Museum of the sculptures of the basilica of Saint Silvestro integrating the visit at the catacombs of Priscilla in Rome

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1. Intoduction

The use of the new technology in the Cultural Heritage has changed the perception and interaction in every field of research and market. The technologies can improve the experience and help a widespread dissemination and new ways to promote the interaction among users and manage big volumes of information dynamically are improved. Web applications are increasingly used, because they allow access from any computer, while keeping a centralised repository of information. The creation of an interactive 3D visualization can have an important role to record the documentation in Cultural Heritage, because it allows the representation of a context that can be easily understood by all users [Guidi et al, 2009].
Today the Virtual Reality (VR) and the Augmented Reality (AR) belong to the language of the Cultural Heritage, together with the commonly used terms like stratigraphy, laser scanner and thermography. There is an increasing interest in developing 3D reconstructions of towns, monuments, archaeological sites, museums during different historical eras and before and after an intervention of preservation [Manferdini&Remondino, 2010].
Nowadays the people can visit and retrieve information in a museum in several ways. The Medelhavsmuseet (Museum of Mediterranea and Near Eastern Antiquities in Stockholm) has planned to digize its collection in 3D with photos and X-ray scans, allowing museum visitors to explore the mummies in a way similar to what archaeologists do when they are looking for novel discoveries from ancient remains[1].
An important contribute of the technologies is that to help the accessibility of a context located where the geographic-political situations do not allow the visit of tourist people. In these cases virtual reconstructions as web application can archive and share information everywhere. This aspect is a common problem for many countries, e.g. the Museum of Zafar in Yemen (built on 2002). Zafar Virtual Museum hosted by the Heidelberg University and the 3D web application are a good example of an interdisciplinary effort realised with limited resources. The site's inaccessibility and the political unrest prohibit visits by foreign tourists and scholars. The project of the Zafar Virtual Museum communicates knowledge on important and little-known Himyarite artefacts exhibited [Pecchioli et al., 2012a].
Celebrating the 100year Anniversary of the Austrian Excavations in Giza, the Kunsthistorisches Museum Wien curated a special exhibition about this event. Beside of digitizing of the original documentation from the excavation various 3D reconstructions were created. On the technical side, state of art interactive

presentation methods allowed to perceive information at different levels [Kulitz & Ferschin, 2013].
If we analyse the the roman context , more close our case, there are interesting projects as: the Centrale Montemartini (Musei Capitolini), located in of industrial archaeology context and converted into a museum. The visitors can find a virtual tour in the website and can download an “application” for mobile device to receive information from the network of twenty civic museums of the city[2]. This short list of projects show how we can use the new technologies as an instrument to improve the accessibility to information in its context, as we aim in our project, the museum of sarcophagi in the basilica of Saint Silvestro.

2. History

The museum of the sculptures of the basilica of Saint Silvestro, collets 471 pieces of sarcophages dated between the beginning of the III century and the first half of the IV century [Tolotti, 1970].
The Basilica of Saint Silvestro was built in the early twentieth century on the foundations of a structure built at different times during the Late Antiquity. The south-east basilica was originally conceived as a space for burials and is currently used as storage of archaeological materials, found during excavations of the last century. The basilica is connected through two entrances to underground tunnels of the catacomb. The underground microclimate influences very strongly also the above environments creating significant of condensation and humidity problems. A monitoring system allowed us to control the situation before and after the project.
The basilica was already included in the visit of the catacombs of Priscilla, but with the museum its role will be more relevant (Fig.1).

Figu.1 - Early 1900: Opening of the museum[3]

Fig.2 - Documentation of the restoration (2009)[4]

2.1. The restoration of the sarcophagus

The archaeological investigations have allowed the recovery of hundreds of fragments of sarcophagus buried in the basilica and the surrounding area.
In this latter area was a necropolis of the first century and numerous mausoleums built after the basilica of Saint Silvestro (IV-V century). In the winter of 2009, the Pontifical Commission for Sacred Archaeology has decided to proceed with the restoration of stone materials (Fig.2). In the course of the cleaning we have realized the opportunity to reconstruct a large number of fragments reconstituting the unity of the sculptures until today. The high quality of materials and the variety of typologies, that testify to the sculptural production of over four centuries, has led to the decision to create a permanent exhibition [Pecchioli et al, 2012b]. The sculptures were restored and archived following the standard of the ICOM-CIDOC (International Committee for Documentation of the International Council of Museum).

