From Print to Pixels: Prototyping a Virtual Exhibition for the Faro Museum Poster Collection

Alexandre Martins(✉), Jorge Carrega, Rui d'Orey, and Bruno Mendes da Silva

Centro de Investigação em Artes e Comunicação, Universidade do Algarve, Faro, Portugal
{acmartins,jmcarrega,rldorey,bsilva}@ualg.pt

Abstract. In 2022, CIAC - Research Center in Arts and Communication and the Faro Municipal Museum began a cooperation to study, enrich and disseminate a unique poster collection that belonged to the Portuguese scenographer Joaquim António Viegas. It comprises 330 illustrated posters from the cinema, circus and advertising industries. This partnership entails the coproduction of multiple exhibitions about the collection, but also future research of the materials that form this important heritage. One of the objectives/aims of this work is to develop a website which will collect and present the information about the poster collection, while also serving as a platform to show virtual exhibitions of the same collection. In this paper we present the initial stages of the development of a 3D real time exhibition which is intended to open simultaneously with a physical exhibit of the posters dedicated to early Italian cinema - scheduled to be inaugurated in March of 2024. We will describe some of the first steps we have taken so far which covers the exploration of tools devoted to building 3D environments, the tasks we already achieved and lay down a couple ideas for the future of this project. We hope the prototype we present here might function as a model and a proof of concept for digital representations and reinterpretations of future exhibits of this singular legacy.

Keywords: Virtual exhibition · Movie posters · 3D Rendering · Virtual room prototype · Unity engine

1 Introduction

Joaquim António Viegas (1874–1946) was a painter and a scenographer who developed his professional career in some of the most important entertainment venues in Portugal including several of the first cinemas in the country, such as the Chiado Terrasse in Lisbon, or the High-Life Hall in Oporto. During the first two decades of the 20th century, he assembled a collection of 330 posters, consisting of three thematic groups: Cinema; Circus/Variety; and Advertising[1].

[1] Even though all posters can be considered advertisements, the great majority consists of show industry examples. The other part comprises ads for canned food, beverages, tourism destinations, an insurance company and even a Harley Davidson dealership.

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The collection, donated to the Faro Municipal Museum in 1990 by Viegas' descendents, includes extremely rare specimens in the world and unique ones in Portugal. The cinema set features 141 posters, dating from 1904 to 1916, including 68 from France, 43 from Italy, and around 30 from Germany, Scandinavia, and North America [6].

Signed by the most notable illustrators of the early 20th century, such as Cândido Aragonez de Faria, Leopoldo Metlicovitz, and Maurice Lalau, these posters represent emblematic works of European silent cinema, such as *Les Victimes de l'alcool* (G. Bourgeois, 1908), *QVO VADIS?* (E. Guazzoni, 1913), and *Fantômas* (L. Feuillade, 1914). They constitute a representative sample of movie poster art in the early 20th century and a valuable testimony to the role they played in the development of cinema as a cultural industry.

For several years, CIAC - Research Center in Arts and Communication (University of Algarve) and the Faro Museum have been developing a fruitful collaboration in the field of exhibition curation. Thus, in July 2021, the museum inaugurated the exhibition "1907–1914: a primeira era de ouro do cinema francês na coleção de cartazes de cinema do Museu de Faro" (see Fig. 1), curated by CIAC, which presented a collection of 33 rare French cinema posters from the first two decades of the 20 century [1, 4].

Fig. 1. Advertisement for the French poster exhibit "1907–1914: a primeira era de ouro do cinema francês na coleção de cartazes de cinema do Museu de Faro", held in 2021 in the Faro Municipal Museum (Source: Faro Municipal Museum)

In February 2022, this same research center signed a protocol to collaborate with the museum. The purpose of this new cooperation is to study, enrich and disseminate the collection through multiple national and international exhibitions, as well as the production of conference papers, articles in journals, book chapters, and future catalogs[2] - all created from the research of these cultural artifacts.

