

Virtual connections between archaeology and stage design

Fragments of ancient time in the 'Marble Odyssey' case study

Francesca PORFIRI, Dept. of History, Representation and Restoration of Architecture, University of Rome Sapienza, Italy

Luca J. SENATORE, Dept. of History, Representation and Restoration of Architecture, University of Rome Sapienza, Italy

Keywords: *integrated survey – photogrammetry - digital storytelling - augmented reality.*

Research framework

In today's society, visual communication in architectural or archaeological spaces plays a fundamental role. In recent decades, new forms of display are being developed that relate the real space with a virtual representation of it, in a 'nostalgic' contrast between the grandiose work, once realised, and the current altered state in which it stands. The testimony of the memory of a place, unfortunately, is destined to be lost in time unless the object of study is analysed, measured, represented, and finally narrated, creating an innovative project capable of reviving a lost space once again. The potential of this technique can be extended if it is applied to the digital reconstruction of an architectural/archaeological asset, proposing, as in some museums, a valorisation and new communication linked to its knowledge.

Architectural representation, understood as a tool for documenting the Cultural Heritage, and surveying understood as a methodologically structured system capable of gathering certain massive three-dimensional information, combined synergistically with the technological development of the last years, have brought about a change in the cultural paradigm regarding knowledge and dissemination of information. The data obtained through the use of massive acquisition methodologies, appears increasingly complete, heterogeneous, implementable and therefore shareable. Consequently, the need to use this data, both for preventive/conservative purposes and for narrative purposes, imposes upstream the need to be able to archive it, to structure it semantically, and then to be able to re-connect it to its original essence.

Mass acquisition technologies (such as 3D laser scanning, or Structure From Motions) make it possible to collect data on the surface qualities of an object in order to subsequently define its geometric and material properties. Thus, the reconstruction of a virtual copy of the object under study - an integrated digital model - makes it possible to add qualitative data to the quantitative data, having a clear idea of the scale of presentation of the model.

The Cave of Tiberius, the proposed case study, is a singular example of the fusion of landscape and architecture, an archaeological site with a scenic value, located in Sperlonga, in the south of Lazio Region. The cave, in particular, belongs to the villa of the Emperor Tiberius and was once characterised by a strong presence of statuary groups, all dedicated to the myth of Ulysses, so famous for their grandeur that the cave could be defined as a sculpture theatre or the 'Marble Odyssey'. The found decorations and fragments of the marble statuary groups are now located in the Sperlonga Municipal Museum, thus far from where they once belonged. The cave today appears to be devoid of its statuary, it is reconstructed fragmentarily but in another place.

Augmented Reality (AR) today represents one of the innovations with the greatest potential in the fruition and dissemination of Cultural Heritage. It is precisely the experiential and emotional approach that guarantees an improvement in the enjoyment of the heritage under study, placing the visitor's

experience at the centre. Within AR it is possible to tell what is no longer visible: the user, through the use of a device such as a tablet or smartphone, can choose what to learn about within a multiple exhibition space, can interact with the works present and get to experience the non-tangible information, consciously enriching his or her cultural background. In this way, the visitor can access the scientific documentation underlying the virtual reconstruction, supplementing the visit in real time with new information. The desire to explore new narrative and expressive modes allows the dialogue between tradition and technology to be re-established, through a poetic expressiveness of great impact, renewing the original idea intended for this particular type of architectural space - a perfect scenic frame - with the aim of defining an unprecedented emotional interpretation of a timeless work.

Methodological workflow

The objective of the proposed study is the creation of a reconstructive virtual model of the chosen case study, capable of digitally restoring to this natural theatre the perception of its ancient splendour. Starting with the found fragments of the statues, it is possible to carry out a digital reconstruction of them in order to then relocate them virtually in their original positions within the cave, so as to make them usable again in an Augmented Reality environment. It is also necessary to acquire the three-dimensional data of the cave, the container in the original design of the work, and process it for the construction of a hybrid and complex digital model, with surfaces represented in high definition, thus defining a 'unique multidimensional model'.

