What communication for museums?

Experiences and reflections in a virtualization project for the Museo Egizio in Turin

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Abstract: Abstract: The use of cognitive metaphors for the transmission of historical and cultural content is now an indispensable condition in the process of revamping the forms of museum communication. In this project for setting up the new Museo Egizio in Turin, the cultural message has been entrusted to three specific filmed segments in 3D computer graphics, aimed at introducing the subjects dealt with in the rooms dedicated to queen Nefertari, the chapel of the painter Maya, and the tomb of Kha. These are archaeological settings of extraordinary importance for studying and learning about the art and culture of ancient Egypt. In these filmed segments, passive viewing is offset by an emotional approach that engages visitors in an information path where, despite the inactive mode of fruition, they are in some way participants, because they are emotionally involved. The film itself is conceived as a showcase of changeable, heterogeneous digital content, capable of offering a concise, preparatory overview of the finds present in the museum spaces. This passive and "self-explanatory" approach will allow the visitor to understand the relationships between various objects – some not directly visible – like the mummy of Kha and of his consort Merit; to reconstruct the tombs virtually in their original context; but above all, thanks to the techniques of virtual archaeology, to visit these settings as they appeared at the moment they were unearthed. All this was made possible thanks to the use of integrated technologies for rendering and representation, capable of bringing virtualization to a level of verisimilitude that can foster a hyper-realistic "participatory" vision. The high degree of realism of the virtual reconstructions, the visual effects, and the techniques of cinematographic representation add emotion to the scientific content, making a positive contribution towards the visitors "losing themselves" between the real and the virtual dimension.

Keywords: Communication, Museo Egizio, 3D survey, virtual reconstruction, Structure from Motion

Active or passive communication?

Based on dynamic narration and multimodal information, new forms of museum communication have strongly changed the very ways in which cultural content is enjoyed by the public, and the logic with which it is displayed. At the same time, the impulse of new technologies has overarchingly imposed new forms of communication, based above all on digital content and languages. Recent studies clearly show that all those museums that characterized their own cultural offering through the use of digital technologies and the public's active participation have been most successful in terms of attendance figures and also, in all likelihood, have achieved better understanding of the cultural information being communicated. In this context, Turin's Museo Egizio has seen a communication proposal come into being that, through the use of 3D restitution technologies, virtual reconstruction, and computer animation, can accelerate and enhance the visitor's cognitive abilities, becoming a medium capable of effectively generating "virtuous" learning

processes. The underlying idea is to re-evoke the suggestions of the past while at the same time informing the visitor by following an approach that is integrated, effective, and engaging, but above all philologically correct. Thanks to the integrated contribution of knowledge and technologies, it is possible to construct exciting paths, in which the visitor receives scientific and historical information, in a general framework dominated by 3D graphics. The communicated message developed starting from the use of 3D representation technologies itself becomes a major component in the musealization process. Certainly a medium for better understanding the objects on display in the exhibit cases, it is also an independent exhibition element containing original reconstructions and information that can maintain an autonomy of their own in the museum display, able to address all visitors with the language of the new digital media. It is a way of conceiving cultural communication that places the new museums in the groove of the current dynamics of social communication.

However, in this specific project, no communication solutions based on interactivity or immersiveness, that would be such as to necessitate the visitor's active participation as required by the most widespread modern technological scenario, were adopted. This choice was dictated by various considerations. The first regards the compatibility of new arrangements in the rooms, along with the need to keep the visitors from lingering. Indeed, the spaces in question, given their organization and display distribution, were not set up to contain large groups of waiting people, who might form queues. As a consequence of this, the first rules to follow were two in number: producing content easy to understand and above all quick to view, and thus of short duration. An additional element, certainly of no small importance in choosing the best solution to be adopted, is linked to the management capacities of the technology instruments. All active use systems require the public to have a certain skill level, and this, however simple, is not always easy to find in certain age groups, or worse still among visitors from a cultural extraction generally little inclined to using interactive stations. This consideration regards the number of visitors viewing a digital content at the same time. Although while it is true that effective, multi-user applications have been increasingly common of late, it must also be admitted that an interactive system can be managed by only one person at a time, or at best by two/three people at the same time. All this is possible only with complex systems, which in our recent experience with other museum installations have demonstrated a certain weakness in intensive use, requiring continuous interventions on software and hardware. Although not party to our reflections on the usability of information technology systems, the museum management deemed it appropriate to entrust the entire communication process to passive animated narration: simple films. These introduce the background themes dealt with in the rooms, and accompany the visitor on a suggestive journey evoking spaces, objects, and people involved in the discoveries. This is all in accordance with dramatic arrangements, narrative paths, and modes of informative approach designed to produce an effective transmission of the cultural message, with no hint of forms of showmanship that produce no more information than the pure viewing of the actual objects on display in the rooms.

