DOI: 10.12871/978883339694146

Visiting the Museo della Specola in Palermo through Virtual and Augmented Reality

Laura Daricello - INAF OA Palermo - laura.daricello@inaf.it
Laura Leonardi - INAF OA Palermo - laura.leonardi@inaf.it
Ileana Chinnici - INAF OA Palermo - ileana.chinnici@inaf.it
Manuela Coniglio - INAF OA Palermo - manuela.coniglio@inaf.it
Donatella Randazzo - INAF OA Palermo - donatella.randazzo@inaf.it
Salvatore Speziale - INAF OA Palermo - salvatore.speziale@inaf.it

Abstract: The INAF – Osservatorio Astronomico di Palermo (OAPa) has recently implemented some ICT solutions to enhance and spread the knowledge of the Museo della Specola and of the archival and book heritage preserved in the Observatory. These innovative tools, which offer personalized forms of learning and give access to additional information on request, have made the museum more reachable to the public even during the pandemic and have enlarged the audience of users of the historical heritage preserved at the Specola. The context also takes into account the guidelines and the objectives of the three-Year Plan for the Digitization and Innovation of Museums of the Italian Ministry of Cultural Heritage and Activities and in the National Plan for the Digitization of Cultural Heritage as outlined in the three-year plan for the digitization of the Italian Public. All these projects and experiments are the result of the synergies between the members of the Communication, Education and Outreach Team and the members of the Heritage Team of OAPa and are part of the museum communication plan drawn up in collaboration with Dr. Martina Sanzeri - OAPa contractor in 2019 - and constitute its development and application. From March 2021, some experiments and research activities in the field of AR and VR for the valorization and enhancement of the museum are included in the activities of the PRIN financed by INAF "Virtual Reality and Augmented Reality for Science, Education and Outreach". Virtual and augmented reality are the new frontier in the field of the enhancement and the valorization of cultural heritage and answer to the need to make objects and contexts more accessible.

Keywords: Scientific Cultural Heritage, Virtual and augmented reality, INAF Palermo Observatory.

1. Introduction

Inaugurated in 2001, the Museo della Specola mainly exhibits scientific instruments dating back to the 18th-19th centuries, which are part of the heritage deriving from the over-200-years activity of the Observatory. The collections, owned by the University of Palermo and managed by OAPa, are housed in the premises of the old *Specola Panormitana*, founded on the top of the Royal Palace in 1790 by Ferdinand I of Bourbon. In order to make the museum more accessible to the public, the Communication and Education and Outreach Service and the Cultural Heritage Team of the OAPa have worked in synergy to experiment and implement some new communication technologies to enhance and spread the knowledge of the Museo della Specola. These initiatives are the development and application of the museum communication plan drawn up in collaboration with Dr. Martina Sanzeri - OAPa contractor in 2019.

2. Experiments with augmented reality

2.1. AR app to enhance the museum

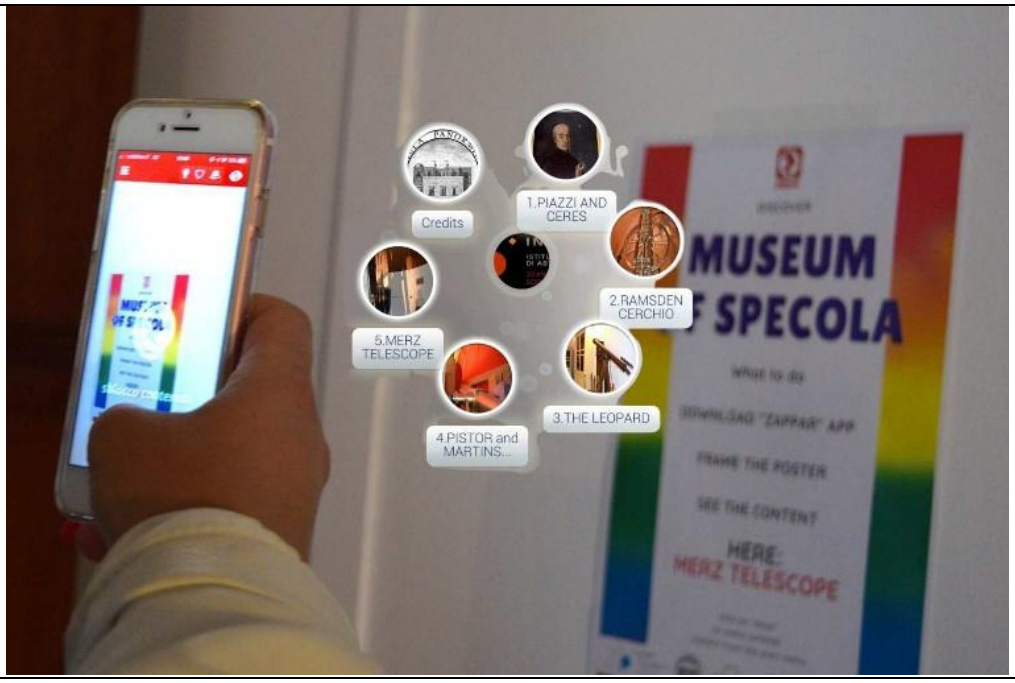

Fig. 1. The interactive experience of the Museo della Specola made with Zapworks Studio.

