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The Virtual Recreation of Mani's Auto de Fe (1562): Methodology and Approach to an Historical Event

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***Abstract* – In the context of heritage conservation, an important and recently developed part of any project is its virtual restitution. Virtual modelling is a growing discipline, used for various purposes, both academic and recreational. Thanks to the use of 3D reconstruction and augmented reality, it is possible to reconstruct an historical event and create an interactive experience aimed at a large audience. *Praeteritas Urbes*, in collaboration with INAH (Museo Regional de Palacio Cantón) and a multidisciplinary group of researchers, intends to reconstruct an important historical event for the history of the colonial period in the Mayan area, the *Auto de Fe* of Maní of 1562. This article discusses the methodology used to conduct the project, including the process of the virtual reconstruction of the former convent of St. Michael the Archangel, the virtual recreation of the historical characters, and the curation of a virtual museum exhibition.**

I. INTRODUCTION

The use of virtual recreation in preserving Cultural Heritage is gaining more ground in recent years, bringing with it advantages, but also methodological problems that need to be occasionally addressed. The advance of modern technologies allows a new way of interacting with cultural heritage and the possibility of reaching a very large international audience. The main purpose in using digital media is to break down the barriers that can lead to the inaccessibility of many artistic, archaeological, or architectural assets, effectively making accessibility to cultural assets more inclusive.

The basic goal of the projects carried out by *Praeteritas Urbes* focuses on in-depth research and investigation that aims to reconstruct both tangible and intangible cultural heritage through the use of virtual recreation.

The potential of the use of tools related to virtualization have led to the search for basic principles that can guarantee greater reliability of the virtual models created for simulations and to better document weaknesses and documentary gaps in the reconstructions.

The first document compiled for this purpose in the field is the London Charter (https://londoncharter.org/), of 2009, which in addition to founding the basic principles behind computer-based visualisations, also aims to establish a rigour in the field of cultural heritage and provide recommendations and guidance for visualization projects.

The principles established by the London Charter were subsequently expanded in 2017 by the ICOMOS General Assembly, which established what has been defined as the Principles of Seville, i.e., International Principles of Virtual Archaeology [3].

II. CULTURAL HERITAGE THROUGH VIRTUAL REALITY

The use of virtual recreation arises from the desire to create a wider interaction with specific aspects of Cultural Heritage, not limited to merely the academic world, but also to a wider audience that also includes small communities and their member soften the heirs of the historical events that have been recreated. In each project, information of a historical nature, especially concerning the characters involved in the events, is combined with architectural and archaeological information, and the use of technical elements.

The strategy adopted by our group starts from an assumption of an educational nature, however the goals of each project also consider how the emotional factor also helps in the learning process. Understanding can lead to historical empathy, which is, feeling emotional identification with something or someone; improving the

perception of a cultural object can directly lead to empathy for it [1].

III. THE "AUTO DE FE"

The current project started in 2022, now in its final phase, is the virtual recreation of the *Auto de Fe of Maní* dated in 1562. It was an inquisitorial style Auto de Fe held by the friars of the Franciscan monastic order led by the local Provincial, Fray Diego de Landa. In this event, a considerable number of cult images, sacred objects, and hieroglyphic codices [books] of Mayan culture were destroyed and incinerated, leading to the condemnation of a large number of people accused of practicing their traditional religion [called "idolatry" by the friars].

The inquisitorial *auto de fe* served as a processional and penitential ceremony of public repentance. The most important and central aspects of an *auto de fe* ceremony included:

1. The procession of penitents
2. The procession of the Tribunal's officers
3. The Oath of Faith and the Solemn Mass
4. The Sermon of Faith
5. The Reading of the prisoners' sentences
6. Abjurations and reconciliations of sinners/penitents
7. Execution of the Punishments [4]

Among the various approaches of this projects, three main aspects stand out: the complete architectural study of the former convent of St. Michael the Archangel in Maní and the plaza where the event happened; the investigation of one of the most important historical events related to this construction during the 16th century, the *Auto de Fe de Maní* of 1562; and finally, the use of new technologies combined with experience in the real world to bring people much closer to the historical event.