The reconstructed settings

The cultural message was entrusted to three specific films in 3D computer graphics, usable on the monitor and aimed at introducing the subjects dealt with in the rooms dedicated to Queen Nefertari, the chapel of the

painter Maya, and the tomb of Kha. These archaeological settings of extraordinary importance for the study and knowledge of the art and culture of ancient Egypt were all discovered by Italian Egyptologist Ernesto Schiaparelli at the dawn of the twentieth century. By specific choice, no narrated commentary was inserted, but communication was entrusted to bilingual (Italian/English) textual infographic. This textual information was reduced to a minimum, taking on the role of quick captions tasked with reinforcing the main message entrusted to the sequential images. In practise, reading the information on the monitor in accordance with this simple scheme shifts the narration's emphasis onto the communicative force of the computer graphics animation, which allows the reconstructed space to be represented by relying on unusual schemes, in animated cross-section, in orthogonal perspective, or with framing impossible in reality
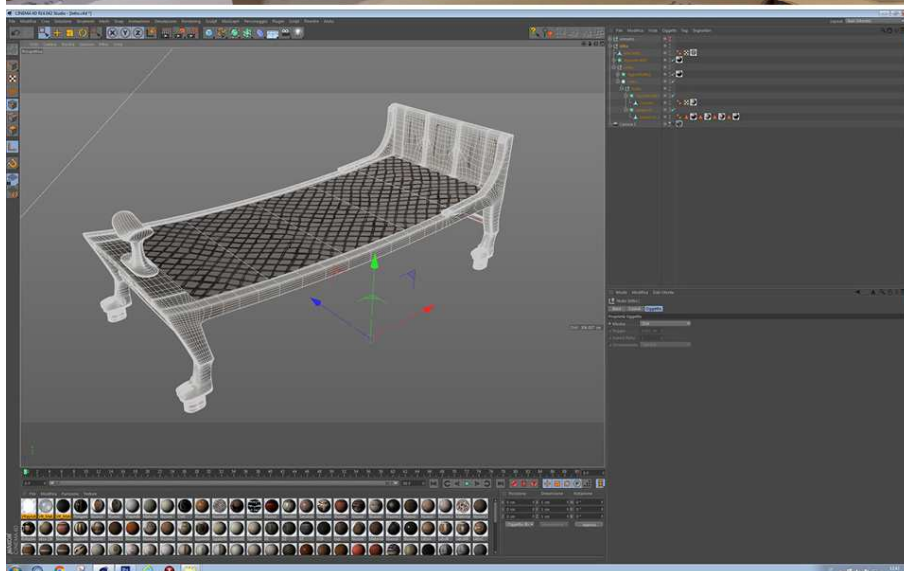

Fig. 1 – NURBS modelling of bed of Kha within 3D modelling software. The 3D model It was obtained through the use of frontal rectified photos.

The emotional approach

The presentation of cultural content in museums using filmed segments is certainly nothing new, nor does it appear to contain in its more classical form elements of interest in the scientific debates over new forms of museum communication. Despite this, there is no denying the role and the incisive nature of emotional narration whenever dealing with themes connected with recreating the ancient, with its shapes, its evocations, its colours, and the lost atmospheres we are called upon to represent.

In this, one may glimpse the attempt to materialize the ancient, a tendency to generate a phenomenology of architecture and of creative expression, in which the "place" is seen as a locus with precise, recognizable identity. In the same way that ancient architecture is integrated with the place in which it is created by harking to its genius loci, we, through the expressive media offered by computer animation, can have those suggestions reinterpreted with philological reconstruction, enriched by those sensations that must be entwined with pure scientific description to produce an engaging account. In this, then, there is the precise attempt to offset passive viewing by means of an emotional approach that engages visitors in an information path in which, despite the inactive mode of enjoyment, they are in some way participants, because they are emotionally involved. In this sense, one may perhaps accept the well-known meaning Heidegger gave to the concept of "presence of Being" – Dasein – that does not indicate a mere location in space, but something more ambiguous and complex: the way in which, in concrete (phenomenological) terms, Being is provided in history, as a part of speech. Developing this "sense of presence" and of emotional and personal participation fulfils certain well-known purposes of three-dimensional representation as part of a language within and essential to Virtual Reality: to develop a dematerialization of the object that exists only in the digital world, while, however, making it "graspable," present, and nearly real. Arising from this assumption is that technological need to make virtual representations more and more real and realistic – graspable, in fact. The realism and credibility of certain rendering algorithms are enabling this process. 3D representation is increasingly ridding itself of those synthetic elements characteristic of the simulations of decades past, to become indistinguishable from the real, that is hyper-realistic. A high degree of realism in virtual reconstructions, visual effects, and techniques of cinematographic representation add emotion to scientific content, making a positive contribution towards the visitors "losing themselves" between the real and the virtual dimension.

