Temporary made permanent

Turning temporary exhibitions into fixed memories

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Abstract—The museum institution deals with the study, the storage and the fruition of cultural heritage. To fulfill these functions the museum uses, as well as the opinion of experts, even the most modern technologies. In this article we present some cases in which the use of digital and virtual reality effectively contributes to increase the knowledge on cultural heritage. In the last years there have been many studies to allow cultural heritage to be preserved with great care, ensuring the memory for scholars but also for future generations. The methods for storing a cultural object are widely studied, but the best techniques to preserve different forms of heritage like temporary or intangible items, are still under discussion. In particular this article refers to the possibility of keeping track of the information contained in a temporary exhibition project, that by its nature exists for a limited amount of time before being finally destroyed or transferred. With the use of standard tools like photogrammetry and three-dimensional modeling we try to define a process in order to turn the temporary into permanent, both for archiving purposes or for allowing the public to access the temporary installation once the physical object has been dismounted.

Keywords—Temporary exhibition, temporary installation, Museum, Photogrammetry, 3D Modeling.

I. INTRODUCTION

The definition of an exhibition design goes through several stages of review and continuous deepening that come to a final point of formalization and implementation determined by time-based constraints. But often the formal development of an installation could continue in the mind of the designer, above the limits imposed by the institution or by the museum curators.

This process of cyclic examination and modification of the spatial arrangement in different phases of the project becomes even more significant when the development pass from representation to the actual implementation. The representation of space through sketches, technical drawings and renderings can not always represent the complexity of the real space and of the objects to be displayed. Therefore, during the actual implementation of the exhibit project, several adaptations can be added on-the-fly. This means that a temporary exhibit arrangement, that sometimes is a piece of art itself, assumes a final configuration not defined in that specific way in any planimetry. This paper deals with the possibility to freeze the memory of such arrangement, undocumented in its final form in any official document, through image 3D acquisition.

For testing this idea we have chosen an exhibition rich of added value given by the its arrangement, whose project was created by an architect famous for its museum design approach starting with rough sketches and continuing at physical level from a certain point. Such exhibition is “Ineffabile Perfezione”, that took place at Villa Ciani in Lugano (CH).

The exhibition was created from some general guidelines that were developed in conjunction with the curators, with an “incremental” approach, which is considered as a point of strength as it exploits the creative moment that take place during the exhibition implementation.

Therefore, relying on the representations of the exhibition arrangement before its physical building, the risk is the loss of a lot of information concerning how the actual arrangement is at the end of the process and how it is presented to the public. Starting from the arranged space for going back to its project is something in general not done, but it is actually there, when the exhibition has its startup, the most appropriate time for digitally freezing a temporary museum arrangement project.

An exhibit is ephemeral and will disappear in a very short period of time in any case. What is often not taken into account is the potential associated with the digital storage of an arrangement. For example it is possible to accurately repeat in other locations the final choices taken, which are essential for the success of the show if, for example, it has an itinerant nature. Or it could be feasible to propose it again with the same appearance after some time, extending the temporary potentially to infinity, providing the opportunity to study retrospectively any specific asset.

II. RELATED WORKS ON CULTURAL HERITAGE

In the recent years digital survey techniques and three-dimensional modeling had an extraordinary evolution. Today we assist to a proliferation in many contexts: from film to fashion, from cultural heritage to design, to the widespread applications in medical and military fields. Their growing use allowed not only a quality improvement, but also a reduction in price, with an increase of those companies providing services such as 3D scanning and virtual reconstruction.

This situation allows also the rising of professional figures aware of the issues related to virtualization of reality, with a know-how on digital survey and 3D modeling, both for capturing the real scenario with conservation purposes, and for expand reality with multiple forms of narration based on virtual models.
Considering the type of object or environment investigated in recent years, and taking into account some known cases, we find the example of several significant works. The studies on which the research has been concentrated can be divided into: (i) lost/destroyed assets; (ii) partial assets; (iii) assets in good conditions; (iv) never created assets; (v) not accessible assets. Few examples of past projects that best explain the subdivision proposal are here reported. However, rather than evidencing a subdivision between different types of applications, they mainly examines the various types of cultural heritage studied.