The OAPA started experimenting with augmented reality to promote the Museo della Specola in 2018-2019, with two projects: an interactive experience of the Museo della Specola (Fig. 1), that allows the public to interact with the instruments collected inside the museum and with the history of the Observatory and at the same time to move inside

the museum;[1] an augmented reality virtual tour of the museum, presented in 2018 at a Science Festival in Palermo, which gives access to extra contents. All these materials can be reached simply using a smartphone to scan a code and by downloading for free the Zappar app. In the recent years other augmented reality projects have been developed, both for education and outreach activities, and for scientific purposes.

"Selfie at the Museo della Specola" is an interactive experience in AR created with Metaverse software; simply by positioning yourself in front of a white wall, the app allows you to take and share on social networks images of yourself together with some instruments of the museum. This tool attracted many students during a science festival.

2.2. Multimedia products with AR and VR made for scientific or outreach purposes

In November 2020 Ileana Chinnici (astronomer at OAPa - her main field of research is history of 19th-century astronomy) was asked to illustrate a virtual tour of the Museo della Specola[2] for the Antique Telescope Society (ATS) Virtual Conference (Fig. 2). In this occasion, the OAPa made a video with augmented and virtual reality effects to present the museum and its collections and share scientific information with other scholars and researchers. In March 2021 the Scientific Instrument Commission (SIC) hosted a virtual visit to the Museo della Specola[3]. With the use of a multimedia product with AR/VR effects, Ileana Chinnici shared with other scientists a selection of interesting items collected in the museum.

Fig. 2. One of the Leopard's Telescope in the video for the ATS Virtual Conference in 2020.

[1] https://edu.inaf.it/news/per-la-scuola/la-realta-aumentata-per-il-museo-della-specola-dellosservatorio-astronomico-di-palermo/
[2] ATS video: https://www.youtube.com/watch?v=lGuLDTg8eIM
[3] SIC video: https://www.youtube.com/watch?v=VOVjdEf9axs

In both the videos, the voice of the researcher accompanies the visitor to discover the museum through a journey in which the real spaces are "augmented" and enriched by images and additional information. The instruments are taken up and explained in a careful way. These products were highly appreciated for their communicative effectiveness.

3. The virtual tour of the Museo della Specola

In 2019 we started thinking about making a virtual tour of museum and then to publish it on the web to virtually open it to the public and schools even during the pandemic. We used the technique of photogrammetry with a high-resolution camera to photograph instruments and rooms, to create usable 3D objects and import them into an open source javascript library for the visualization, and to carry out the perspective conversion from a curved image to a flat image on the monitor. The virtual navigation (Fig. 3) gives the possibility to move between the rooms, accompanied by a narrator and supported by a map, text boxes and a menu and to get closer to the historical items collected. In many cases, we inserted high-resolution navigable photos to see the most minute details of some instruments (see: http://virtuale.oapa.inaf.it/SpecolaVirtuale.html).

Fig. 3. A screenshot of the virtual tour of the Museo della Specola.

4. Experiments with virtual reality: 3D models of some scientific items and volumes kept in the Museo della Specola

Between 2019 and 2021, we made 3D models of some scientific items and volumes kept in the Museo della Specola and in the library of the Observatory. OAPa made models of the plaster bust of Father Angelo Secchi[4] (Domenico Costantino, ca. 1870), of the plaster bust of Giuseppe Piazzi[5] (Villareale School, early second half of the 19th century), of the Pendulum Clock[6] (Cumming & Grant, London, 1790), of a late 19th century model of Mars[7] and of the Terrestrian globe[8] (Bonne, late 18th century). There are also the 3D models of Angelo Secchi's three-volume work entitled *Le soleil: exposé des principales découvertes modernes sur la structure de cet astre, son influence dans l'univers et ses relations avec les autres corps célestes. 2. éd., revue et augmentée*, published in 1875-1877,[9] and an animation of the *Atlas céleste de Flamstéed* (1776)[10] preserved in the OAPd Historical Library. All the models are published on Sketchfab, the world's leading platform for sharing content in virtual reality, and some of them can also be reached from the virtual tour of the museum. The high-definition reproduction of a three-dimensional model can now be considered practice in the field of cultural heritage documentation. It gives the possibility of examining an item in its details and allows to obtain data and information, which can be useful for fruition, restoration and conservation.