3D reconstruction, techniques and methods

For these reasons, in this project, the best possible performance was constantly sought in the rendering phase. By relying on the latest conquests in the sectors of restitution by images, almost one hundred of Kha's grave goods were rendered in 3D, and then virtually reset in their original context to become the basic elements of a narration. This passive, "self-explanatory" approach described earlier will allow the visitor to understand the relationships between various objects – some not directly visible – like the mummy of Kha and of his consort Merit; to reconstruct the tombs virtually in their original context; but above all, thanks to the techniques of virtual archaeology, to visit these settings as they appeared at the moment they were unearthed. Since the entire project was completed in only three months' time, only accelerated survey technologies were used, seeking to maintain the metrical datum under control while considering that the final

objective is not the survey in and of itself, but describing and contextualizing the objects. From the technical and operational standpoint, three different technologies were used: the objects with a rather simple geometry were rendered using NURBS modelling techniques, using frontal photos orthorectified based on direct measurements. Rather complex objects like sarcophagi, statuettes, and Merit's mask were surveyed using Agisoft Photoscan, which, as is known, uses SfM (Structure from Motion) algorithms to generate 3D models complete with textures. As compared with usual operating practise, after the generation of the mesh, each model was temporarily exported (obj format) into sculpting software; this is for the purpose of manually managing certain small surface irregularities and subsequently applying a smoothing algorithm in order to eliminate the noise induced by the high ISOs and by the indeterminacy of certain measurements, due to the low lighting and low surface characterization of certain details. The models were then re-imported into Photoscan (obj format) for the final calculation of the texture, generally at a resolution of 10,000x10,000 pixels.

Fig. 2 – The mask of Merit, 3D survey using image-based techniques

The virtualization of the tomb makes it possible to understand the exact placement and morphology of the grave goods, exactly as they were discovered and documented in minute detail in Schiaparelli's excavation logs and photographs. Of course, many other archaeologists leading up excavations in Egypt in the same period, as Sir William Matthew Flinders Petrie and especially Francis Llewellyn Griffith, meticulously documented the excavation through reports, drawings, notes and especially the photography. The Italian archaeologist, in particular, used the stereoscopic photography to document the excavation phases, and thanks to these photographs (of the year 1906) the entire find could be reconstructed, from opening the shaft to reaching the burial chamber. His images were reused in these films and reprocessed using matte painting and camera mapping techniques to offer the visitor the exact impression of the find. The use of metrically controlled 3D scenes served to overlap the archival images with a colour representation of the tomb, in which the individual objects surveyed in the museum come back to life, once again in their original context. The viewing of the film is a preparation for the museum visit, but it is also an occasion for a deeper examination and for an informative reading of the whole context, linked to the votive chapel and to the Deir-el-Medina site. The tomb of Kha was then represented with a variety of techniques and methods, and the perspective sections and continuous camera movements provide direct information simply, with no mediation or excessive fragmentation of the communicated message. The narration proceeds without enhancements provided by special effects, and goes no further than to provide information and viewpoints that allow what is exhibited to be understood dynamically and sequentially, with a scale that goes from the Deir-el-Medina village down to the smallest object.

Fig. 3 – Tomb of Kha, 3D reconstruction of burial chamber

The second film regards the chapel of Maya, the painter of the aforementioned necropolis of Deir el-Medina, whose frescoes, taken out of their original environment, are currently on display inside the museum. In this setting, a virtual reconstruction of the small building was proposed, with the partially surviving paintings put back in place and integrated with reconstruction hypotheses in order to make the reading of all the registers

more clear. Here, too, the historical images, appropriately reconstructed in 3D with the techniques described above, support the description of the funeral ritual depicted in the paintings. The overview representation describes the contents of the registers in accordance with the order of reading, allowing the ritual's performance to be observed horizontally, in accordance with its natural development. Many zooms on the figures allow the outlines and stylistic details to be appreciated, with integrations to the line that, within the limits of the admissible, complete the description of the ritual.