The work was carried out in four main stages:

- historical research
- the architectural study
- the recreation of characters and assets
- the reconstruction of the objects of the virtual exhibition

Fig.1. Satellite image of the north of the Yucatan Peninsula with Mani location (source: Google Earth)

A. Historical research

The historical study collected information from various sources whose purpose focused on the virtual historical recreation of the event linked to the *Auto de Fe* and complemented it with the architectural study carried out in the former Convent of St. Michael the Archangel.

The main sources used are the testimonies and stories rescued from the archives, which as primary sources provided first-hand information about the events that occurred in 1562 (see Archivo General de Indias, Escribanía de Cámara, 1009A). Works that are based on this primary source information and that provide valuable data for research are, for example, the published volumes of "Don Diego Quijada, Alcalde Mayor de Yucatán" that offers transcriptions of selected archival documents linked to Don Diego Quijada, and fray Diego de Landa who both participated in the Auto de Fe. Some of the trials of the Mayans accused of committing "idolatry" are also contained there and the rest are found in the General Archive of the Indies [5].

These sources were then cross-referenced with other contemporary and ethnographic sources, especially for the details of the scenes and the clothing of the characters involved in the historical event [4].

Finally, some archaeological sources from studies conducted in the surroundings of the former convent provided hypotheses for the reconstruction of some of the historical stages of the constructive elements and the Auto de Fe. Thanks to the 2015 project of the archaeologist Dr. Tomás Gallareta, it was possible to recreate these elements based on the evidence found in situ during the archaeological excavations in the plaza of the town of Mani. Some examples of these elements are the thatched roof structure that served as an Indian chapel and which was attached to the convent, and the discovery of the location of the actual bonfires where various objects were burned during the Auto de Fe located at the end of the municipal plaza of Maní.

The historical study which formed the basis of the project allowed for the documentation and use of an Historical-Archaeological Evidence Scale for the Virtual Reconstruction, which offers a method for the visual representation of the historical and documentary authenticity of the virtual reconstructions. [6] (Fig. 3).

Fig.2. Proposed theoretical reconstruction of the ex-convent during the Auto de Fe in 1562 (model by Antonio Rodriguez Alcalá, Luis Díaz de León and Hans B. Erickson)

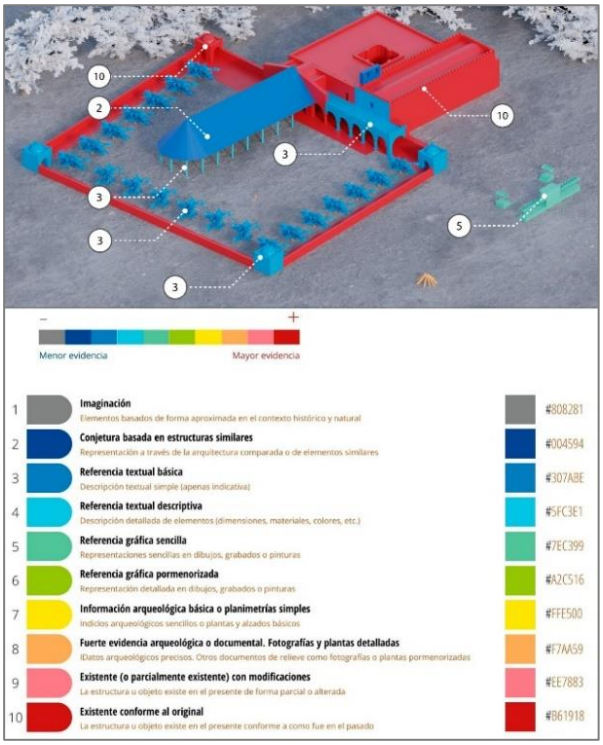

Fig.3. Proposed reconstruction according to the Historical-Archaeological Evidence Scale (process by Luis Díaz de León)

B. Architectural study

One of the most important steps for our project focused on the proper reconstruction of the former convent of St. Michael the Archangel as it may have existed in 1562. The methodology for architectural reconstruction consists of the review of initial documentation (bibliographic and fieldwork), an essential basis for defining the final model of the reconstruction proposal.

