Augmented Culture: Historical Environments for Captivating Educational TV Programs

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Abstract

New visual information technologies are increasingly effective in the field of Cultural Heritage mainly for educational purposes and communication. Three dimensional reconstructions of historical or archaeological environments constitute an interesting and flexible tool. It is well known that 3D models can be used to completely construct realities and objects which either no longer exist or exists only as ruins or fragments. A reconstruction which is historically and technically validated can become a good starting point for different educational products. Why should we be limited in showing just the three dimensional models when it is possible to make them alive in a Virtual Set? The researchers can "live" inside the results of their studies explaining and communicating them in the most effective way. This was achieved in a project recently developed by Cineca (Interuniversity supercomputing centre) and Rai educational (RAI - Radio Televisione Italiana - Milano). The reconstruction of a Roman House in Pompeii has become a stimulus for exploring new frontiers in TV narration in the age of digital reproducibility of environments and locations.

Introduction

Virtual Reality is increasingly perceived as a useful medium. It's a tool capable of simplifying the performance and the execution of various tasks, enabling people to get in touch with the world thanks to more and more realistic simulations. It is also an effective way for improving knowledge. New visual information technologies are increasingly effective in the field of Cultural Heritage. In particular, Virtual Cultural Heritage refers to the usage of Virtual Reality systems in order to generate, navigate, explore and inquire into reconstructed historical environments.

Three dimensional reconstructions of historical or archaeological environments constitute an interesting and flexible tool that enables for example to:

- access monuments that could be damaged and are, therefore closed to the public;
- reproduce, in the best possible way, realities and objects that no longer exist or that have left only some fragments or ruins;
- offer a fruition without limits, take reconstructed objects to viewers and gather objects scattered in the landscape, displaying them in a new context;
- reach a dynamic vision, without spatial and temporal limits, offering points of view not easily reachable in real life (i.e. birds eye view point), and travelling along the time line in order to show different phases of the analyzed reality .

The VIS.I.T. Lab: Methodologies and Projects

Since 1988, Cineca has been promoting visualization techniques to support the research through a dedicated laboratory: VIS.I.T. (VISual Information Technology). The VIS.I.T. Lab is an inter-disciplinary laboratory dedicated to developing human-centred, powerful, interactive 3D graphics tools in a variety of fields, including Scientific Visualization, Bioengineering and Cultural Heritage. The mission of the lab is to present concepts and techniques, as well as massive or complex numerical data, through Interactive Computer Graphics, Virtual Reality and Human Computer Interaction technologies.

The working experience in the field of Virtual Cultural Heritage models has highlighted the importance of multidisciplinary environment among engineers, computer scientists, architects, modellers, historians and archaeologists. The team has to work together in every phase for designing and implementing an immersive emotional and historical experience. By means of this kind of collaboration it is possible to rely on a deep scientific knowledge of historical data regarding their selection and their representation that can be made visible through the interactive application. Therefore, it is mandatory to highlight: 1) the references to the authors of the models; 2) the sources used for the reconstructions; 3) the procedures for validating the reconstructed models.

During the last few years, several projects have been developed: from Ancient to Contemporary History, passing through Modern History, paying a high degree of attention to educational purposes:

- The Nu.M.E. Project Interface has been developed in order to allow visitors to witness the evolution of the city from the end of the first millennium to today (http://www.storiaeinformatica.it/nume/italiano/npresent_a.html).

- 'Bologna delle Acque' concerns the importance of water in the history and in the environmental evolution of the city of Bologna and its surroundings. The aim of the project is remind and renew a relationship with this natural element that has constantly been the base of great part of activities, settlements and commerce (http://www.cineca.it/HPSystems/Vis.I.T/Researches/ibc.html).

- In the MUVI project - the Virtual Museum of Daily Life in 20th century (http://www.cineca.it/muvi), starting from historical researches, a domestic interior of the Fifties has been reconstructed, furnished in any detail. The objects in the virtual world have been linked to a DB with historical info and explanations.

- The Roman Bologna is an archaeological project that unifies cartography, GIS and landscape perception and awareness.

- The Certosa Museum - The Certosa Cemetery in Bologna is an important but neglected monument and the Museum is born in order to valorise it. This kind of urban environment can be enhanced using tools similar to those used for cities: the 3D reconstruction can be integrated with information about the landscape and the archaeological excavations and can become a graphic interface for accessing data archived in several databases of multimedia sources (http://www.progettocertosa.it/).

Applications are being developed with a particular care in their flexibility, quickness of use and improving the context awareness. There are several multidisciplinary undergoing projects that use various computer technology functionalities and attain flexible multi platform realizations. Applications can range from a medium powered PC to High Performance systems, such as Virtual Theatres and Virtual Sets. 3D virtual worlds are starting points for a straightforward interaction with complex environments that can be navigated, modified and queried through the link to more than one relational Data Base at the same time (GIS, Multimedia data, etc.), becoming an interface for accessing different information and developing different educational products as well.

The Virtual Reconstruction of Casa del Centenario and the Manifold Possibilities of its Use

Another relevant project is the Virtual Reconstruction of Casa del Centenario in Pompeii. Thanks to this project we will see how a historically and technically validated reconstruction can become a good starting point for a series of educational products.

