Virtual Cultural Identities

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ABSTRACT

Virtual environments and the Internet provide an important medium for interactive collaborative learning. Immersive Virtual Environments appear able to support intuitive interaction techniques and metaphors. Our Identity Authoring Approach is aimed at our multicultural global society, and allows for multiple identities / persona to be created and used as interaction metaphors by users. The approach can be used to generate virtual environments in which the interaction is both intuitive and adaptable to the cultural background of the user, taking into account issues such as gendered and age-based identities. The approach is exemplified by focusing on interaction in virtual learning environments that engage and facilitate the introduction and experience of different cultures, by different users.

1 Introduction

Virtual environments (VE) provide innovative ways to engage with cultural learning experiences. VE also provides important challenges for VE designers working with culturally rich content and in culturally diverse contexts, such as is the case in South Africa. For this paper, we wish to focus specifically on the role of culture in VE. We argue that culture adopts a dynamic and complex role in learning design in multi-cultural societies. It is both the *subject* – i.e. the content such as learning about a different culture – and the *object* – i.e. the perspective from which that learning takes place – of the learning process.

We argue, that it is not enough to merely present (via an “expert” or documentary-type story) high quality digitised cultural artefacts to users. Our aim is to present cultures dynamically and to show the dynamics of cultures – especially when the distribution platform is Internet-based and defined by global and distributed consumption conditions. Our Identity Authoring Approach allows for VE to be designed with high levels of interactivity and affectivity, taking into account the diverse cultural background of the users. Multiple identities / persona are created, which provide different ways to experience the VE. Users have the option of having a facilitated exploration of the VE by adopting an identity, or a non-facilitated interactive exploration. New identities are creating either by "recording" the non-facilitated exploration of users or by authoring a collective identity. This approach is different from international projects in that it does not focus exclusively on interaction with cultural artefacts that are housed in repositories such as museums – but rather presents living cultures – and the richness of people and their lived cultural experiences and identities.

People experience cultures differently and on various levels. At an individual or psychological level, complexity and fragmentation exists and is an integral part of people’s psyches. In fact, people have multiple, dynamic identities and are not just one identity. This impacts on their experiences – and of course – their learning potentials and engagement with new and challenging learning opportunities.

Learning about diverse cultures is interesting but also emotionally and cognitively challenging because it brings the user into direct confrontation with assumptions about “otherness” and with difference and diversity. Facilitation is required in these learning tasks to ensure that users are able to appreciate diversity of others i.e. not to reject another group or way of being because difference – not diversity – is emphasised.

Culture is often portrayed statically – i.e. as the “official” or hegemonic perspective / story of a culture or a people. Cultures, themselves, are dynamic and fragmented and attempts to portray them statically or rigidly are misrepresentations of that culture.

People create meaning through narratives or stories. They access new learning opportunities and new ways of being through stories. Interactive storytelling is a powerful tool that can be used to support cultural learning opportunities in dynamic encultured ways.

VE's can be designed – with high levels of interactivity and affectivity – using what we call the Virtual Identity Authoring Approach that provides new learning opportunities. This approach allows for multiple identities / persona to be created and for users to engage with different cultures and to enter new or challenging cultural experiences in a facilitated and different way. "Facilitation" comes from the adoption of different identities and allows users to overcome anxiety associated with new or cognitively and emotionally challenging cultural content. The user has the option to experience the different cultures either by adopting one of these identities or by freely interacting with the VE. Furthermore, new identities can be created, by "recording" the way users from diverse cultural background experiencing the environment.

The next section provides the basic definition and the background both in terms of identity, culture and learning and to authoring VE's for cultural learning. Section 3 describes the theoretical approach, exemplified by a cultural learning example that focuses on age, culture and gender issues, in authoring an interactive immersive VE for cultural learning. Finally, section 4 concludes this paper and highlights areas of future research and development.

2 Background and Related Work

In the introduction to our paper, we stated that VE's provide important ways to engage with cultural learning experiences and we used this statement to reflect our commitment to research on virtual technologies that emphasises the importance of people-centred innovation and success.

2.1 Learning and being

In order to understand what constitutes effective learning and being in VE's, we need to make some general observations.