We say future because the Faro Museum has published in 2021 a catalog entitled *Cinema em Cartaz* [6] about the collection of cinema posters which included, among others, texts by Jean-Louis Capitaine, Adelaide Ginga and Marta Mestre. Even so, the

[2] The research is currently being produced by the CIAC's Film Studies research group, and other academic national institutions which are currently in talks to formally join this venture.

collection still offers multiple possibilities for unexplored approaches, i.e., the study of film production companies, of illustrators and studios, of circus numbers and variety artists, or of the advertisement culture and industry in the early 20th century.

Also due to the fact that the Faro Municipal Museum currently does not own an official website where it can display and promote its different objects, and the only information about the poster collection comes from the Faro City Hall which only dedicates a single paragraph of information about this important cultural heritage and four low resolution illustrations [7], another goal for this project is to create an open-access digital platform, where these posters will be made available in a digitized version. Furthermore, it will serve as a space to access all the scientific knowledge that emerges from the research of these objects, i.e., papers, book chapters, catalogs, etc. Finally, this online platform will also give us the possibility to host recreations and reinterpretations of the poster exhibitions held at the Faro Museum - and possibly other national and international museums - in a digital real-time 3D environment.

Between the different small-scale initiatives already promoted by CIAC, which include various scientific communications about the collection [9, 10, 25, 29], for the next stage of this project, CIAC and the Faro Museum will organize its next poster exhibition entitled "A ascensão do cinema italiano através da coleção de cartazes do Museu de Faro".

Scheduled to open in March 2024, this exhibit, which brings together twelve large Italian posters (see Fig. 2), is intended to be accompanied by a virtual exhibition - presented simultaneously with the opening of its physical counterpart. This might allow us to show posters that cannot be presented physically due to its state of preservation: three new ones to be more precise, which are incomplete (missing half of its entire page) or in a poor condition. We could also add new information and other forms of media which are not possible to integrate in the former exhibit.

Besides that, this second concurring event will enable other types of public to learn about an important period in cinema history and discover posters whose artistic and cultural value deserves to be recognized, without the need to travel to Faro during the limited timeframe of the physical exhibition - estimated to have a duration of five to six months.

2 Museums in the Twenty-First Century

The landscape of museums is evolving. They are now acknowledged as having a significance that extends beyond the presentation of objects and artworks, or their preservation and research. Because of this, museums in the twenty-first century are prioritizing their communication strategies and attractiveness, enhancing the visitor experience and enabling a deeper understanding and engagement with our cultural heritage. They aim to create an enjoyable visit while also serving as social and cultural hubs, drawing both tourists and residents alike. For individuals to revisit a museum, these institutions usually have to offer new and engaging exhibits that might provide flexible contents. According to Pescarin [23] studies have associated engagement or attractiveness of museums with exhibits that have narratives which could be rendered through information and communication technologies (ICTs) and through virtual museums.

Fig. 2. Three Italian posters from the museum's collection. From left to right: *Amore Pacifico* (1915), illustration by Atelier Butteri; *Gli ultimi giorni di Pompei* (1913?), illustration [unidentified]; and *Scienza Fatale* (1913), illustration by Leopoldo Metlicovitz (Source: Faro Municipal Museum)

While curators' responsibilities encompass the preservation of collections, their exhibition and communication, or the acquisition of new objects, nowadays their roles are expanded to also include the insurance of scientific accuracy and quality of digital content, maintenance of clarity in communicating concepts to specific groups, selection of appropriate communication channels and media, and integration of digital elements into museum operations. They must also consider the innovativeness of technology in terms of visitor engagement and comprehension - interactivity, visualization, immersion and user-friendliness [13, 23].

We find ourselves amidst an era where ICTs have a profound influence on cultural heritage, an impact that remains to be fully perceived and understood. The potentials inherent to these technologies are opening fresh perspectives for experiencing cultural heritage, which encompasses aspects like visualization, representation, interaction, exploitation, enhancement and dissemination [2]. When effectively integrated into museum itineraries, digital programs take up an important position. Interactive virtual exhibitions or museums hold great potential that should be thoughtfully developed, to meet visitors' expectations while remaining attuned to the requirements and needs of curators.