After an important documentary phase, carried out with the support of archaeologists and restorers, a complex integrated survey operation was carried out, aimed at obtaining the data necessary for the various processes. Two types of Laser scanners and digital photogrammetry techniques were combined in order to control the reliability of the multiscale measurement operations, which allowed a considerable amount of information to be obtained both at the architectural scale (for the cave) and at the scale of extreme detail (for the statues).

The documentation phase was carried out by means of an integrated multiscale survey using different technologies: Faro Focus 3D Laser Scanner for the cave; IReal 3D Scanner for the statues; Full Frame Canon 6D MII digital camera to integrate some detail data of statues and decorations through SFM technique. Once the laser scans for the cave were made for the architectural definition of the space, guaranteeing an accuracy of 1 cm, photographs were taken and used for Sfm applications dedicated to the study of details combined with a laser scan with submillimetre accuracy.

The survey operation was followed by a processing phase aimed at completing the documentation, through the creation of 2D and 3D models - textured mesh models - of survey and critical interpretation. Finally, Unity software was used for the augmented reality and subsequent reconstruction of the "Sculpture Theatre".

The spread of awareness of this extraordinary historical and landscape heritage, which today can only be visited in fragmentary form, has driven various scholars over time, particularly historians and archaeologists, towards different reconstructive hypotheses. The ancient 'natural theatre' today appears stripped of its constituent elements, a container devoid of content. The Cave of Tiberius represents a work within a work, an exceptional historical and landscape heritage, a microcosm with an extraordinary iconological programme no longer inserted in its original context, and the aim is to restore its lost function.

The methodology of analysis and study of the proposed work, constitutes an operational workflow functional to the understanding and narration of the space as it appeared in its original design, the objectives set thus concern the study, cataloguing, acquisition and re-connection of the virtual data to the existing real data, thanks to the virtual musealisation of the nymphaeum.

The research project has been structured in four phases: the historical framework of the research; the application of an experimental acquisition process followed by data processing; and finally the virtual musealisation project of the ancient 'sculpture theatre'.

The aim of the research is a dynamic re-proposition of an optical and visual atmosphere that can once again excite because it can be used again, a new channel of communication capable of bringing the work back to life within its context thanks to augmented reality. The Cave will be at the same time background and active part of the reconstruction, container and content, its very essence will be enhanced through the story of "a work within a work".