For the historical documentation, the investigation of primary sources was carried out in the Archive of the Archdiocese of Yucatán and the historical archive of Yucatán; as well as from secondary sources of different authors referring to the former Convent. In these sources it was possible to find descriptions of the building and its construction stages through the centuries with photographs of the main façade from the late 19th through the 20th century.

On the other hand, the architectural group carried out organoleptic analysis in situ, identifying construction elements, joints, failures, and any useful information for the work. In addition, the team conducted interviews with the Maní population using ethnographic techniques with key actors in the community to obtain more information of the building from people who inhabit it or had inhabited it.

Essential elements for the reconstruction are the photogrammetric models of the Convent, which were divided into three different models according to their scale. First, the team made an analysis of the context of the convent, an aerial photographic model of the immediate blocks to the convent was made and with satellite images of the Geographic Information System of the Yucatan Institute of Legal Security (INSEJUPY) and Google Earth. Secondly, we carried out an analysis of the presence of vernacular architecture in the Mayan houses and the existing colonial constructions, as well as the identification of important buildings of the community, such as the chapels of the neighbourhood centres and some important natural heritage elements such as the cenotes, botanical evidence, and the town block centres full of vegetation characteristic of the local landscape.

The second data point was focused on the exterior of the ex-Convent through an aerial photographic series of shots using a drone (500 photographs), and the third a photographic series of shots of each of the interior spaces (12,000 photographs) expanding upon the information collected in the previous steps of the process. This data facilitated the possibility of contrasting the information obtained through the different stages, by obtaining the photogrammetric models in the Agisoft Metashape program (version 2.0.2). Finally, the model was completed adding possible missing polygons in Blender (version 3.1) for their subsequent integration into the Unreal Engine (version 5) used for the VR reconstruction. (Fig. 2).

Fig. 4. Francisco de Montejo Xiu (recreation by Maria Felicia Rega; render by Zoraida Raimúndez Ares)

C. The recreation of historical characters and assets

The third step of the project was the creation of the historical characters involved in the *Auto de Fe* and the assets that were part of the various scenes of this historical event. The process of creating the characters as well as the assets the design team carried out through the use of Blender software. Blender is a free program that allows modelling and animation, along with texturing and rendering of objects, structures, and characters. Before using Blender, each character was created with the MakeHuman software, an application also open source for the creation of humanoid prototypes that can be modified according to some parameters and phenotypes. The clothes and other accessories, after being modelled in Blender, were textured with Substance 3D Painter (version 7.2), which allows for creating fine and realistic textures of the clothing. The software includes alpha materials, textures, and images, but it is also possible to download or add others from various sources.

Each character and their roles in this historical event followed a specific order, according to historical sources. The characters included in the scenes were of various types: on one hand, Spanish friars and officials, for whom we have many historical sources; and on the other hand, Maya characters of various kinds, some of whom were used as spectators or populated the house plots of the village around the main plaza, and others who were the main characters or protagonists of the event, many who were penitents or convicted idolaters, wearing a specific costume called a *sambenito* that bears their name and their crimes/errors: "*…en el dicho auto se sacaron los dichos naturales desnudos y con corozas y sogas en las gargantas y candelas en las manos alrededor de la plaza del dicho pueblo de San Miguel de la provincia de Mani…"* (DDQAMY, 1938, vol 1. 295 [2]) (Fig. 4).

For each character, where possible, information has been extracted from the various historical sources available, both written and visual, so that the physical characteristics are as similar as possible to the historical reality of the moment. The information that is known about these characters is limited. In some cases, little information is known, such as their age in the year of the Auto de Fe, as is the case with Spanish officers, but, for example, there is no information about some of the friars and Maya penitents other than their names other than their names. In an exceptional case, the appearance of the character is known, as is the case with Fray Diego de Landa. Two portraits of Diego de Landa are currently preserved. One of them is currently in the Convent of San Antonio de Padua, Izamal, Mexico. Another can be seen in the bishops' gallery in the chapter house of the Cathedral of Mérida, Mexico.

