Old and new virtualization, innovative approaches to digital integrations for the sacred hill of St. Vivaldo, Montaione, Italy

Rocco DIMATTIA, Dipartimento di Architettura, University of Florence, Italy
Ylenia RICCI, Dipartimento di Architettura, University of Florence, Italy
Andrea PASQUALI, Dipartimento di Architettura, University of Florence, Italy
Ettore URSINI, Comune di Montaione, Italy

Introduction

"Locus amoenus," peripheral, but not marginal. The Jerusalem of San Vivaldo is a "Sacro Monte" near the Via Francigena, nestled in a wooded and hilly area in the municipality of Montaione, not far from Florence [1]. This particular settlement is the last transposition to the world of the Holy City on a smaller scale, arrived in our time still faithful to the initial project. A kind of "Charta Peregrini" is reproduced in San Vivaldo, which not only reproduces the buildings of worship most frequented by the faithful in Jerusalem, but also the orography, the arrangement of the places, the distance between them and the orientation. It is an open-air play, with each chapel narrating an event, from the Last Supper to the resurrection. The itinerary is articulated through the chronological unfolding of events. One has to move in an unordered way between the chapels. It is a virtualization of the sacred space that creates a possibility of visiting at the time made with the best available solutions, so as to obtain spaces that are suggestive and effective in their being an 'effective alternative to visiting the real place. The means to "virtualize" it is based on technology and the art of time, taking full advantage of the possibilities of terracotta sculpture, cold-painted on site. Some of the leading artists of the period worked on the work: Andrea Della Robbia, Benedetto Buglioni, Agnolo di Polo. The resulting overall work reflects the canons of the period and reveals a skillful use of physiognomy. The purpose is to provide a realistic virtual environment for visitors. Those who access it can identify themselves, recognize themselves even through the physical imperfections of the sculptural groups, and become part of the representation. Thus, the intention is not to sublimate the Renaissance, not to emulate the great sculptors, but to immerse pilgrims in the scenes. Immersivity and virtualization are the real goals of the work, a theme faced centuries ahead of digital virtualization and today still interpretable and empowering in these terms.

Virtualization before digital virtualization

In the Europe of the 1500s there was a desire to allow the visitation of the holy places of the Holy Land, in virtual, translocated form. This logic led to a series of interventions in Europe and Italy, mainly in northern areas, but in some cases also in the center. It is a few kilometers from Florence, in fact, that we find the Sacred Mount of San Vivaldo. The complex is the only case in the world where a copy of the city of Jerusalem is replicated, with the exception of the Sacro Monte of Varallo in Piedmont. The Piedmontese one predates it as an artifact, but unlike the Montaione work it becomes the subject of modifications over time, which distort its initial design. A visit to the Sacred Mount of San Vivaldo is a unique event that takes place through a series of loci. These simulate the reality of things in Jerusalem through the use of technologies typical of the time: statues. They almost come to life, to become "immobile inhabitants" of this miniature city among the hills of Montaione. The environments are built with the suggestion of certain construction stratagems and realize spaces that allow the believer to visit the events of faith, through their sculptural representation, tangible, readable even for the less educated. Renowned artists worked on the work; Della Robbia, Buglioni, Agnolo di Polo are mentioned, as if to legitimize the work, which reflected the canons of the time [2]. In the 1500s therefore, virtualization was achieved through architectural devices, through technological tools such as terracotta statues, but also through the use of physiognomy and the involvement of well-known sculptors. Among the sculptures there are figures bordering on the grotesque, certain anatomical deformities are matched by certain pathologies, however these are not a sign of less sculptural elegance, rather they can be read as an attempt to include the common viewer. A realistic environment for believers, those who enter it can recognize themselves, identify with it, become part of the representation. The viewer is thus given the opportunity to participate in the events in an active way, to be sometimes beside the statues, almost forced to take part in the narrative. One often finds oneself in cramped places, in fact becoming, "ex abrupto," part of the scene almost unconsciously. Sometimes one finds oneself in the middle between two sculptural representations, called in as judges. Even, at least until 1800, one is allowed to intervene in the scene by throwing a stone at a statue, that of Barabbas. So what greater concession can there be for a viewer than that provided by the opportunity to intervene in the life cycle of a work of art? What further possibility of throwing a stone at it and breaking it, destroying it, killing it, basically admitting that he held it alive!? So the will is not to sublimate the great renaissance, not to emulate the great artists of the time, but to immerse visitors. This paper, then, describes an in-depth study of the reproduction of the Sacred Mount of Jerusalem at San Vivaldo. Initially, the Sacred Mount is the subject of an accurate integrated digital survey, which involves the use of advanced instrumentation and methodologies such as laser-scanning and SfM photogrammetry. The analysis subsequently leads to the development of 3D models and graphic elaborations that describe the current architectural state. At the same time, the investigations make it possible to codify what is in principle the architectural design and witness it through virtual reproductions and augmented reality installations. The results of the digital investigation also lay the groundwork for historical investigations related to the comparison of the many reproductions and representations traceable throughout Europe, in relation to the original one in Jerusalem and its transformations over the

