VIRTUAL DOMESTIC ENVIRONMENTS AND HISTORICAL NARRATION: A METHODOLOGICAL HYPOTHESIS

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Abstract - During the implementation of the Muvi project (Virtual Museum of Daily Life in Bologna), at the Cineca Visit Lab a methodological hypothesis has been developed in order to optimise the realization of virtual reconstructions both flexible, for a real multiplatform use, and appealing, for an engaging storytelling suitable for a wide audience.

INTRODUCTION

The Muvi project starts its long developing path in 1999 thanks to a small funding from "Bologna 2000". Shortly after the beginning of its development, since the Cineca Virtual Theatre had just been finished, the project, initially conceived as a Web multimedia hypertext, widened its possibilities and upgraded the 3D reconstruction of a house of the Fifties to a virtual reality fruition. Hence, the modelling, started with 3DStudioMax, switched to MultiGen Creator, at the time, in association with the Vega navigator, the most suitable software for real-time applications.

At the end of the first developing part of the project, some years later, the final output was, therefore, a Web multimedia hypertext, enriched with stop-motion pictures taken from the 3D model as a graphic support to historical explanations, and a domestic virtual environment, made of a kitchen and a living-room of a middle class house of the Fifties, browsable in real-time 3D in a Virtual Theatre [1].

In 2008, the project receives another funding, this time from Carisbo Foundation, for the reconstruction of virtual domestic interiors of a house of the Thirties and of a house of the Eighties of the XX century. But, in the meantime, several technical premises have changed and the implementation aims this time to achieve a real multiplatform flexibility and a more appealing look to be matched with an involving storytelling, suitable for a wide and differentiated audience such as the one that will attend the City Museum that the Carisbo Foundation is going to open in 2010.

The subsequent efforts were all aimed to reach this goal.

OPTIMISING THE APPLICATION: AN EMOTIONAL OUTPUT

Approaching the audience by using daily life means that an emotional view point is already central in the application. Of course there are several topics capable of triggering the visitors feelings, but virtual reconstructions of domestic interiors are easily accessible by a wide range of possible users thanks to the familiarity with the environments. Even when the reproduced periods pertain to earlier generations, houses maintain a series of characteristic places (where to prepare and/or eat food, where to spend time during the day, and so on) that can be immediately recognised by nearly everyone. The historical news, explaining the specific peculiarities of the different settings and objects, can be conveyed in a friendly manner due to the "well known" subject.

The implementing methodology for this application starts, therefore, from traditional historical research, capable of delivering to modellers philologically true information. Every object that is

going to be set inside of the virtual environment must be certified by historical documents or resources pertaining to the correct historical period. Every object, hence, will be used for narrating daily life aspects that, more often than not, don't limit the view to local history but have references to national or international perspectives. Even when references seem circumscribed, the banality of the object is overturned by the curiosity felt by the visitors that have ignored its existence, on one hand, and the sense of recollection felt by the others, who maybe not many years before had used it, and the comparison between different life styles enhances the reciprocal comprehension.

But an emotional application is the result not only of an emotional subject, but of a good aesthetic appeal as well.

The reconstructed living-rooms of a house of the Thirties and of a house of the Fifties

OPTIMISING THE MODELLING

Once the objects for furnishing the virtual domestic environment, selected for delivering as many interesting information as possible about the specific historical time, have been chosen, the effort for an appealing realization passes into the hands of the 3D modeller. Some observations suggest that, if we are dealing with a good script, capable of improving the story telling level, or with a high level of interaction, users usually forgive, or even accept, a mediocre graphic layout [2,3], but this possibility doesn't justify an intentional carelessness in graphic development.

A good product rests upon good modelling, good management of models and good textures.

Photographic textures are heavier than material settings but grant a higher realism and cause less problems with format changes. Of course, an efficient use implies the adoption of LODs (levels of detail), at least three of them in order to get light models when visualised from afar and enable the perception of details from a closer inspection, making texts readable, for example. Unluckily, photographic textures usually need long Photoshop sessions due to constraints in taking the pictures: i.e. sometimes objects are too large or can't be properly handled in order to take pictures from every angle suitable to cover every polygon of the 3D object or, in other cases, the geometry is such that a 2D photo without a long work can't be adapted to the tridimensionality of the object (as for the patterned fabric covering a stuffed chair).