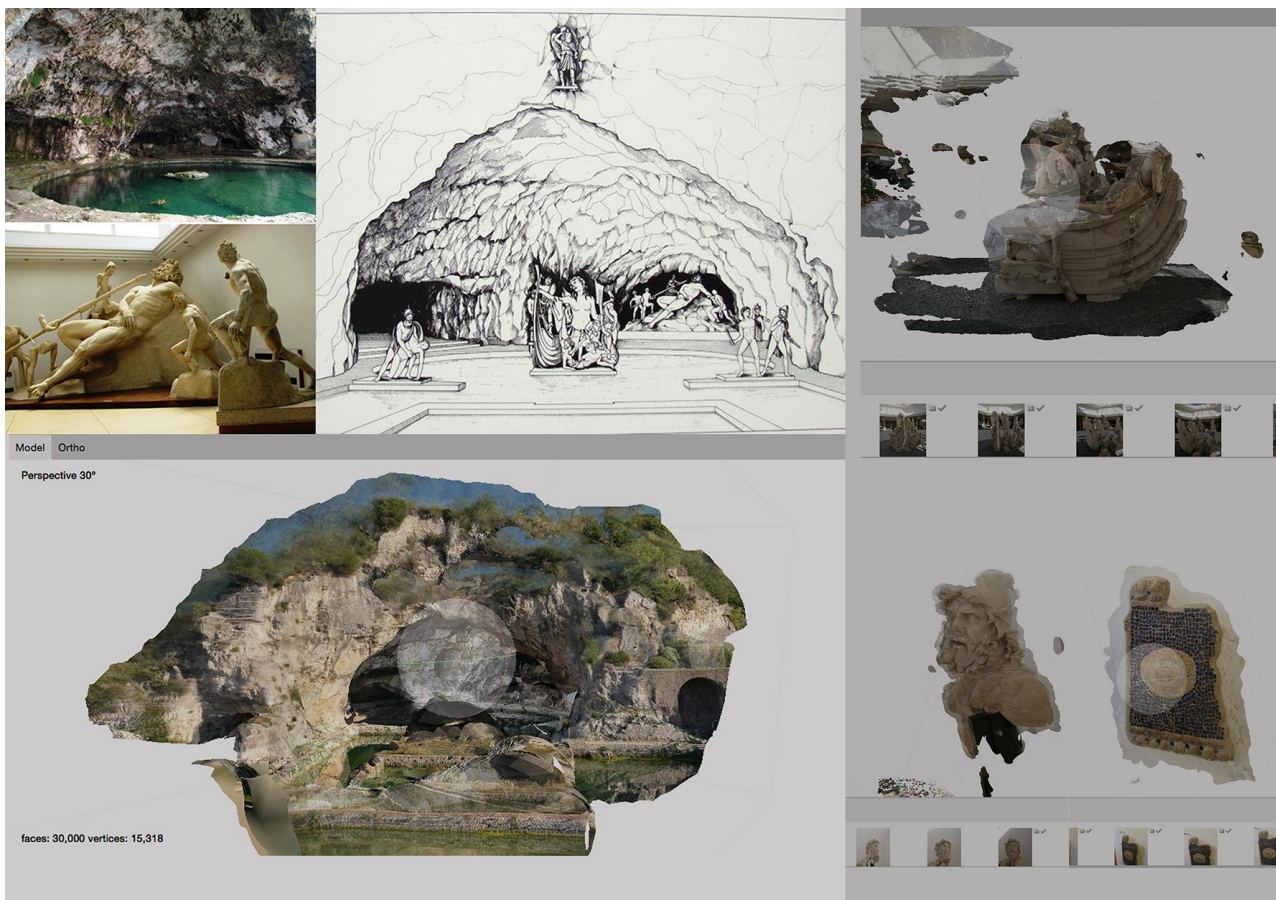


Fig. 1. Tiberius Cave, 3D texturized models of the fragments and of the cave (© Porfiri, Senatore).

Conclusion

The creation of a virtual three-dimensional model is also functional to a greater understanding of its formal and constructive aspect, while remaining on the whole an ephemeral and scenographic apparatus. Reconstruction is first and foremost a communicative, cultural, didactic necessity.

The correct perception and enjoyment of the architectural and archaeological heritage, aware of its value for the community, constitute a tool for protection and safeguarding, which induces the participation of museum users in an active and emotional manner. For this reason, the Cave-Neumphaeum will be both the backdrop and an active part of the reconstruction.

Figurative representations such as this one open up the construction of a living and dynamic dialogue between those places where architectural and human elements interacted with each other, managing to permeate the essence of that particular context.

Conflict of Interests Disclosure

We disclose any financial or personal relationships with other individuals or organisations.

References

- Bonacini, E. (2020). 'I musei e le forme dello Storytelling digitale'. Roma: Aracne editore.;
- De Luca L. (2014), 'Methods, formalism and tools for the semantic-based surveying and representation of architectural heritage'. Applied Geomatics, n.6, pp. 115-139.;
- Guidi G., Russo M. (2011), 'The role of digital models in cultural heritage preservation'. Proceedings of IX International Forum Le Vie dei Mercanti, Aversa, Capri, 09-10-11 June 2011.;
- Bianchini C. (2004), 'Modelli interattivi esplorabili in rete: nuove applicazioni del 3D Web Browsing al settore dei Beni Culturali'. Disegnare, Idee, Immagini, n. 28.;
- Addison A., Gaiani M. (2000), 'Virtualized Architectural Heritage: New Tools and Techniques', IEEE MultiMedia journal, vol. 7 n. 2, pp. 26-31.;