The first observation is that users are cultural beings and as cultural beings, they actively experience culture as a dynamic process [16]. Culture is not a timeless and motionless body of value systems that remain unaltered by social change: rather culture is dialectic and incorporates new forms and meanings while changing or reshaping traditional ones. Culture is also not homogeneous but contains variations and differences. Cultural processes are complex, and in understanding the dynamics of cultural learning, we need to account for enculturation and acculturation. Enculturation is the process by which people become cultural beings. Cultures have cultural traits metaphorically regarded as jigsaw puzzle pieces that fit together. The cultural traits or jigsaw pieces that people have do not always fit into a coherent picture, as the metaphor of a jigsaw puzzle suggests. Some cultural traits relate to some identities or situations, and not to others. The implications of this are that when engaged in a cultural learning experience, the user has to be understood as a cultural being, with certain cultural traits that will impact on her meaningful and successful attainment of the objectives of the learning process. Acculturation is a process of adopting other cultural traits into one's identity. An indigenous / traditional cultural trait can sit alongside – not always comfortably – a cultural trait from a non-indigenous / western culture. The typical example cited in South Africa is of teenagers raised in hybridised indigenous and western cultural way, where "respect your parents" (communalist authoritarianism) and "obey your thirst" (individualism) are simultaneously held. Cultures have sub-cultures, which combine mainstream and new or moribund cultural traits, such as within western culture, rave culture is a subculture which is moving into the mainstream. Hence, when learning about a culture diverse from one's own, the user may experience the process of enculturation or may, if the learning is unsuccessful, reject the value and diversity of the different culture.

Users are also beings with diverse identities. Identity is difficult to define and there exist several approaches to working out a definition, ranging from homogenous ones (i.e. a core identity) to identity as a way of being and becoming. Our understanding of identity is influenced by Foucauldian theory. We believe that one of the ways in which we can think about our identity is by thinking about the body. The idea and experience of having a body (i.e. embodiment) is vital to understanding identity [15]. The term embodiment is used to express more than just our physical or material body. Embodiment

suggests our experience of having a body in relation to the discourses that are created about that body in the social, political and economic worlds. Gendered identity – when discussed from the perspective of the embodiment thesis – argues that women's abilities and potentials are fore grounded in many cultures (not just western ones) by their physiological reproduction abilities. So, when asking questions about women's (and men's) identities, the embodiment thesis examines issues such as the difference between gender and sex, assumptions that women's physiological bodies limit their cognitive and emotional potential (e.g. "girls can't do maths") and as a result, give rise to oppressive practices in the treatment of women in society [15]. The important implication of this embodiment thesis is that when we speak of identities in VE's, we need to understand that the body – and its associated discourses – are an important consideration in designing opportunities for learning about and through culture.

The third is that presentation of virtual content is not a sufficient condition for learning [17] and a lot of virtual learning is based upon false assumptions about what actually is involved in communication and learning.

Arising from these observations are important implications for using VE's to support cultural learning.

Firstly, as Turkle suggests, new technologies provide new opportunities for being and learning. But we – like Turkle [31] – caution that there is a risk that because the virtual is designed to be compelling, as a consequence, we could be led to believe that we are achieving more than we actually are. So, a learning experience in a VE does run the risk of being compelling but not authentically educative for the user.

Secondly, drawing on insights from cognitive science, we recognise that communication and cognition are opportunistic processes in which we use whatever we can get hold of, and whatever works. We communicate by taking cues of, for example, trust or distrust not from just what is said but from voice tone, timing, mismatch between facial expression and body language. Learning demands communication and trust, and it could be contended that VE's designed to support learning could risk leaving out some of the important variables required for effective learning, if they do not attend to some of the most important aspects of communication as a contextualised, embodied phenomenon.

2.2 Interactive Storytelling in VR

VE's have been used successfully in a variety of application areas for learning or training, ranging from medical systems for pre-operative training, highly interactive real-time environments such as flight simulators and training for high-risk environments, through to learning environments for children of all ages, such as virtual planetariums and museums. Most of these applications are either designed for expert users or assume a homogeneous group of users with a very similar profile. From the previous discussion on learning and being and the changes on the learning process stimulated by the advances in networking and telecommunications, it is evident that more diverse user profiles have to be taken into consideration when designing VE's for learning.