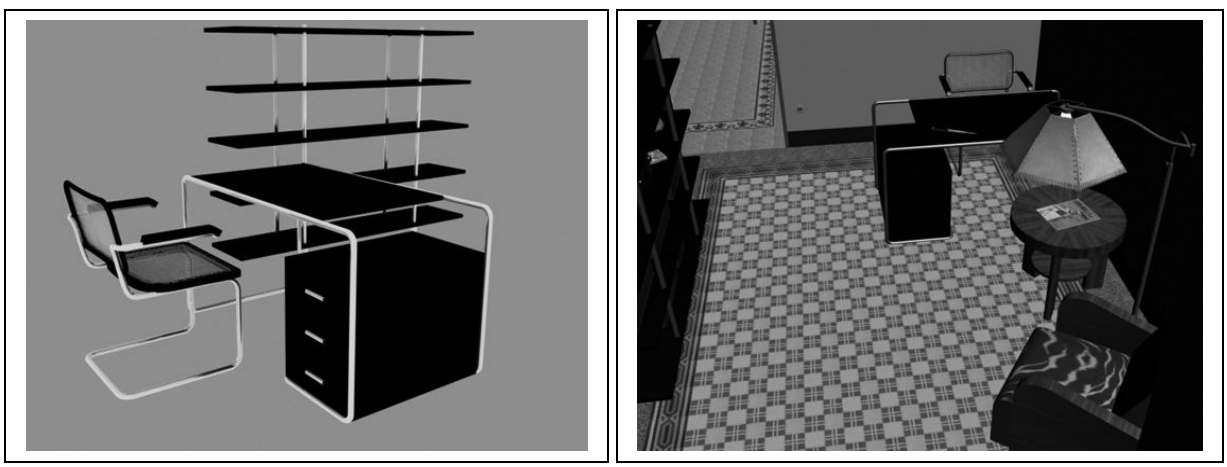
On the other hand, materials settings create lighter files than photographic textures but need crafty selection of the proper ones, in order to obtain an effect truest to the original material and avoid a drastic loss in realism. The 3D Studio (by Autodesk) modelling software counts on a rich library of materials but, when the 3D model is finally exported for real-time navigation, keeping the readability can become a problem.

The original wicker furniture used for recreating this virtual version was too large for taking a good picture of the upper side. Hence, its texture was realised by multiplying and jointing the photo of one of the front doors. An intensive work as well was displayed in order to adapt the 2D photo of the textile to the 3D coverings of chair and pouf on the right.

As before said, at CINECA for a period real-time applications were realised and browsed with two software of the same company: MultiGen Creator and Vega. These software had the disadvantage of very expensive licences. Hence, in 2003, thanks to a project funded by the Spinner Consortium, an ad hoc navigator, Visman, was developed[4]. It was capable of reading the FLT format from MultiGen both on PC and in stereoscopic mode inside Virtual Theatres using OpenGL Performer graphic libraries. These libraries, if the Performer licence was not paid, let just an advertising mark on one corner of the screen during visualisation, and the cost of the Vega licence was removed. Then, the joint events of the adoption by 3DStudio of a plug-in for converting its 3DS files in FLT and the refactoring of Visman in Open Source (with OSG graphic libraries), enabling Web navigation and widening the reading possibilities to IVE and OSG formats, enabled the emancipation from MultiGen as well.