Since the beginning of the 21st century, the concept of virtual museum has evolved to incorporate ideas like simulation or an interactive reading of the different potential realities of cultural information, becoming complex communication environments with interaction and immersion in 3D reconstructed settings. They can be classified based on different criteria, such as their content, interaction type, duration, communication style, level of immersion, distribution method, scope and sustainability level [3, 16]. These digital hypermedia objects are interconnected by a shared objective, an interdisciplinary theme, a concept, an idea, an individual, etc.; are presented in both 2D and 3D formats; at times, are stored across distributed networks; and can be accessed through modern

technologies and a system architecture specifically designed to provide users with novel experiences.

Some advantages associated with these types of presentations are the promotion of the cultural legacy safeguarded by institutions; its role as a pedagogical tool; access to valuable artworks or documents without significant risks; availability of documents and papers that may otherwise be inaccessible; long-term accessibility, as they are not limited to a specific event; availability for users worldwide, enabling visits regardless of geographical constraints; or the potential to serve as an online repository for information related to physical exhibitions [14, 17].

And while it is challenging to replicate the sensory and emotional significance of its physical counterpart, web-based virtual experiences have additional benefits like the direct access to culturally rich content from personal computers or mobile devices; freedom to explore content based on individual preferences; possibility to save, store, and reuse content for personal use; or flexibility to establish connections with other virtual exhibitions or external sites through external links [14, 20].

Overall virtual exhibitions provide flexibility by adding new components - or modifying existing ones - to the museum or gallery's exhibit. With a virtual exhibition there is also the possibility to create virtual duplicates of valuable and delicate physical objects, minimizing the risk of damage that may occur during their handling [11]. The development of systems designed to present often rare and important artifacts through virtual exhibitions is something that museums could include in their communication plan, offering visitors the chance to consume cultural heritage in new and different forms.

3 Creating a Virtual Exhibition

3.1 Setting a Structure for a Prototype

Since the signing of the protocol between CIAC and the museum, there has been a steady effort from this research center to assemble a team of experts from different research fields, departments and institutions with the objective of studying the collection. This is precisely one of the primary goals of this partnership which will enable us to gather new findings about the items included in the cinema nucleus, but also explore the other two groups - Variety/Circus and Advertising - that have not yet been studied. All this new data, which is going to include a digital record of all posters, will result in the production of future exhibitions, conferences, and catalogs - all with the full support of the Faro Museum -, an endeavor that will permit us to keep promoting this legacy. This can be designated as the main, and for now, only concrete and formal method of work: study and digitalization of the collection → dissemination of the collection through exhibitions and scientific texts.

Despite this, a smaller group of CIAC researchers has joined to discuss ideas related to the eventual possibility of creating an online platform that will gather all the knowledge gained from the scientific work. From these meetings we arrived at a proposition to create a virtual exhibition - a prototype at least -, that enables us to start experimenting with different 3D building software, while presenting us a proof of concept for future virtual exhibitions once the website is running.

Because we already have a scheduled exhibit for the first trimester of 2024 dedicated to a series of Italian posters, we explored the feasibility of simultaneously opening a second one, but this time in a virtual three-dimensional space that simulates - until a certain degree - the first one. The decision was to make a simple prototype with the following elements:

a) create a virtual 3D environment that simulates the room where the physical exhibit will take place;
b) include high resolution images of the twelve posters presented in the main event and three more that cannot because they are either incomplete or in a bad state of preservation[3];
c) include interactive elements that connect to textual information regarding each poster - museum identification number, title, year of movie premiere, movie director, poster illustrator, and small description of the movie - and another that contextualizes de exhibition[4];
d) include interactive elements connecting to online spaces that host some of the movies which are currently publicly available and in the public domain, e.g., *Quo Vadis?* [15][5].

If these points are not met by March 2024 and we assess that this prototype does not have aesthetical value or doesn't function properly, we will not present it to the public, but instead will keep improving the model and use the knowledge gathered for future works. On the contrary, if we see that the project has the potential to be shown, the prospect is to display a QR code in the museum's room and another in the program that connects to an online platform with the 3D simulation of the exhibit.