Fig. 4 – Tomb of Kha, 3D reconstruction of entrance corridor based on 1906 photos

Fig. 5 – Tomb of Kha, the complete burial assemblage

The third film regards the painting cycle that decorates the underground tomb of Nefertari, one of the most complete and significant in the New Kingdom. Discovered by Egyptologist Ernesto Schiaparelli in 1904, and unfortunately defaced and looted even of its mummy, this vast tomb is located on the northern slope of the Valley of the Queens, and has a highly complex layout. It in fact differs from the tombs of other queens (usually simpler, and with only one burial chamber), taking its inspiration instead from the Pharaohs' burials in the nearby Valley of the Kings. The paintings reach the apex of quality in Egyptian funerary art especially for their wealth of colours (green, Egyptian blue, red, yellow ochre, white, and black) and details, while the themes and content respect the indications contained in the Book of the Dead. The images describe Nefertari's journey to the afterlife, during which she plays Senet, and enters the underworld where she encounters many divinities, including Isis and Osiris. At the end of the painting cycle, Nefertari is triumphant and transforms into Osiris (god of the dead), with the consequent, desired achievement of immortality and eternal peace. The Museum houses part of Queen Nefertari's sarcophagus and a scale model of the entire royal tomb, accompanied by the painted decorations abundantly replicated at the moment of discovery. It is a document of considerable interest for the complete reading of a cycle that cannot be read today in its entirety. The context was rendered in 3D with the aim of illustrating the path of the Queen's becoming the sun and a god upon her death, involving the visitor in a virtual and emotional journey into the afterlife, among the Egyptian gods, with the real objects present in the room being the initial and final points of linkage. This process of historical recreation is developed in accordance with a cinematographic style, taking up the techniques of overview representation of the paintings used for the chapel of Maya and uniting them with the 3D rendering of the wooden model on display in the museum. The way the narrative evolves makes it possible to understand the figurative themes, the dynamic development of the path on the way to becoming a god, and the spatial nature of the tomb – one of the most beautiful and evocative in the Valley of the Queens.

Fig. 6 – The tomb of Nefertari modelled using the 3D reconstruction of E. Schiaparelli wooden model

Conclusions

The virtualization of the three contexts described in this paper allows the visitor of Museo Egizio to better understand the particular nature of the objects present in the room, while at the same time allowing them to be contextualized and the relationships between them described. Many objects that cannot be viewed directly in the room are appropriately described in the video: for example, the arrangement of the three sarcophagi, one inside the other, and the smaller objects originally contained in the cases. The image rendering technologies and NURBS modelling on orthophoto allowed almost 100 grave goods to be reconstructed, which served for the complete reinterpretation of the burial settings. This work also makes the specific attempt to offset passive viewing through an emotional approach that engages visitors in an information path where, despite the inactive mode of enjoyment, they are in some way participants, because they are emotionally involved.

Those emerging and promising technologies have marked a significant advance in the field of virtual archaeology with their potential in enhancing communication processes and edutainment. Many of those research have become real products, exploited by tourists and scholars for enriching their knowledge experience, with a consequent growth in terms of tourist flux and diminishment in the misknowledge of the main contexts.

New jobs assigned us from the Egyptian Museum, demonstrate that the visitors welcomed the use of these media in the museum exhibition and, on the contrary to the actual trends, the passive media are a good solution in museum communication processes.

Some links to know more are viewable on broadcast TV series:

Stanotte al Museo Egizio del 28/05/2015 - Rai1

     http://www.rai.tv/dl/RaiTV/programmi/media/ContentItem-04bbd6ad-e251-4278-979b-0388c9da39f3.html (from 29:00 to 31:00)

Voyager - I mille volti ed i mille segreti di Torino (18-12-2015) - Rai2

     http://www.dailymotion.com/video/x3i4a73 (from 16:20 to 16:50 and from 17:00 to 18:00)

And on the web:

The chapel of Maya: http://itlab.ibam.cnr.it/index.php/la-cappella-di-maia/

Tomb of Nefertari: http://itlab.ibam.cnr.it/index.php/la-tomba-di-nefertari/

Tomb of Kha virtual reconstruction (full movie): http://itlab.ibam.cnr.it/index.php/la-tomba-di-kha/

Tomb of Nefertari (trailer): https://www.youtube.com/watch?v=5bY-XjS5uec

Tomb of Kha (trailer): https://www.youtube.com/watch?v=UkQ2AbgxxzQ

Fig. 7 – Frame of the chapel of Maia movie

Acknowledgements

Fig. 8 – Tomb of Nefertari, 3D model used for the description of the paintings

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