From a technological point of view, we need to author VE's that can adapt and support learning for these expanding, diverse and heterogeneous user groups. However, most of the present authoring tools for VE's are little more than interface libraries to standard programming languages (DIVE [3], CAVE Library [4]), or provide minimum support for defining walk-throughs through the VE, and interaction with the virtual objects [9] for a default user profile.

2.2.1 Why Interactive Storytelling?

The majority of VE applications for training and learning provide some kind of facilitated guidance to the users. For example, use of real life interaction metaphors can guide the non-expert user on how to use and interact with the environment in an intuitive way. More sophisticated facilitation for guiding and engaging the user in experiencing the environment is taking the form of *interactive storytelling*. Storytelling techniques are extensively used in other media such as video, film, and art-installations [10][21]. Recently, similar techniques have been applied in developing *immersive learning virtual environments* that make use of Interactive Storytelling, with very promising results [27] [18] [23].

2.2.2 VR Authoring Tools

The usefulness of Interactive Storytelling techniques in generating VE's has been recognised by researchers in Virtual Reality and is reflected in the number of emerging *VR authoring tools* that have some support for generating interactive stories. The existing ones use metaphors such as play, script, scenes and paths to describe what a user experiencing and interacting with the environment is allowed to do. For example, AVANGO [29] has been extended to allow authoring of applications via the definition of scenes, paths and interaction with the virtual objects of the scene. Then camera paths are created that provide the user of the final interactive story with alternative paths through their environment. Other approaches include the automated cinematography [14] and TV multi-user inhabited worlds [13]. However, these approaches are mostly focused on the technical aspects and the underlined geometry of the VE, rather than the end-user or the learning process.

2.2.3 Virtual Characters and Collaborative Virtual Environments

In Collaborative VE's, the user interface of a VE is unique in that the user is represented inside the environment by an avatar[1]. Animated Characters or Video Avatars have both been used for collaboration over distance [12] [22] [2]. Virtual Learning environments and computer games are also using virtual characters to make the virtual world more attractive and engaging and role-playing to enhance the learning process [1]. Research in Virtual Characters has focused on realism both in terms of visual appearance and motion [28] [24] [30]. More recent research approaches introduce cognitive modelling. These models govern what a character knows about the environment, how that knowledge is acquired, and how it can be used to plan actions. For example, in [8] a character is imbued with *domain knowledge*, specified in terms of actions, their preconditions and their effects, while *character direction* is specified in terms of goals.

What has become the traditional notion of an avatar in VE's, is rather limiting in that it concentrates on the external appearance of the user in the VE. Our approach uses the term *Virtual Identity* to signify that many more factors play a role in how users regard themselves as well as others within a VE.

3 The Virtual Identities Approach

In our approach, we aim to enhance the use of VE's for cultural learning. Given the points raised in section 2.1, we argue that learning VE's need to be designed to attend to issues of effective embodied communication and authentic learning. Our Virtual Cultural Identity framework presented here is an initial approach towards a VR Authoring tool that supports this design.

From the discussion on Interactive Storytelling and VR authoring tools, the complexity of developing such an environment is apparent. We would therefore focus on the use of interactive storytelling in VE for cultural learning, having as target the high-end platforms, namely the ones using projection-based systems such as the CAVE [4] and Cyberstage [6]. The interaction devices supported by them vary from tracked styli, shutter glasses, data-gloves, 6 degree of freedom tracking devices, to more specialised ones like the Cube [11], and devices for olfactory and tactile feedback. This focus allows for our approach to be as generic as possible taking advantage of the full potential of the technology. It is then easy to focus the approach depending on the limitations imposed by the available technology (display systems, interaction devices, etc.).

Before discussing the approach in detail, we wish to provide an illustrative example of what we mean.