The first type, the lost or destroyed assets, refer to applications such as the digital reconstruction of the Great Buddha of Bamiyan, realized by the ETH Zurich, where the peculiarity was the total absence of the heritage to be digitized because it was destroyed by bombing. The statue was reconstructed using photogrammetry starting from photos taken by tourists, images collected on the Internet and satellite photos [1]. The digital model was then used for the prototyping of a 1:200 scale model.

To the partial assets belong those entire cultural heritages that we inherited only partially from the past. In these cases, the survey is carried out both to keep track of the assets in its current state, both to perform remote studies on the objects, reaching up to the virtual reconstruction of how the asset was supposed to be, preferably placing it in its original environment. These studies are a part of numerous projects such as for example the digital acquisition of the Forum of Pompeii [2] or the Etruscan Tombs of Tarquinia [3], for interpretation, conservation and visiting purposes in the field of Archaeology.

The survey and reconstruction of assets in good condition may have several purposes, including the possibility of studying remote heritage or the possibility to enjoy in exhibitions or virtual paths. A case of assets in good condition but accessible to visitors for a limited time because of their deterioration, led to the reconstruction of the Sacrofano Chapel in Padua, where particular attention to virtual visits has been paid. In this case the creation of a multimedia workstation by the Wiegand Multimedia Center was provided, which, besides offering a visual reproduction of the entire structure, allows to query the frescoes and provides different ways of “reading” it according to the topic treated or to the space distribution of pictorial elements [4].

An example of assets ever created, but reproduced digitally, can be found in the project realized by Fondazione Cini in Venice, together with architect M. De Lucchi and Factum Arte in Madrid, whose cooperation saw as a final output of the exhibition "The Arts of Piranesi: architect, engraver, antiquarian, landscape artist, designer", which would have been impossible without the use of most advanced technologies of representation. The exhibition presents numerous works designed by Piranesi and re-created from scans of drawings of Piranesi, passing through the 3D modeling that were then prototyped [5].

The not accessible assets, finally, are all those cultural heritage that can not be achieved by the visitor since they are in places difficult to be access, are preserved in museums that do not have space for displaying or are closed to the public because the visits could affect the state of conservation. In these cases the digital reconstruction make accessible these places or these works, giving back to the object the value of cultural heritage through its valorization. The reconstruction of the tomb of Tutankhamun, Seti I and Nefertari is a project realized by the University of Basel and consists in the survey and reconstruction in high resolution of Egyptian tombs, with the purpose of achieving the 1:1 scale models and make them accessible to the public [6].

III. ABOUT THE MUSEUM AND ITS FUNCTION

Another aspect taken into account in this experiment concern the functions of the museum, how these have been joined by new technologies and which are the areas in which design can intervene to point out new paths and design ideas.

The definition given by the International Council of Museums in 2007 [7] indicates that the functions of a museum regard: archiving and preserving the works of art of the collection, studying and researching on works and displaying to the public, allowing everyone to access and use. The first two functions have been extensively studied and remain to the judgment of experts in the field, but several studies can be done for the exhibit function. From the exhibition design, taking into account the various factors involved (the host site, types of information and narration, types of users, etc...) to the innovative solutions in terms of interfaces that would facilitate the use of knowledge and communication.

An example of an educational model is given from edutainment, a form of education based on fun, in which knowledge is available to everyone, with the addition of a dynamic and entertaining aspect, a museum in which one goes for distraction, having fun and wonder. The risk in the use of this strategy is to not find the right balance between education and entertainment. "The entertainment is still a fundamental dynamic and entertaining aspect, a museum in which one goes for distraction, having fun and wonder. The risk in the use of this strategy is to not find the right balance between education and entertainment. "The entertainment is still a fundamental strategy by which American museums work to talk to the public and to organize own paths, aimed mainly to the narration and therefore the involvement of the visitor rather than the exploitation of individual objects." [8].