3.2 Searching for the Ideal Workspace

Kickstarting from these four objectives we began a process of exploration for different programs that delved into virtual tours and more specifically virtual exhibitions. From this research we found two distinct online examples that showed some potential and gave us insights into what could be done in this context.

The first one was OnCyber [21], a program described by their website as "a metaverse platform that makes it easy for anyone to create their own 3D, immersive experience that can be accessed from the browser" [22]. Although they call their platform a place to create 3D experiences, it is greatly used to create gallery type spaces to exhibit and sell digital art through Non-Fungible Tokens (NFT's) (see Fig. 3). And when we say create, this does not mean to construct the spaces themselves, because those are mostly pre-built, but to customize them with different assets (e.g., images, gifs, videos, etc.).

[3] Even regarding the twelve that will be in the physical presentation, the final selection will only be confirmed after an evaluation from the museum about the preservation status of each one. This will not be true in the virtual one where we already know for sure that all of them can be displayed.

[4] Due to space limitations of the available exhibition room, some of this information will also not be demonstrated in the museum.

[5] This is another feature unique to the virtual mode.

Although there is also a feature that lets you upload your own customized space, the process itself and philosophy of the platform didn't seem quite in line with the purpose of the poster exhibition.

Despite this, OnCyber showed us some promising ideas to later use, like freely controlling the movement of an "avatar" through the x and z axis - and the camera in all directions - in a real time environment, much like a first-person video game. Also, some ways that you could interact with the artworks were kept in mind. For example, if your avatar gets to a certain distance from a video, which has its images constantly playing throughout the exhibit, an event triggers the sound to play. The proximity system also shows another interesting aspect. When you are close to a particular object, the screen highlights that artwork while omitting the others, and a visual cue appears saying that you can interact with the object by clicking "E" on the keyboard. This will lead you to different information about the piece, like data about its author and his social networks. By interacting with the work, you can also place a bid for that piece.

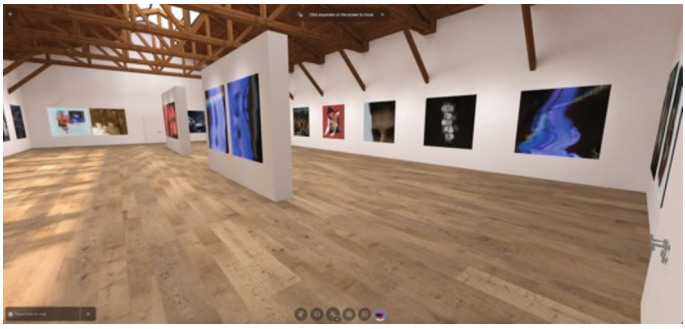

Fig. 3. First person view of an exhibit for digital art in OnCyber (Source: OnCyber)

The other online platform we studied is called kulla, self-described as the "Ultimate Virtual Tour Software for any business". This program enables the user to create 360º/3D tours for real estate, architecture, art galleries, etc. [19]. Kulla is a virtual tour editor that uses multiple panoramic photos to create 360º environments, by arranging and connecting the different pictures uploaded to the system. When connected you can customize the spaces with hotspots icons - meaning the different points of view where you can control the camera freely in all axes - and add labels, images, audio and sounds.

In the context of the poster exhibition, this platform would allow us to capture panoramic photographs of the exhibit's venue and then add images of the Italian posters, textual information about them, create QR codes to external platforms, or directly link icons in the virtual exhibit to the poster's respective movies on YouTube.

These are all possibilities that we attested in one of the examples studied, a virtual exhibition for digital and (audio)visual works integrated in the 2022 edition of ARTe-FACTo's conference, which took place entirely online due to COVID restrictions in the country's venue (Macau). This exhibition was produced using kulla, and from what we could observe, besides the elements listed above, there was also the opportunity to add

3D models of the artistic artifacts, although we weren't able to find out the method used to create them - we didn't see it advertised on kulla's website.