3.1 An Illustrative Example

A ten-year-old boy child from an isiZulu cultural background is given the opportunity to engage in a cultural experience in a VE. This cultural experience involves allowing him to experience what it would have been like to be a child, an adult male warrior in the army, and an adult woman in the seraglio established by Shaka Zulu during the early 19th century. Please note that it is not our intention to

1 Avatar[avt] n. L18. [Skt avatara descent, f. ava off, away, down+tar- pass over] Hindu Mythol. The descent of a god to earth in incarnate form, L18. An incarnation or embodiment (of another person, an idea, etc.) E19.
A manifestation to the world as a rulling power or as an object of worship; gen. A manifestation, a phase. E19
Excerpted from The Oxford Interactive Encyclopedia.

provide a factually authentic account of Shaka Zulu and his court but rather to use this as an example of a cultural learning experience. The VE could be designed to replicate a small part of Shaka's court, Bulawayo, in a geographical and architectural sense such that the boy child would be able to move through the huts and structures. However, the cultural aspect of the court comes into play when one adds in certain 'rules' operating in Shaka's court such as children and warriors and women were able to enter certain structures and not others because of the taboos and societal rules about who could go where. The VE could also provide certain experiences for interacting with virtual objects. The presentation of cultural artefacts – and the manipulation thereof – such as allowing the boy child to pick-up and simulate stabbing with the *iklwa* (i.e. a short, bladed weapon invented by Shaka) is (potentially) a compelling experience for a short while. The boy may act out using the weapon but would not, unless provided with other cues and content, be able to experiment with the identity of a warrior in Shaka's army or understand the lethal effectiveness of the weapon and its use. If, for example, a boy child in Shaka's court picked up the *iklwa*, there would be rules about who could and could not touch this important weapon, and the result may have been that the isiZulu child would be punished for doing something as simple as picking up this weapon.

3.2 The Theoretical Approach

In this sub-section of our paper, we highlight some important issues that characterise our approach. We do not offer an exhaustive account of all of the issues relation to our approach, as this falls beyond the scope of this paper.

3.2.1 Identity and Culture

As the example of the boy user in the Bulawayo VE suggests, the role of learning and being in a VE is a complex one.

The experiences of the boy user adopting the *virtual identity* of a child in the court of Shaka Zulu shows how cultural learning is both a product and a process. The boy user may be aware that Shaka's Bulawayo looked a particular way but actually knowing and understanding that children were not allowed to touch weapons demands more from the VE designer. We could design certain rules of "navigation" through the VE that differed according to whether or not a child or adult virtual identity was moving through a particular part of the court.

Similarly, we need to understand that the user – in this example, the real boy child – is a complex being. The way in which the user engages with the virtual representation of Shaka's court would be influenced by his real identities. So, stereotypically, we would assume that if the user were a boy, he would be interested in armies and weapons and would pick up a weapon. The user may, however, have no interest in weapons, and could ignore that experience entirely (at best) or be psychologically disturbed by picking up a lethal weapon (at worst).

Further, because the user is a child, the experience of picking up the weapon and understanding that it is a short, bladed weapon may present problems because a child user is physically diminutive and the *iklwa* may be the same size as the child.

Hence, the ways in which the user interacts with the cultural learning experience, demands that we take into account a wider range of variables about gender, age, embodiment, identity and so forth, than just a virtual representation of the architectural and geographical layout of the environment.

3.2.2 The virtual World

At this point, we briefly summarise the components of this virtual representation, outlining some of the foundations upon which the VE of Bulawayo would be built:

- The geometry of the virtual data and of the surrounding world;
- The different media (such as video sequences, text, audio) and sensory feedback (tactile, olfactory, auditory) related to the geometry;
- The definition of kinematic and / or physical simulation and motion of the virtual data;
- The interaction metaphors and techniques related to the first two levels;
- The collaboration metaphors and techniques (for local users);
- The communication metaphors and techniques (for remote users).

Depending on the interaction devices, the displays, network availability and the application, the virtual world could have all or some of these components. For example, the components of the Bulawayo VE may include:

- A virtual model of Shaka's court at the geometry level;
- A simulation of stabbing with an *iklwa* at the kinematic and physical simulation layer;
- Picking up an *iklwa* at the interaction level;
- A fight sequence together with another warrior at the collaboration layer;
- A video connection with a historian from Bulawayo at the communication layer.

3.2.3 The Virtual Identity

To define a *virtual identity* we argue that this is a process which begins by filtering down the observations about real identities, their relationship to culture, and cultural learning. The process resembles the thin melting point where the sand-grains constituting a real-identity slowly fall into the virtual identity through a time-glass, as is shown in Figure 1. These grains are structured and further refined, taking into account the specific VE application and the different user groups targeted by the application.

