depicting the culture and stories of the San people, there are thus many options available. Visual anthropologist Roderick Coover (2001, cited in Search 2009) believes that one should experience a culture through different forms of sensory input. Input of images, text, sound, rhythm, action, light, and colour can together create an environment that provides a particular cultural experience and allows the viewer to interpret their own meaning, relationships and cultural values. This implies that the final product should be one that uses a variety of techniques to engage the user in the story being told.

## 7 Education through digital storytelling

In terms of education, it has been found that digital storytelling can be a useful teaching method for both gaining and holding a student’s atten-

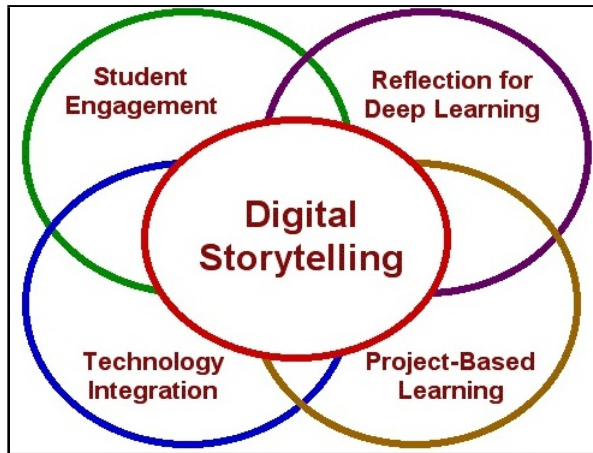


Figure 3: Convergence of student-centered learning strategies (Barrett 2006)

tion (Xu et al. 2011). Digital storytelling is said to enhance the convergence of four student-centered learning strategies (as depicted in Figure 3): student engagement, reflection for deep learning, project-based learning and technology integration into the classroom (Barrett 2006).

Educational digital storytelling usually involves a student creating a digital story. This can be in the form of a short movie clip or a compilation of still images with audio overlay. More recently, research has been done on letting students create a digital story in a virtual environment, with the online world of Second Life<sup>4</sup> often being used for the creation of these stories. This world allows users to create an experience or even a viewing space where others can walk through their stories. In a survey conducted by Shin and Park (2008, cited in Xu et al. 2011) to study digital storytelling in a virtual environment, it was found that students were more engaged and enthusiastic about participating in the

<sup>4</sup>secondlife.com

construction of the environment of the story, as opposed to simply listening to it, or listening and interacting with it. Digitally storytelling thus, whether it is in a VR form or something simpler, provides students with a new and interesting way of expressing themselves and learning at the same time.

## 8 Conclusion

Rock art is a fascinating art form that provides us with a window into our past. Likewise, storytelling gives us the narrative to this window. Both rock art and the stories that accompany it need to be preserved and documented, both for research and educational purposes. Technology provides us with a unique way of doing this. Various techniques, such as laser scanning, exist for the collection of the data, while digital libraries are available for the storage of the data and the World Wide Web for providing a way of distributing the data.

The problem of the information often being static or hard to visualise can be solved by creating an environment that engages the user and immerses them in the information. Techniques such as interactive Web sites and virtual reality can aid in doing this. These techniques also have applications in education. Students are more inclined to learn if they are enjoying themselves and interacting, as opposed to reading through copious amounts of text.

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