As for the Maya characters, in the process of creation we followed the Maya phenotype of the characters which were re-created from historical sources adding comparative data with the contemporary Maya population, especially from the Yucatan peninsula and the region around the town of Maní. A similar approach was used for the creation of the characters' clothing. Where possible, we used written sources dating during the XVI century, describing the Maya dress and clothing and the textile materials, for which we can add ethnographic comparative data [5]. Some of the clothes, especially the *sambenitos* similar to those worn by the convicted Mayas, are exhibited in museums, and were used as models for the creation process. As for the appearance and clothing of the Spanish officials and friars, our design team utilized information from iconographic data such as XVI century paintings representing the colonial upper classes of that time, including sources on friars, soldiers with their armor and weaponry from the decade of the 1560s, along with evidence about other possible characters.

In addition to the recreation of the main square of Maní and the former Convent of St. Michael the Archangel which served as a backdrop to the events, our gaze, as mentioned, also moved to the population who lived in Maní, from the reconstruction of their houses to the recreation of the objects of daily use which also included Maya work in the kitchens and in the milpa. Many of the objects used by the Maya are still in use in some geographic areas, for example the mano and metates for grinding maize. Our team also used archaeological models coming from excavations from the Maní region and held in local museums. In the case of ceramics, the creation process took advantage of technical drawings of ceramics in use in the XVI century in the Yucatan Peninsula. The decision to also show the daily life of the Mayas of Maní has the aim of bringing us closer to the more human

aspects of the historical recreation as well as to the modelling of this important historical event, and to bring the current communities closer to their history and cultural traditions.

Fig.5. Example of a 3D photogrammetric reconstruction of a Maya figurine (by Antonio Rodriguez Alcalá, Luis Díaz de León and Hans B. Erickson)

D. The reconstruction of the objects of the virtual exhibition

Another aspect of this project was the physical and virtual museum exhibition called "*Ídolos: Resistencia y persistencias mayas*", dedicated to the artifacts and other elements that somehow survived the *Auto de Fe* and are part of the collection of the Museo Regional Palacio Cantón in Merida, Yucatán.

Part of the physical elements such as the pieces of the exhibition were digitized as 3D models using photogrammetry, which allowed for faithfully reconstructing the pieces and making them accessible to the public (https://p3d.in/jiJ3R) (Fig. 5).

The methodology used for the photogrammetric process consisted of taking images from the pieces *in situ* and processing the accumulated data through specialised software such as Photoshop and Agisoft Metashape and later post-processing of these models in Blender and Substance Painter (Fig. 6).

The archaeological pieces were categorized following the details and descriptions in the Museum catalogue itself.

The virtual exhibition will be accessible generally to the interested public without cost and located in the virtual reconstruction of the interior of the former convent of St. Michael the Archangel. In addition to being able to visit the exhibition, the final recreation will allow for a virtual tour of the interior of the convent complex. In this way, the architectural heritage, its history, and related historical events and cultural objects can be approached in a virtual setting that values all aspects of the cultural heritage integrated into this project.