The introduction of stunning effects, touch screens, films, reconstructions, period rooms, holograms, etc, can create the opposite effect to that desired, i.e., an exhibition of technology that emphasizes only the highest state that the electronics came today, instead of using it as a way to learn more. The Museum of Ercolano (Naples) is a good example of massive introduction of technology [9], the experts fought on the quality of the result, divided between those who exalts it for the new way of enjoying the content and those who compares it to a media circus.

IV. TEMPORARY MADE PERMANENT

Starting from the previous considerations, we tried therefore to identify new fields of application of the 3D restitution techniques, finding in the temporary exhibition a field that has not yet been studied. These realities are becoming more present and more successful, but today all temporary exhibitions, being limited in time, does not have a proper conservation. At the end of an exhibition that was staged, visited and then dismantled, nothing remain but a catalog and some photographs, which probably are not sufficient to store the narration that they wanted to communicate.

The exhibitions also lend to the transmission of knowledge, that the museum should be able to transmit for two reasons:
firstly, the presence of artistic or cultural heritage is the primary reason why an exhibition can be considered as a collector of knowledge, on the other hand the same exhibition has been mounted from a path which involves choices that, from the design point of view, are very important to be preserved. According to Marani [10], the exhibition is a place of metaphor, the place of representation of all values that should be stored or communicated better with the preservation of materials related to the exhibition. In his book he also emphasizes the importance of the story, so that displaying means telling a story and the objects serve to tell this story.

The relationship exhibition-tale puts in light that an exhibition design is a way to communicate information, as well as the architectural space, the materials and graphics used. Among the several experiments that can be applied to cultural heritage, then, we decided to investigate the survey applied to the temporary exhibitions. The goal is to make permanent, virtually, something occurring for a limited time.

V. CASE STUDY

The following case study was conducted in the City of Lugano (CH), where from 28 October 2010 to 28 February 2011, there was an important initiative dedicated to the oriental culture: Nippon, between myth and reality: art and culture from the Land of the Rising Sun. Within the four exhibitions dedicated to the Japanese ancient and modern art, the exhibition taken into account was “Ineffabile Perfezione” (Ineffable Perfection), consisting of a collection of hand-colored albumen photographs, made in Japan between 1860 and 1910. The visit allowed to explore the technique, the combined use of cameras and craftsmanship, Eastern Europe, and from an aesthetic point of view. The photographs, painted sometimes with thin brushes (for some details were also used instruments consist of a single hair) were then enclosed in an album sold as souvenirs to Western travelers. The pictures want to represent the Japanese culture, the subjects of the works were indeed monks, geisha, or ordinary workers.

The preparation of Ineffabile Perfezione (Ineffable Perfection) was quite articulate because they wanted to recreate the atmosphere of a Japanese garden and it had to be visited as a "walk" in the oriental culture. Since the exhibition stationed in the rooms of the ancient Villa Ciani, whose origins date from the early ’500, there were many structural elements that were not part of the exhibition: painted ceilings, decorated stairs, mirrors and other objects that however, have been well integrated into the tour.

VI. DIGITAL SURVEY AND MODELING

The survey was conducted at Villa Ciani, limiting for this study the acquisition to the first three rooms of the exhibition.

The photographic survey operations were conducted with the following equipment: Canon EOS 5D Mark II; Canon 20mm lens; Canon 50mm lens; Manfrotto tripod; Kodak color scale; laser meters distance-meter; metal rule.

During the work two sets of images for each wall were carried out, one for the texturing and one for the process of photogrammetry, omitting the details of individual items displayed, both for reasons of time, and for a motivated lack of interest in registering all the elements.

Regarding the texturing, also ceilings and floors were photographed in order to subsequently re-create the texture to be used in rendering engine. In the images was also recorded a Kodak chromatic scale allowing to obtain texture as close as possible to reality. For the photogrammetric process, performed with a focal length of 20 mm, two photographs were taken for each cross wall. Despite the focal length used to frame allows a wide area, the limited size of some rooms, caused the loss of some details that it has been necessary to search in other shots. Parallel to the photogrammetric survey, direct measurements of the main objects in the rooms were taken in order to quickly reconstruct the main architectural volumes possibly without the need of the photogrammetry. The camera was calibrated using the iWitness software for both focal lengths and, once obtained the distortion parameters, we created a new camera in the PhotoModeler software, with which the entire process of photogrammetry was completed. For the restitution process three different processes of photogrammetry were made, one for each room, starting with the coupling of two converging images of a same wall and adding each time the image of the next wall.
Once finished the photogrammetry, the scale and orientation have been set through reference measurements and the model was exported via DXF format in Rhinoceros to model all the objects.