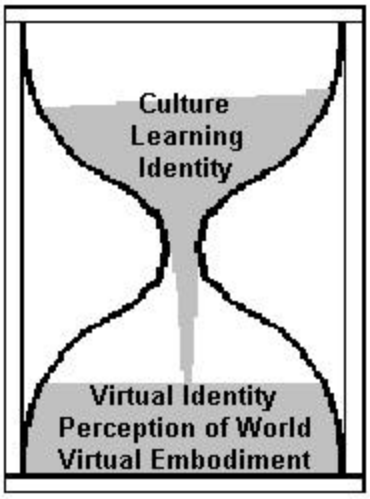

Figure 1 The melting point of Real and Virtual Indetities

Our virtual identities are empowered with knowledge about themselves, which they use to perceive and interact with the virtual world in their distinctive ways. For example, this might involve providing the virtual identity with knowledge about its age, gender and cultural background. The fundamental difference between the virtual identities we propose from that of intelligent characters or artificial life approaches is that there is not a unique domain knowledge. Rather, our approach allows for different *perceived virtual worlds* and different VE's depending on the virtual identity.

A virtual identity is thus defined by:

- Knowledge about itself (i.e. the identities of a boy aged 10 years experiencing the virtual identities of a child, an adult woman and an adult warrior);
- Its perception of the environment (i.e. note the difference between the identity-driven perceptions of Bulawayo as full of "kraals I am not allowed to enter" or as a "kingdom which I must serve / protect");
- Its virtual embodiment of the identity (i.e. the deeper voice of virtual adult warrior);
- The kinematics and physical simulation of the virtual embodiment (i.e. the difference between the confident stride of the adult warrior or the subservient shuffle of the adult woman)

All of the above clarify a number of issues related to the virtual identity and its virtual existence, including:

- Interaction with the environment (voice cannot grab objects);
- Reaction to the environment (video cannot go through solid virtual objects);
- Cognition of the environment (can enter that kraal / hut, but not another); and
- Emotive reactions (fear when moving near to a forbidden section of Bulawayo)

3.2.4 The Interactive Story

By creating a virtual identity, single-user non-facilitated interaction is already described, because a user coming into the VE can take on the role of the existing virtual identity and interact with the world according to the restrictions and possibility for interaction of the virtual identity. A user is embodied in this virtual identity and it is through this embodiment that can sense and interact with the VE. For example, a user takes up the virtual identity of the isiZulu child while the user's position is tracked in a CAVE™ installation. The viewing position of the user would be shortened in height to match the height of the virtual embodiment of the user, that of the isiZulu child. However, the user is still free to walk around in the CAVE and as a consequence move around in the virtual Bulawayo.

We would like to facilitate and engage the user even further in the VE by providing more than one way of perceiving, experiencing and interacting with the VE. Therefore, in our approach, the interactive story is used to put together a virtual script that facilitates – but does not restrict – interaction and collaboration. To achieve this, we define an interactive story using our virtual identities with the result that the story (of Bulawayo) would be experienced from the perspective of the particular identity. The term "story telling" does not denote something passive like a film or a television program, nor does it denote something interactive where only choice between predefined paths through the story are allowed. We aim at an experience and interaction that is not defined by the creator of the virtual world but rather by the different virtual identities that the user adopts.

The interactive story is thus composed of:

- A set of virtual identities and their starting points (in the VE in terms of space/time); and
- Transition points from one to another virtual identity.

The scenes, and consequently the VE's that the user will experience are defined in terms of what a virtual identity perceives. Objects constituting a scene can be conceptually the same but presented visually differently according to the identity. Consider, for example, the difference between a detailed 3D geometric representation of the interior of a kraal for the identity that is allowed to enter with that of a 3D exterior of the kraal that is impenetrable for a child.

The transition points in the immersive experience are not only transitions between predefined paths or scenes as in more traditional authoring tools. Rather, transitions involve remembering (i.e. transfer back in time), emotive transfer (i.e. fear of approaching a forbidden place transfers to another identity that is allowed to enter), and transfer by interaction (i.e. playing with a weapon transfers to the warrior fighting with the same weapon).