2.2. Test 3D Model of the Sarcophagus

One of the most important pieces in the collection is a well preserved marble sarcophagus, dated around the III Century b.C., graven with scenes from the everyday life and from agriculture and sheep-farming activities . This piece is the object of this study, a robust challenge for the digital survey, because of the complex characteristics of the sculptures and their small size details and last but not least the difficulties linked to the light subsurface dispersion of the marble. For these reasons the survey was based on the Structure From Motion process, operating using a digital SLR camera and a specific SFM software. The main advantages of this choice are the reduction of the instrument costs and their practical management: all was done with a good quality camera, a tripod and some studio lights. A single (middle price) software was used to produce the final digital 3D model. The final results, edited and optimized at different resolutions for multimedia presentation and prototyping were soon ready for further usage, like the implementation in the multimedia detail

Fig.5 - The wireframe 3D model and the mesh with texture of the sarcophagus

database, right now under development (Fig.5).

3. Our goal

The goal is to enhance the environment and his graves rebuilding its historical identity through a permanent exibition, where the fragments of sarcophagus can be highlighted. The museum has been thought and developed using the technology since the beginning. Our choice has been to maintain the pieces in their original context of the basilica and to improve the accessibility to this monument both physically, through an architectural project, and virtually with a web-application. The study of the sarcophagi is a particular field of research in archaeology, and not easily accessible everywhere. The numerous fragments do not allow the presentation of much information in the exhibition. The user will be able to retrieve detailed information connected to each fragment, using a QR-code (or with an url) in situ connecting to a local server through a WiFi network in the Basilica. Moreover a 3D web application for a virtual visit and a QTVR (QuickTime Virtual Reality) to understand the context of the whole basilica will be available on internet.

4. The approach

The archaeological context and the exhibition of the fragments give to the visitors a different experience from the usual museum of classical archaeology. The project has been thought as a museum-construction site (Fig. 3). The visitor can explore the objects, the basilica, the burials, the stratigraphy of the walls, the new structure of the floor from different views. Where the antique and the new met, unless there were fundamental functionality issues, the priority has always been to preserve and enhance the antique.
The technological solutions aim at integrating the visit, allowing for each fragment to retrieve further information directly in the museum using smartphones.

5 The museum

5.1 Project of the museum

The museum is inserted in a new tour of the catacombs of Priscilla. The archaeological site is represented from burials. The project has built a floor, using


Fig.3 - View from the stairs towards/from the catacombs; Fig.4 - Part of the exhibition (construction site)

Travertino Imperiale, glass and metal grids, over these burials. The floor has been built to guarantee a good air flow and microclimatic preservation of the burials, while giving access to the museum and access the tour of the catacombs (Fig.4)[5].

6. Web applications

6.1. 2D Web application

Despite the fast progress of the performance of mobile devices, performance is still constrained, and 3D visualization is possible only using optimized native applications. This requires an order of magnitude more effort, and will restrict even more the devices supported.
To allow as many users as possible to access the information a web application using only image maps and simple javascript effects is being developed.
This is the application that is available in the museum. QR-codes (or the corresponding urls) jump to specific areas of the museum, but the whole museum can be navigated with a touch friendly and engaging interface, even without using the QR-codes.

6.2. 3D Web application

A 3D web application will be available to discover and visit the museum and their information. An important aspect with Internet usage is the optimisation of the 3D model. In our case it has been achieved creating a low poly 3D mesh with the application of normal maps generated with a baking process of the high poly 3D model. In this way we have optimized for the Web and the interactive use. The project will available for all the major browsers (IE, Firefox, Safari) and platforms (Windows, OsX), but does not support mobile devices.

6.3. ISEE Software

To view the pieces in their original context of the basilica we thought to create a web-application based using ISEE Software [Pecchioli et al, 2012b].
ISEE software allows to present interactive 3D environments and access information through the Web and had been prototyped as content management tool with Internet Explorer since 2008 and currently supports all the major

browsers. The basic idea is to enable information retrieval by simply looking inside a 3D environment, since moving and looking in the real world are basic modes which all viewers use. It ranks the relevant information by means of its position/orientation in 3D space as a viewer [Locatelli et al, 2012].
Normally we use the Unity 3D technology[6] to visualize and interactively navigate 3D models. The Unity plug-in is available for all the major browsers (IE, Firefox, Safari) and platforms (Windows, OsX) (Fig.6).

7. Conclusions

Our interdisciplinary collaboration has been a contribution to try an innovative solution for the accessing and managing the information in its context. The approach has been to give better access to the monument through an architectural project, a web-application and insitu through QR-code, based on a method ISEE.
In the last months, some of the fragments have been reassembled again, after new discoveries, giving a new interpretation and collocation in the exhibition.
Next October the inauguration of the museum will take place in the Basilica, thus in next two months the final pieces should fall in place, in the meantime its name has been decided: MuPriS.
We hope that our work can be a contribute for a interdisciplinary approach in Cultural Heritage.

Notes

[1] http://www.varldskulturmuseerna.se/en/medelhavsmuseet/
[2] http://www.centralemontemartini.org/
[3] Archivio Fotografico della PCAS
[4] Archivio Fotografico della PCAS

Fig.6 - One screenshot of the 3D model in unity3D

[5] Source: Andrea Nobile
[6] http://unity3d.com

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