The "Pompei - Insula del Centenario IX 8" Project was started in 1999, thanks to the efforts of Daniela Scagliarini Corlàita of the Department of Archaeology - Bologna University. It has been realized in the framework of the MUSE Project (funded by MURST within the National Research Program on Cultural Heritage Parnaso) conducted by Boconsult, a Ducati sistemi Division, in cooperation with Bologna University, CINECA and Sinet. Its aims are the documentation, study and valorisation of the Insula IX of Pompeii, called "Insula del Centenario" from the large domus, excavated in 1879-1880, which occupies its main part. Peculiar to the Virtual Archaeology project applied to Insula del Centenario, and even to the whole "Pompei - Insula del Centenario IX 8" Project, is the educational character: from data acquisition to their elaboration and processing, from 3D modelling to texturing and dissemination. The main features of the digital application are:

- Use of digital photoplanes
- Archaeological texture painting
- Time varying models
- Communicative and philological models
- Porting to low resolution environments

The Virtual Insula del Centenario consists of two immersive virtual environments: as it is nowadays - in order to stimulate comparisons and to make possible the access in an area where tourists are not admitted, and as it was at the time of the eruption that, in AD79 A.C., destroyed Pompeii - in order to visualize archaeological hypotheses and theories based on the study of ruins and findings. The project "Casa del Centenario in Pompeii" has reconstructed part of this Pompeian house starting from the present structures: frescos, taken away and stored in museum, have been artificially put again in their original position; frescos left on the walls and damaged due to weather impact have been "replaced" with less spoiled versions worked out using photos taken in the Thirties; ruins have been integrated with reconstructed lakking sections (e.g. the higher part of walls, coverings, fixtures).

As before said, this reconstruction has been used in several ways:

Figure 1 A render of the peristilium

1 - with PDAs, for helping the context awareness on the archaeological site. Portable devices are easily handled and enable a friendly interaction to the majority of users, offering the opportunity of visualizing in a non invasive way, sources - i.e. photos, drawings, plans, texts, etc. - necessary to validate virtual reconstructions and to better understand it.

2 - with a desktop fruition, for both navigating the model and accessing the Data Base. Thanks to the collaboration with the VISMAN project (supported by the Spinner Consortium with Regione Emilia-Romagna and EU funds), 3D models are being linked to different relational Databases. Users, depending on the kind of DB chosen, can inquire GIS or multimedia sources. In this case, selecting objects in the scene, users obtain explanations on the selected object and see original photos. In other applications, as the one we are currently developing for the Certosa of Bologna, 3D models are a graphic interface for accessing the land register, GIS and the historical sources archived in a multimedia database with audio, video and texts about the partisans' sacrarium.

Figure 2 Some experimentations for linking the ninfeum of the reconstructed Casa del Centenario in Pompeii to a database

3 - with the Virtual Theatre, as the one in CINECA, for experiencing a sense of physical immersion in the virtual environment. Virtual Theatres can show models in a 1:1 scale, fostering a direct and natural perception of space and proportions. The large screen amplifies the sense of presence in the reconstructed environment that, of course, can be simulated even better if enjoyed stereoscopically. Moreover, it enables a collective view and, therefore, an immediate comparison of impressions among the audience.

The application for the Virtual Theatre was performed by a "picture in picture" solution so, while navigating the model reproducing the building of the 79 a. C, in a corner of the screen there is the other model following the same perspective, and vice versa.

4 - models have been used also during a conference that was broadcasted via streaming video and that it is still available on the Web (http://www.cineca.it/convegni/ut_natura_ars/).

5 - and then, 3D models have been used in a Virtual Set for creating a TV documentary in collaboration with RAI (Radio Televisione Italiana - Milano). A Virtual Set system merges in real-time shootings taken with cameras on real people and objects, along with three dimension digital scenes.

In a Virtual Set 2D or 3D digital models are synchronized with the movements of cameras and become virtual scenographies. Optometric sensors, infrared LED, radiofrequency pointers and optical grids for pattern recognition are used in order to transmit to the cameras the co-ordinates of the movements. Except for the actors and some real objects, the Virtual Set is empty and covered with a blue-screen. The various elements of the virtual scenography can be seen only on a video.

Now, once the documentary has been shown on TV a national channel, it has entered an archive created by RAI: Mosaico, a TV mediateque for educational support (http://www.mosaico.rai.it/). In a framework called Mosaico, people, teachers in particular, find a list of educational TV programs and can ask for their programmed broadcast on the RAI Educational satellite channel. People need just to be registered and then they will be notified about the date of transmission.

With a simple registration people have the possibility of asking for the broadcasting of the documentary and then they are informed about the date of transmission.

Conclusions

As we have seen, starting from the same 3D model it is possible to obtain several products and reach different goals and users, from tourists to researchers and students, from the on site fruition by PDAs up to Streaming video, Virtual Theatres and Virtual Sets. The prerequisite is to plan and develop applications aiming to a flexible output in order to adapt them easily to whatever system suits the communicational purposes.

Acknowledgements

The authors wish to thank prof. Daniela Scagliarini Corlaita, Antonella Coralini and Erika Vecchietti, of the Department of Archaeology, Bologna University; Giosué Boetto Cohen of RAI - Radio Televisione Italiana and Riccardo Perani - Virtual Set RAI Milano, Maria Elena Bonfigli of CINECA.

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