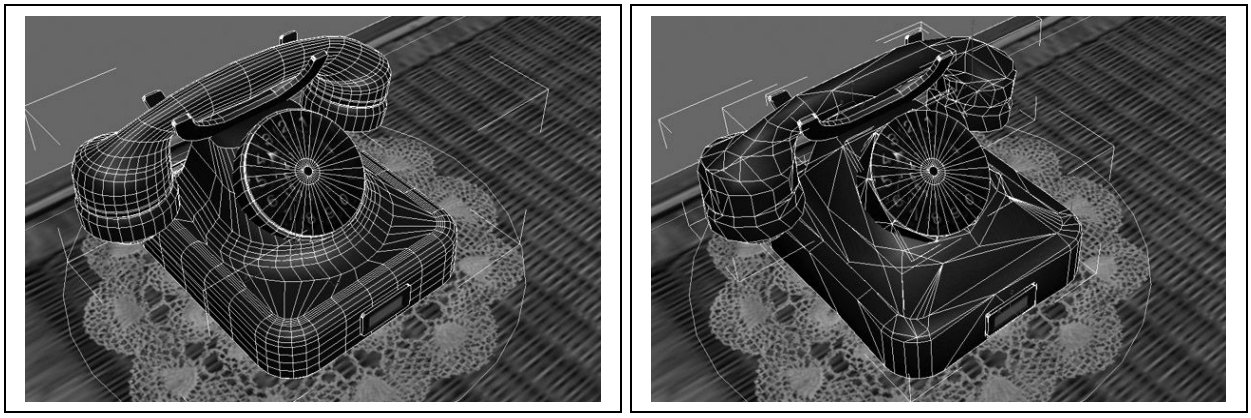
At present, the VisITLab has chosen 3DStudio, with its several options and affordable licence fee, as the main modelling software, but Blender will be tested in other projects in near future. Besides, while considering the issue of digital preservation for 3D models over “long” lengths of time, we become aware of how good a match is the one between Open Source, with its lively community, and commercial software with a wide diffusion, in terms of high levels of exportability toward and from all the most common file formats.

The management of OSG files by the Visman framework revealed its usefulness in solving the problem of keeping the peculiarities of materials after format conversion. Being a text format, OSG files can be opened and edited, writing those desired characteristics gone lost during the automatic converting process, as happened to us, for example, to the “chromium steel” material.



On the left the Thonet furniture without the “chromium steel” material, on the right the material is set directly inside the OSG file

For the modelling process, instead, some constraints were set, such as the attempt to maintain the polygons of each object below 400K, keeping the option of using LODs for geometries too.



LOD for geometries - High and low resolution

The real optimising effort, anyway, has been about the management of models during up-load and navigation phases, in particular in association with the plug-in used for Web navigation [5].

In order to enhance the flexibility of use and the possibility of interaction, all the objects were set at the origin of the coordinate system (0,0,0). Instead of positioning each 3D model in a display, fixed once and for all inside the virtual environment, a file for managing the furniture has been created. A matrix of displacement defines the position of the objects inside the environment, setting rotation, translation and, sometimes, scaling each original model that is therefore uploaded from the origin while an instance is called and the instance in the origin is not visualized anymore. The system of instances is used also with identical or repeated objects, hence avoiding multiplication and its subsequent increase in heaviness. Not only chairs, doors or windows have been instantiated, but also the foldings of curtains. Only a couple of foldings have been modelled and then, thanks to the use of instances, the curtain can be widened at will, without adding further weight to the application.

The management file helps in uploading objects following an organisation of nodes called PagedLOD, giving to the system an up-load hierarchy defined by the distance of the objects from the camera point of view. Management files have been also divided for the various rooms using the fragmentation for improving the hierarchy.

Shadows are not rendered on the main textures but in separate files, in grey scale. Textures can be repeated on different objects while lighter shadow files are created for single objects. The lighting will be neutral for better exploiting this solution.

The kitchen and living-room of the Thirties with neutral lighting and shadows.

Furthermore, each object is grouped with a linking node, identified by a name, for bounding it to explanatory pages.

CONCLUSIONS

The selected topic and the adopted methodology enable us to get an application with a dramatic appeal and a technical flexibility, but a further development step is still lacking. The use of the application as a support to a multimedia hypertext, as a cinematic output, or as a real-time navigation, both on PC and in Virtual Theatre, as a backdrop to historical explanations, are all well handled realisations. Now the challenge is about the development of natural interfaces and of a multi-user interactivity suitable to a museum environment.

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