centuries. The research also deals with the phases, techniques adopted and results obtained, carefully describing each of the architectural elements that comprise it. It also highlights the importance of proper illumination of the work, which unfortunately is not properly legible at the moment.

Today, in a historical context in which the term "virtual" is strongly associated with digital issues, we focus on those aspects of the work that are more difficult to read and understand. The state of affairs at San Vivaldo leaves certain elements unresolved, such that one can miss a recognizable element such as the lantern of the Holy Sepulchre, or in some cases witness dumb scenes, as in the "Noli me tangere" chapel.

Enabling the fruition of the Cultural Heritage through the use of advanced technologies it's the ultimate goal of this research.

Repurposing connotative elements such as the lantern, or the Christ in the "Noli me tangere" chapel, or even repurposing proper lighting of the sculptural groups become key points in reading the work, yesterday as today.

Organising contents and experiences

This contribution, which is the basis of a larger project to enhance the site, aims to highlight some of the achievable interventions designed to better engage the worshippers and visitors and to share the information that has been collected over the years about this sacred place. The work done on the entire complex began with the documentation phase and then continued with the processing of the collected data and the restitution with digital models useful for understanding the work [3]. The collection of the data was done through digital survey carried out with the techniques of digital photogrammetry and laser scanner survey, with the first of these yielding the most complete result.

