Interactive Cultural Experiences using Virtual Identities

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1. Introduction

People create meaning through narratives or stories. Every culture has stories that are passed along from generation to generation. Culture influences our perspectives, values and behaviour.

The story metaphor has been used in Multimedia and Virtual Environments to create interactive stories [8][9]. Interactive stories enable users to interactively explore the story world and to be actively involved in the outcome of the story. Virtual environments are much richer in terms of freedom of navigation and ease of interaction. Projection-based systems in particular, don't bind the user to a predefined path and enables the user to have a hands-on experience through immersion and interaction with the virtual world.

Our approach for authoring interactive stories in virtual cultural environments allows the creation of several virtual identities, through whose eyes the user perceives the virtual world. Each identity is empowered with knowledge about itself and its perception about and embodiment in the virtual world. This approach allows free interaction and navigation that is appropriate for the specific virtual identity in the culture that is being experienced. This enables the user to experience the culture from many different angles and to get a true reflection and cultural experience.

2. Background

Museums are institutions that have traditionally performed two major roles:

1. They provide an area for displaying artefacts and information about them to the general public, by putting the artefacts into glass cases with accompanying information panels.
2. They act as centres for knowledge about a particular subject area – keepers of collections and research staff build up information about these artefacts, such as when and where they were recovered from.

Museums carry out a range of activities and produce a variety of resources whose purpose is to make visitors aware of what is available in the museum, to guide visitors physically through the collections in numerous ways and to increase their understanding and enjoyment of these collections.

Museums are about cultural artefacts that are chosen and displayed in such a way that they incorporate the narratives about history, nature, technology, culture and science. One of the most important visible statements that museums make is the selection, labelling and physical arrangement of individual items and whole collections.

The traditional museum guides that guide visitors through the museum have limitations such as:

- Their limited background in terms of specialist knowledge and professional educational skills
- The random composition and heterogeneous nature of the groups that they deal with
- The limited duration of the tours or other educational programs for which they are responsible
- An inevitable lack of depth in their comments
- Frequent repetition of the commentary can lead to mechanical and boring representation
- The necessity of offering quick, to the point answers in a group when questions are asked, because of the pressure of time
- Physical restrictions of access to museum collections – only a selected number of items can be included in the tour due to time restrictions

Many applications, such as culture, are dynamic and therefore static representations are not efficient for portraying them. Virtual environments can solve this problem by allowing people to experience the virtual world interactively and dynamically.

The combination of interaction, immersion and the digital computer makes virtual environments an exciting medium for cultural productions. Mitchell said that virtual environments can play a crucial part in museum work [1].

A virtual tour is a tour of a museum that is represented in a virtual environment. Virtual tours can be either prearranged (the virtual equivalent of the tours that are conducted by a tour guide in a real museum) or individualised and tailored to particular needs and interests, which is rarely possible in a real museum.

The prearranged tours are designed to respond to recognized general interests and to reflect the museum's own viewpoint of what is important, most distinctive and valuable in its collections. They are inflexible, since one a visitor has joined the tour; s/he has to follow it through. This option can be useful for special groups such as school children where they need to view what the teacher specifies. The tours can be made more flexible by allowing a visitor to depart from what is prescribed at any point to follow a particular idea or interest and then to return to the group.

A virtual tour has the following advantages:

- The restricted or transitory access to collections can be overcome
- Visitors are not limited by opening hours of the museum to view the artefacts
- Artefacts can be inspected at a level of detail that are usually not possible in a real museum where the artefacts are in locked cabinets, have to be looked at from a distance or are arranged in such a way that only one view is possible
- The visitor can interact with the artefacts without fear of breakage or loss
- The artefacts that are displayed on a particular tour are not constrained to a specific physical location. Therefore a tour can be constructed that consists out of artefacts that are ordered by a logical arrangement or that reflect a special interest, but are located in many different rooms in the real museum
- Abstract data can be transformed into a virtual artefact
- Artefacts from different museums can be combined in tours, assuming that the problems of metadata, permissions and copyright are resolved

- Special exhibitions and their tours can be preserved in the virtual environment even after their constituent artefacts are dispersed to their regular locations in different galleries of the museum, to storage or back to other museums or lenders

3. Methods used by museums

Museums worldwide are becoming aware of the power of using virtual environments to interpret and demonstrate cultural heritage.

Some of the VE applications are the Tomb of Menna [1], Tomb of Menna for educational purposes [1], Kahun project [1] and the ancient city of Miletus [4].

The purpose of the *Tomb of Menna* project was to investigate the process of creating a virtual artefact from existing information resources and to provide alternative ways for visitors to access the virtual artefact. The Tomb of Menna is located at Sheikh Abd el-Quarna, the most central area of the Theban necropolis. This project was aimed at the general user and did not aim to meet specific educational outcomes. It was primarily a means of displaying information. However, it did not allow the user any real interaction aside from the ability to walk through the tomb and click for more information.