Once obtained the full model, the 3D model was exported in Cinema4D in order to set the lighting and textures. Before proceeding with the assignment of texture the lights have been set, trying to remain as close as possible to natural and artificial lighting. The images used for texturing were first corrected with Photoshop using the ColorChecker. Interacting with the levels we tried to restore the correct RGB components thus eliminating the color components derived by the lights and reflections present in the rooms, so as to achieve to the entire frame a color appearance as close as possible to the real one. To create the shaders seamless, some samples to be repeated later in the rendering engine were extracted from correct photographs, also going to manually delete the shadows or small defects.

For the final renders were used Global Illumination and Ambient Occlusion algorithms in order to simulate more accurately the illumination of rooms.

Below is a render of the final result of the project.

The global time needed to complete the 3D digitization of this sample exhibition was 157 hours, divided in:

- On-site survey: 5 hours;
- Photogrammetric processing, room 1: 10 hours;
- Photogrammetric processing, room 2: 25 hours;
- Photogrammetric processing, room 3: 10 hours;
- Modeling: 80 hours;
- Setting lights: 5 hours;
- Preparation of textures: 20 hours;
- Setting render: 2 hours.
Once obtained the model of the three rooms some uses were hypothesized, particularly interesting is considering the possibility of creating a catalog of the exhibition not limited to the use of images and text, but a catalog which allow to navigate inside the rooms and to interrogate the environment in order to obtain prompt information of the elements contained. For this reason there have been some preliminary tests on the transposition of these data within software capable of managing 3D models to generate an app containing the 3D model of the exhibition.

Finally, some critical aspects of the process were identified in order to improve it in future applications. Among the problems identified, it was possible to note that having in the process of survey an adequate lighting, dividing a priori the areas of greatest interest (in this specific case the mounting) from those of lower interest (architecture) and then, realize photographs that take account of this distinction, or finding more information on illumination present, such as temperature and light intensity, lengthen the time of the survey, but can significantly reduce time of image processing and modeling, that are the most expensive part of the process.
VII. CONCLUSION

The developed case study analyzed an area of interest in which image based 3D digital acquisition and modeling has several possible uses: the temporary exhibition. The examples taken into consideration during this research show that the use of digital technology is already widely used to enhance, maintain or studying cultural heritage. The 3D digitization finds here an application that increases the value of assets that otherwise would not be adequately protected. As a matter of facts for an exhibition usually only a catalog of photographs remains. The exhibition has instead its own value in storing and displaying objects in a certain way involving an implicit storytelling, a message that must be grasped by the visitors and that only the physical arrangements of objects can adequately reproduce.

In this experiment a procedure for a virtual reconstruction and survey has been tested, highlighting the strengths and critical areas on which it is advisable to pay attention for optimal results. Archive the temporary nature of an exhibition allows us to keep the memory of the project. The application of such digital technologies seems efficient for all three pillars at the base of the concept of museum: study, exhibition and archive. The methodology developed for this archiving approach allows a "sustainable" approach and its implementation can be calibrated according to the complexity of the exhibition and to the economic resources available, evaluating the number elements to be surveyed and the level of detail of the graphic representation.

The implementation of this technique allow to obtain a model navigable and queryable. The digital document in addition to being the document of an absent asset can afford to move into it with links to images videos and other sites and especially can get additional information on the context on the curator and on the exhibition. The new media allow to combine all this information on a website or a downloadable application on smartphones, or any tablet PC, in this perspective anyone without advanced computer skills can access a virtual model and all the information contained in it.

The catalog of the future as well as in the classic print version may be formed from an app allowing a different way of enjoying all the knowledge that deserve to be protected and that the designer wanted to transmit through the experience of visiting the museum.

REFERENCES