In one of the artworks presented in ARTeFACTo2022, entitled *In MarImmersive Waves* [12], which uses a marimba as an integral part of the piece, we saw the chance to add a 3D model of this instrument, hear sounds produced by it, have access to a video on YouTube with the work's performance, and to some textual information, which was complemented by a QR code that connected to more documentation about the work in a different website (see Fig. 4 and 5).

Fig. 4. Overview of *In MarImmersive Waves*, one of the digital artifacts present in ARTeFACTo2022 virtual exhibition, with 3D models (Source: kulla)

Fig. 5. Connection to In MarImmersive Waves' performance on YouTube (left); and panel with textual information about In MarImmersive Waves and a QR code to external documentation about the work (right) (Source: kulla).

kulla's platform and this example showed us the prospect to create a virtual exhibition capable of simulating physical and existing environments. That was one of the main points we delineated for this project. But despite this, it seems that this program was missing one or two key elements to be the ideal place for us to produce this first exhibit for the museum's poster collection.

One thing that we immediately saw as constraint (literally) was the fact that the visit's walkthrough is designed to occur from icon to icon, from one fixed point of view

to another. This scenario was more limiting than the one provided by OnCyber. Because we had previously tried this second platform, it was strange to then be deprived of the freedom of movement we had experienced with OnCyber's examples. That was a feature we intended to keep.

The other component that was important, and which in this case was not possible to be achieved with both designs, was the freedom to experiment with other elements besides those which were already programmed in each system. It is important to note that besides the creation of an interesting virtual experience that concurs with the Italian poster presentation, we want to use this digital visit as a jumping point for other exhibitions. It is then important to utilize this object as a model for experimentation and to gather as much information for future iterations of the artifact.

Because of this crucial goal, we realized that the most indicated path was to operate a more generic system dedicated to the creation of 3D scenes that would allow us to achieve the four points previously listed, but also discover new elements that could be then either applied to the current exhibit or reserved for future works. This is an idea that could be tested in the fields of user interface and interactivity, or on the aesthetic choices for the room itself.

After some discussion between the current CIAC members in charge of this task, we decided to work with Unity for this first exhibition and possibly future ones. An engine first designed to develop games for the MacOS, Unity is now a cross platform and multimedia software used to create movies, like the short animations co-produced with Disney Studios [26], in product design, architecture, interactive and live performances, augmented and virtual reality experiences, etc. The technologies provided by the Unity engine grant us the opportunity to recreate, to some degree, all the features from the other two platforms, while also enabling us to add new ones. Overall, this engine is useful to produce real time 3D environments with many different tools at our disposal that establish the perfect setting to experiment with different designs and concepts.

3.3 Prototyping the virtual room.

After agreeing on the workspace for the first digital exhibition, we started immediately experimenting concepts we saw in the other two online platforms. The first was the character and camera control. For this we appropriated a simple 3D rendering of a building from the Unity Learn [27] and created/trained the movement control in a first-person view mode. For this alpha version we also included some images of the poster collection (see Fig. 6). The final design was later published in the Unity Play website to see how the program would run on their platform [28].

Subsequently, we decided that for the next stage of this project we should gather images of the room where the exhibit will take place in 2024[6] (see Fig. 7). Although the museum has a virtual 360º tour of its space available in the City Hall's website [8], it only covers the rooms with permanent exhibitions and not the temporary ones. For this reason, we headed to the museum to capture some images of the Italian poster exhibit room. And since experimentation is a key component for the work, we decided to do

[6] This stage happened after briefly trying and not getting quite what we wanted from a 2D to 3D conversion of the floor plans of the room (using the extrude function in AutoCAd).

Fig. 6. Creating and training movement in first person mode using Unity (Source: authors)

some trials with 3D scanning using the Polycam mobile app [24]. With help of this program and a camera equipped with LiDAR sensors, we were able to capture the first 3D images of the three sections that form the room in less than 10 min and without having to acquire expensive and specific tools for these tasks (see Fig. 8).