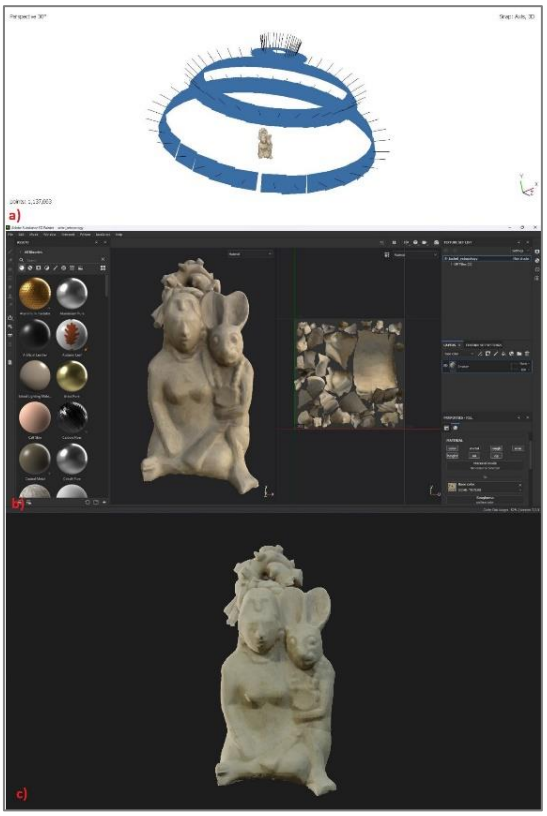

Fig.6. Workflow of the photogrammetric process using a) Agisoft Metashape b) Substance Painter c) Blender (process by Zoraida Raimúndez Ares and Maria Felicia Rega)

IV. DISCUSSION

Methodologically, historical reconstructions need to have clearly marked spaces to testify to the veracity and origin of the documentary sources that support the various parts of the reconstructive visual hypotheses. That is why in each project our research group included diverse “origin codes” that provide evidence of the sources used. In this way, readers can evaluate the veracity of the reconstructed simulations by themselves, offering spaces for the correction and addition of the next cycle of knowledge.

Each of our working teams has its own production and validation dynamics of its processes and products; however, it is important to mention that the final validation of all processes is given by the end users of the exhibit: i.e., academic peers and the general public. Through exit surveys, guestbooks, and other data collection techniques, users of the exhibit provided valuable feedback to teams.

In the exit survey of 60 participants, 60% mentioned 5 they did not know about the Auto de Fe de Maní. Those who did know about it mentioned they had only heard of it in their elementary, secondary or university education. More than 65% of users considered that the violent actions of the Auto de fe were unnecessary and more than 90% considered it to be of great importance for the history of

Yucatán. A total of 85% of those surveyed considered the exhibit to be of high educational and cultural usefulness. Finally, in the qualitative comments written by users, they mentioned having enjoyed the reconstructions and AR applications as well as regretting the lack of more information in English, which due to the urgency and logistical issues could not be completed in time for the exhibit´s opening.

Thanks to the use of historical sources, it was possible to insert hundreds of characters in the virtual recreation, including more than three hundred Mayas, Spanish officials, and friars. The order of the procession, the structures and objects of the scenes were inserted following a well-defined order and using the Unreal Engine 5 software for the final animation [Fig. 7].

The use of immersive reality has allowed visitors to see first-hand the scale of the events and the reconstruction not only of the main square of Mani, but also of the houses that made up the city, with a small glimpse into the daily life of the Maya in 1562.

Fig.7. View of the Auto de Fe recreation in Unreal Engine (process by Hans B. Erickson)

V. CONCLUSIONS

Collaboration that involves the interdisciplinary work of an international research group implies significant challenges, not only in the dynamics of interaction and logistics necessary to carry out cultural historical recreation projects. Any such historical recreation project must first set a priority to decide upon the theme and narrative thread of the proposal, so that the project is coherent, respectful of the historical actors and characters portrayed, and that it has robust learning strategies for the target users. In this sense the "whole" is much more than the "parts".

The methodological approach presented in this paper defines a typical project cycle which has not been closed or concluded. It is always possible to incorporate new evidence, documentation, and approaches that enrich the proposal, or incorporate new technological tools to improve the simulation and recreation. In essence, the primal components that make up a proposal for a historical scenario (primary sources, architectural and archaeological evidence, among others), must be considered and submitted to the characteristic scrutiny of any new approaches and technologies and make use of them, to shed new light and evidence on the historical facts under study. In effect, these projects are created to exist and adapt to constant review and data input, making them living representations of our ongoing interpretations of the cultural heritage of our past.

VI. ACKNOWLEDGMENTS

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