3.2.5 Example of a virtual cultural identity in AVANGO

In this subsection, we provide an example of how a virtual identity and an interactive story would be defined in the AVANGO Virtual Environment Software Framework. It is not our purpose to give a full implementation example since that requires a detailed description of the Software Framework. We only mention briefly the basic structure of AVANGO.

AVANGO is a programming framework for developing distributed interactive VE's, built on top of IRIS Performer. (A detailed description of AVANGO can be found in [29]). It uses C++ *nodes,* which provide an object-oriented scene-graph API, which allows representation and rendering of complex geometry. *Sensors* provide AVANGO with its interface to the real world and its interaction devices. The AVANGO objects are a collection of *fields*, each one of which can be connected to build a data-flow graph orthogonal to the scene graph, which is used to specify behaviour and allow for interactive applications. In addition, AVANGO features a complete language binding to the interpreted language Scheme [19], thus allowing rapid prototype development through *scripting*.

It is this scripting language that we use in the following generic definition of virtual identities and interactive stories in AVANGO. Two new C++ nodes are added namely the fpVirtualIdentity with fields

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™ CAVE™ is a registered Trademark of the University of Illinois

for age, gender, culture, virtual_embodiment, and fpInteractiveStory with fields VirtualIdenityList and StartingPointList. The virtual identity is then defined in Scheme as follows:

```
(define isiZulu_Child (make-instance-by-name “fpVirtualIdentity” ))
(fp-set-value isiZulu_Child ‘age 10)
(fp-set-value isiZulu_Child ‘gender boy)
```

If we assume that the geometry (visual representation of a boy-avatar) is defined as follows:

```
(define littleboy (make-instance-by-name “fpLoadFile”))
{fp-set-value littleboy ‘FileName “littleboy.iv”)
```

Then the following Scheme function connects the virtual identity to its virtual embodiment:

```
(fp-set-value isiZulu_Child ‘virtual_embodiment littleboy)
```

Similarly, we can define the virtual identities of isiZulu_Warrior and isiZulu_Woman. An interactive story that uses these virtual identities is then defined:

```
(define VirtualBulawayoStory (make-instance-by-name “fpInteractiveStory” ))
(fp-add-1value VirtualBulawayoStory ‘VirtualIdenityList isiZulu_Child)
(fp-add-1value VirtualBulawayoStory ‘VirtualIdenityList isiZulu_Warrior)
(fp-add-1value VirtualBulawayoStory ‘VirtualIdenityList isiZulu_Woman)
```

Apart from these basic definitions, we can, for example, include one more field in the C++ node fpVirtualIdentity for the virtual identity’s height. By connecting this field to the head-tracking device of the user in the CAVE, we can manipulate the tracked data and shorten it to match the age of the virtual identity rather than the tracked user’s height. This is possible through the notification and evaluation mechanisms that AVANGO provides for connected fields. This can be achieved by connecting the fields in Scheme according to the virtual identity in use:

```
(define tracker (make-instance-by-name “fpTrackerSensor”))
(fp-set-value tracker ‘Station “head-tracker”)
(fp-connect-from isiZulu_Child ‘height tracker ‘Transform)
```

4 Conclusion

In this paper, we have attempted to combine expertise and insights from research in socio-cultural and psychological disciplines with that of technological sciences. It is our thesis, that the creation of effective virtual learning environments demands sensitivity and awareness of the complexities of learning and being as people.

By using the example of a boy user interacting with a virtual Bulawayo, we have shown how the use of identity-driven experiences and design can better facilitate the attainment of successful cultural learning in the VE.

We wish to point out that we have only recently begun to implement this approach in our research and work, and it is clear that there is a need for rigorous evaluation of this approach. However, we believe that there are possibilities for extending this type of approach in other ways. Interactive storytelling using our Virtual Identity approach is not limited exclusively to learning VE’s. Most VE applications can be viewed as some kind of *interactive story* that involves either telling the story of user communication, or defining the ways of user interaction within a VE.

Finally, we are also planning to “record” user interactions in these types of VE’s such that this constitutes the body of knowledge on which it will be possible to automatically create new virtual identities in the future.

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