The decision was made to focus on the educational potential of the Tomb of Menna and in particular its application to children of primary schools. The original version of the Tomb of Menna provided a limited range of interaction. Therefore, three interactive tasks were incorporated into the walkthrough experience. However, the children experienced some problems interacting with the system:

- The children had to be too precise in lining the symbols up in the hieroglyph writing task – a more sensitive mechanism for having symbols snap into place would have been useful
- Some children clicked on symbols in stead of dragging them
- Very young children had trouble selecting symbols, because the mouse is physically too large for them to move and hold down a button at the same time
- Granularity of the presented information – it was not always immediately apparent to children that they needed to scroll down a page to see more information
- Some children found it quite disorientating being able to go through the walls of the tomb into darkness – the model lacked collision detection

The aim of the *Kahun* project was to investigate how virtual environments can be used as and educational resource to support the work of Manchester Museum. The three main goals were to teach children about everyday life in Egypt, to provide children with a context for the objects in the museum's collection and to show how objects were used in various activities.

Most of the cultural applications in virtual environments are only walk-throughs or fly-throughs with minimal interaction. They provide many advantages over the real museums. However, the virtual experience is limited to only one perspective.

Mitchell said that there is a distinct lack of methodologies that can be readily applied to the development of virtual environments for museums [1].

Our virtual identity authoring approach can provide solutions to these problems.

4. Virtual identity authoring approach

In [5] we proposed the *virtual identity authoring approach* to interactive storytelling. With this approach the participant experiences the interactive story through the eyes of the virtual identity. Each virtual identity is defined by knowledge about itself, its perception about the environment and its virtual embodiment. This approach allows for multiple identities to be created and for users to engage with different cultures through many different perspectives. This enables a rich and realistic cultural experience.

Each virtual identity is empowered with knowledge about itself, for example its cultural background, age and gender, which it uses to perceive and interact with the virtual world. The story unfolds as the user explores and interacts with the virtual world, through the embodiment of a virtual identity.

We extended this approach by providing a taxonomy (framework) that can be used to define a virtual identity, with the following main features:

- Characteristics that a virtual identity is born with
- Characteristics concerning the virtual identity's background
- Behavioural characteristics of the virtual identity
- Characteristics concerning the virtual embodiment of the virtual identity

According to the identities characteristics, the participant is allowed to do appropriate interactions and experiences the culture through the eyes of the identity. For example, in certain cultures, according to the identities age or gender or both, s/he is allowed to do certain things. With our approach this can be reflected in a realistic and true manner.

5. Interactive storytelling tool

We used age and gender to define the virtual identity and developed an interactive storytelling tool. This tool enables the user to create many different cultural experiences with the use of a single virtual model. Certain characteristics are allowed according to the age and gender of the virtual identity.

We developed the interactive storytelling tool with the AVANGO [6] framework that has been under development at GMD since 1996. We tested our idea in a Cultural Heritage example that is described in section 6. The storyworld is a shebeen (township tavern) in Cato Manor [7]. We enhanced and imported to AVANGO a 3-dimensional model of a shebeen in Cato Manor developed by the CSIR under the *CultureWare*[1] project.

[1] CSIR is the South African Council for Scientific and Industrial Research.
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6. Cato Manor – a Cultural Heritage example

Cato Manor [7] was once a vibrant South African community that was torn down during apartheid, to enforce racial segregation and to open up a prime piece of real estate for white occupation.

We used a model of the Cato Manor shebeen (township tavern) as the storyworld and created three virtual identities, namely the shebeen owner, a Zulu man and a Zulu boy. The user can experience what it was like in a shebeen through the eyes of each of these identities. S/he perceives the shebeen through the eyes of the specific identity, allowed only interactions within the shebeen that is allowed for the specific identity by the culture.

Some of the interactions that can be done by the shebeen owner, is to switch on the shebeen radio, to place extra crates in the room and to move tables, chairs and crates. The Zulu man is allowed to click on photo's that triggers a soundfile to be played, e.g. if he clicks on a photo of a jazz singer, a jazz song starts playing, and to drink from the mugs. If he clicks on one of the mugs, he starts swaying when he walks, portraying him getting drunk from having too much to drink. The Zulu boy is not allowed to enter the shebeen, but if he clicks on the front wall of the shebeen, he transforms into a Zulu man and is then allowed to do all the interactions that a Zulu man is allowed to do. With this approach, the user experiences the culture in a realistic way and experiences the culture from three different perspectives. This leads to a rich and realistic cultural experience.

7. Conclusions

In this paper we presented how the virtual identity authoring approach can be used to create interactive virtual cultural experiences. This approach enables the user to have a realistic and multiple rich cultural experiences through the eyes of the different identities. We have implemented one application in the area of Cultural Heritage and demonstrated it in Cyberstage – GMD's surround-screen projection-based stereoscopic display system. We are currently improving the GUI of the interactive storytelling tool and further extending the virtual identity approach and framework.

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