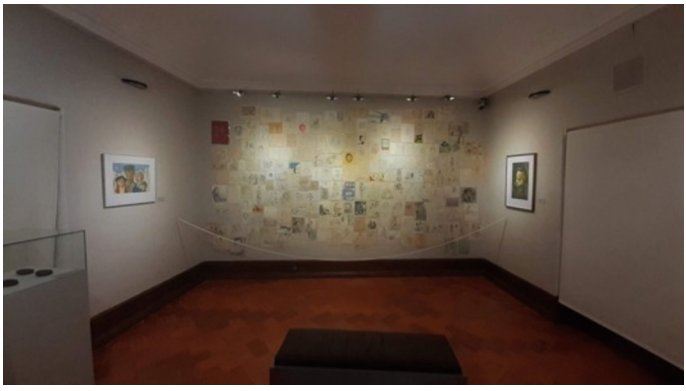

Fig. 7. View of one of the sections that form the museum's room that will be used for the 2024 Italian film posters exhibition (Source: authors)

Although still imperfect[7] and with a lot of space to improve, at the time of this writing, this is the rendering we are working with. We already went back to get another scan of the same room, but even though some parts of the design improved, there is still room to progress. We are planning to get back to the museum, this time equipped with cameras more adequate to our needs (Insta360 X3), other apps and technologies - e.g. experiment with Neural Radiance Field (NeRF) models [18] -, and with better strategies

[7] This first reading has a lot of digital artifacts in the walls: some parts protrude forward while others are missing, giving the room a feel of amorphousness. These "errors" were possibly caused by an incomplete or imperfect scanning of the room.

to capture the images - e.g., improve the space's lighting, scan movements, exposition time, etc.

Fig. 8. Different perspectives of the 3D rendering of the museum's room (Source: authors)

For the time being the plan is to work with the scans provided from the first and second readings. This is precisely the current state of the project. After uploading the GLB files from the PolyCam scans into the Unity software we were able to start implementing some basic components for the new and current model of the exhibition (see Fig. 9).

Right now, most of the work is focused on: a) implementing and testing character and camera controls; b) creating physical barriers around and beneath the scans; c) testing the space's lighting; d) positioning the posters and editing their size and colors; e) writing the texts for each poster and for the exhibition; f) finding the original movies in online platforms that are in the public domain; g) integrating and testing interactive elements for the posters, texts and videos; h) adding extra videos and sounds.

Regarding the elements listed above, presently some are in a more advanced state than others. After uploading the scans, we immediately started by creating the physical environment that surrounds the room and soon after we implemented and tested the first-person controls. All posters have been positioned on the walls, although their final place has not yet been finalized - there have also been some tests with the hue, saturation and brightness of the illustrations. Concerning the texts only a portion have been written, although this is not important for now because these are small and will take little time to produce - to test the user's interaction with textual items we will use a sample and replace it later with the true examples.

About the movies, we have done a little exploration and found four already - *Quo Vadis* (1913), *In Hoc Signo Vinces* (1913), *Gli ultimi giorni di Pompei* (1913) and *L'Emigrante* (1915) -, but there is still a lot of work to be done in this regard: we have not only to search for the other movies - even though we understand some don't

Fig. 9. From upper-left corner to lower right corner: first section of the room (north view); middle section (north view); middle section (south view); and third section (north view) (Source: authors)

have any copy available - but also to find the versions with the best image resolution possible. Finally, there's already been some work done with interactive elements: in this field we already tested a simple method to connect a poster to the respective movie by creating a button, changing the button's image to a 2D sprite of that film's poster, and finally using a basic script in C# to connect to an online link of the movie. We also embedded that same movie - *Quo Vadis* (1913) - in an object and displayed it on one of the walls of the room, playing in a loop and without audio (see last frame from Fig. 9).

4 Future Work

In general, this describes in simple terms what the current stage of the prototype looks like. We can say that this work is still in its infancy and has a lot of space and time to evolve. For now, the main goal for us is to deliver an interesting 3D real time experience that can offer materials which, due to space limitations and preservations issues, cannot be presented in the 2024 museum's exhibit, be it the incomplete posters, extra textual information, or the possibility to watch easily and quickly one of the movies from early Italian cinema that the respective posters illustrate.