With regard to the work inside the "Noli me tangere" chapel, since the statue presents a significant lack, it was essential to combine the collection of the geometric survey data with a search for sources on the status of the complete work. Searches in paper and digital archives of images helped to form a sufficient framework for the reconstruction of the lack. The data processing phase was performed with canonical software procedures [4]. Using Reality Capture for image processing and exporting the obtained 3D mesh model in file format compatible with AR applications. The digital model containing the reconstruction component was structured by merging the detected model with that of the reconstructed part. For the modeling of the lack, the reverse engineering process was chosen starting from a clay model, hand modeled at a scale of 1:4. Digital image acquisition was performed on this and photogrammetry brought a 3D mesh model used for the completion of the lack.
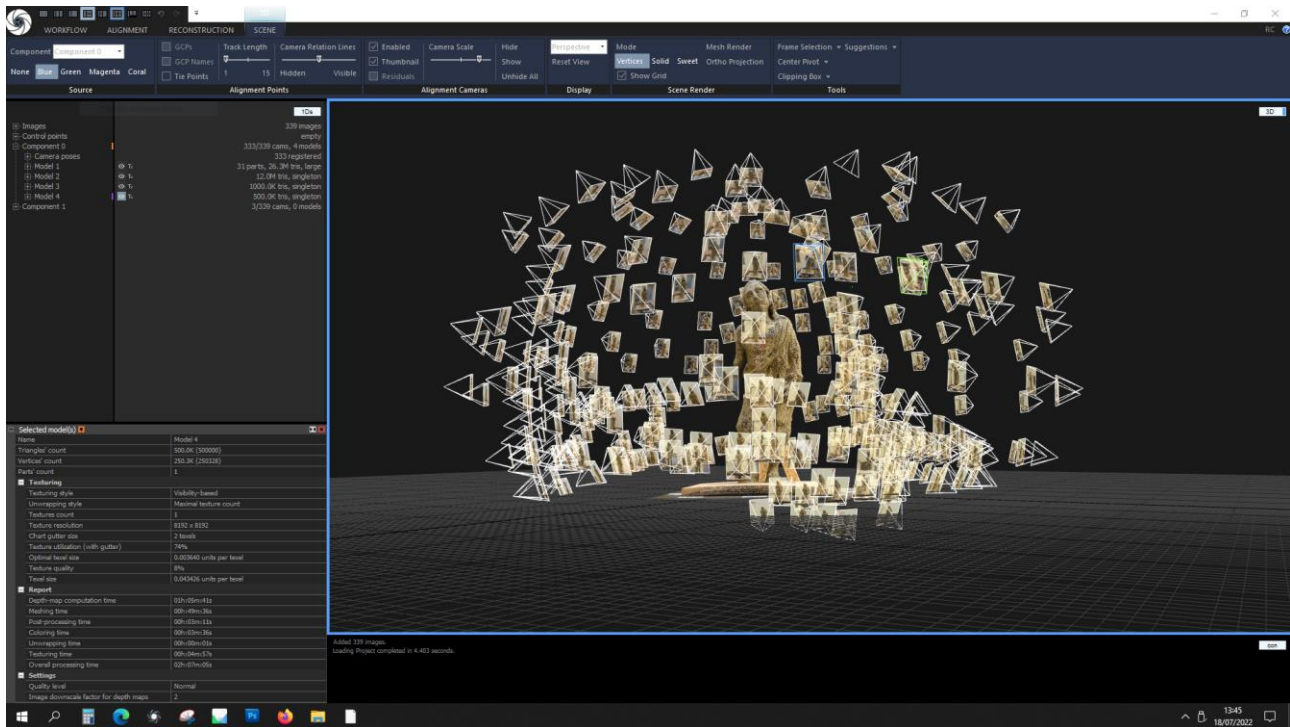
Fig. 1. Data elaboration in Reality capture (clay statue of Christ)

The realization of the AR experience is in the development phase, but the path to be followed and the ultimate goal are clear from the beginning: the need to amplify the information picture of this place that is so significant for its religious, historical and architectural value can only be achieved through the use of augmented technologies that can guarantee an interaction between the visitor and the place itself.

Content and installations will be created using dedicated software, such as Unreal Engine 5, Unity and ARkit, which will be made accessible through the use of an application or by scanning QR codes [5].

Expected results and conclusions

The valorization of built heritage is one of the issues in which new technologies and their use in a functional way have played a key role in recent years, a role that covers different stages of this process that goes from analysis to virtualization and digital archiving of the same heritage object.

In the case of San Vivaldo, to the presence of value in the architectural sphere is added the religious component, a magnet therefore not only for scholars and tourists, but also for devoted pilgrims. The desire is also to create a link with other examples of miniaturization in the city of Jerusalem, to offer a complete historical picture of this open-air religious play. The creation of Augmented Reality content and installations inside the chapels, combined with the redevelopment of the area, promises to be a decisive act in giving new life to this place.

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Author Contributions

Conceptualization: Giorgio Verdiani, Ettore Ursini
Data curation: Giorgio Verdiani, Andrea Pasquali
Formal Analysis: Ylenia Ricci, Andrea Pasquali, Rocco Dimattia
Funding acquisition: Giorgio Verdiani, Maurizio De Vita, Ettore Ursini
Investigation: Rocco Dimattia, Andrea Pasquali, Ylenia Ricci
Methodology: Ylenia Ricci, Andrea Pasquali, Rocco Dimattia
Project Administration: Giorgio Verdiani, Maurizio De Vita
Supervision: Giorgio Verdiani
Visualization: Ylenia Ricci, Andrea Pasquali, Rocco Dimattia
Writing – original draft: Ylenia Ricci, Andrea Pasquali, Rocco Dimattia
Writing – review & editing: Ylenia Ricci, Andrea Pasquali, Rocco Dimattia

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