And regarding the two incomplete posters shown in the virtual exhibition - for the movies *Quo Vadis* (1913) and *Gli ultimi giorni di Pompei* (1913?) -, very recently we discussed the possibility of showing not the original digital images which we have in our possession, but to try to produce a "restoration" of both posters. Since both are missing the half bottom page, we have started to experiment with A.I. image synthesizers like Stable Diffusion or Adobe Firefly to fill the missing parts. The objective is not to recreate the full poster as they were originally, but to use creative and artistic liberties to imagine different possibilities for those sections (see Fig. 10).

Fig. 10. First trials to fill the half-bottom page of the poster *Gli ultimi giorni di Pompei*, using the inpaint(ing) mode(l) in Stable Diffusion (left) and the Generative fill function in Adobe Firefly (right) (Source: authors)

Besides this, even though we already concluded that the model of the virtual room should be somewhat faithful to the original venue for the first exhibition, for future works we would like to play with different designs for this place and other museum rooms. This means experiment with the scan captures by exploring more abstract environments. We already have begun toying with this idea by making 3D renderings of this same room with different meshes, for example one filled with dots (see Fig. 11)[8].

On a final - and more formal - note, after the presentation of the virtual and physical exhibitions in March 2024, we will continue to work with the collection and begin structuring a project for the online platform. The bigger project is aimed at obtaining national funding through FCT's grant system. This will permit us to get financial aid and more human resources which, in turn, will encourage us to develop more ambitious multimedia objects. We will also keep working on straightening the ties with the Faro Municipal Museum and see if they can support this team on future virtual exhibitions, perhaps even about other subjects besides the poster collection which are adequate for this type of representation. Overall, until the end of the first semester of 2024, CIAC will lay some of the groundwork - which also includes the research about the posters and the various scientific communications to disseminate the findings about the collection - for this bigger project which entails the creation of an online platform that will gather much of the knowledge and creative production about this important and singular heritage.

[8] To test different designs of the room we have been using a different software, namely cables.gl [4]. We are also doing some experimentation with this program because it also allows for fast prototyping and adjustments of interactive content. It also enables different members of the team to be working simultaneously in the same design. Cables might also present a possible path to pursue in future works.

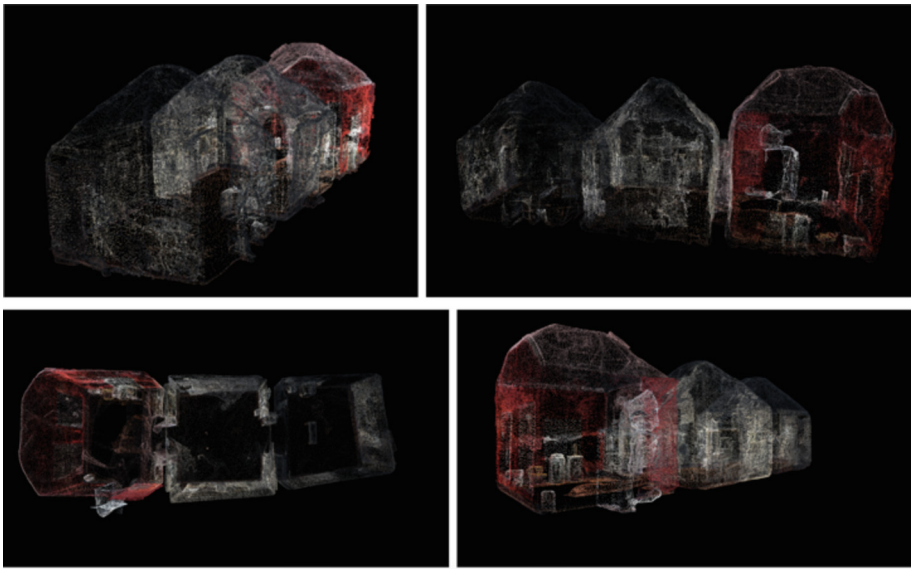

Fig. 11. 3D rendering of the Italian poster exhibit room with a mesh of dots. Program made with cables.gl (Source: authors)

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