5. The digital collections of the cultural heritage preserved in OAPa

With the aim of preserving and enhancing fruition of our cultural heritage, the OAPa Heritage Team has recently developed a project to create digital collections of the items of historical interest kept inside OAPa. This kind of initiative provides for the convergence of categories of collections traditionally separated from each other. This trend, condensed in the acronyms MAB (Museums, Archives and Libraries) and GLAM (Gallery, Library, Archive and Museum), is increasingly shared in the national and international panorama of cultural heritage, also from a cataloguing point of view. The historical heritage of OAPa, testimony of its life through the centuries, fits particularly well with this approach, as it brings together heterogeneous resources such as archival papers, books, scientific instruments, works of art, furnishings, architectural elements, which are deeply connected to each other and constitute the pieces of a single cultural mosaic. To realize the project, we chose the Omeka platform,[11] an open Source content Management System for the creation and management of digital collections characterized by ease of use by both administrators and users (Fig. 4).

[4] https://sketchfab.com/3d-models/angelo-secchi-6a6cd525b0484756bdbf6ed319cddf6b
[5] https://sketchfab.com/3d-models/giuseppe-piazzi-85093b5c5b5a4dec878aca872bc2ba87
[6] https://sketchfab.com/3d-models/orologio-a-pendolo-cumming-grant-1300c9e69ddb410ba955996eab931e99
[7] https://sketchfab.com/3d-models/modello-di-marte-b4acf1ef2fc14891bea1c8f873d571fa
[8] https://sketchfab.com/3d-models/globo-terrestre-bonne-79d6f25a93474cc7861fb126b96d1274
[9] https://sketchfab.com/3d-models/asecchi-le-soleil-1875-1877-fd4bf792a13f420ebecb8aef25012ada
[10] https://sketchfab.com/3d-models/animation-of-atlas-celeste-de-flamsteed-1776-7b86416a83264f4f9a2e333de6247052
[11] www.omeka.org

With the Dublin Core as a resource description standard, Omeka has the advantage of offering full interoperability with major cultural metadata aggregators, such as Europeana.[12] Its information architecture is based on two essential elements: the document (item), and the collection. Each item in a synthetic form offers essential information, provided with internal links to other items of collections present on the platform and to other external online resources available, including the catalog cards present on the INAF 'Polvere di Stelle' portal or the 3D resources shown above. In this way, Omeka can be configured as a real dynamic virtual museum. Another important function available on Omeka is the creation of virtual exhibitions with the items already cataloged on the platform, which follow itineraries that can be divided into sections and enriched with textual descriptions. Furthermore, the images and main information relating to each single item can be easily shared on the main social networks. Work on the Omeka platform is constantly in progress, as it is continuously enriched in terms of resources and connections (see: http://starlod.astropa.inaf.it/).

Fig. 4. The digital collections of the cultural heritage preserved in OAPa made with Omeka.

6. An eBook on the foundation of the Specola in Palermo

Among its resources, the Omeka platform also presents a recently published eBook on the foundation of the Specola.

The connection between the platform and the collections allows the reader to make real-time insights into instruments, books, tools, archive papers and architectural elements mentioned in the text and cataloged in Omeka (see: http://starlod.astropa.inaf.it/ebook).

[12] www.europeana.eu

7. The Facebook and Instagram accounts of the Museo della Specola

The Museo della Specola has recently opened accounts on Facebook (www.facebook.com/Specola.Palermo) and Instagram (www.instagram.com/specola.palermo) in order to expand its cultural offer to an ever wider audience, with whom to share stories and insights on the museum, archival and book heritage of the Palermo Astronomical Observatory and on the characters who animated the life of the Specola in Palermo.

References

[*Piano Nazionale di Digitalizzazione dei Beni Culturali* (2018). Ministero per i Beni e le Attività Culturali]. URL: <http:// pnd.beniculturali.it/il-piano/> [access date: 3/11/2021].

[*Piano Triennale per la Digitalizzazione e l'Innovazione dei Musei* (2019). Ministero per i Beni e le Attività Culturali]. URL: <http://musei.beniculturali.it/wp-content/uploads/2019/08/Piano-Triennale-per-la-Digitalizzazione-e-l%E2%80%99Innovazione-dei-Musei.pdf> [access date: 3/11/2021].

Bianchini, C., Guerrini, M. (2014). *Introduzione a RDA. Linee guida per rappresentare e scoprire le risorse*. Milano: Editrice Bibliografica.

Guerrini, M. (2020). *Dalla catalogazione alla metadatazione: tracce di un percorso*. Roma: Associazione Italiana Biblioteche.

Guerrini, M., Possemato, T. (2015). *Linked data per Biblioteche, Archivi e Musei*. Milano: Editrice Bibliografica.

Leonardi L. (2019). *La realtà aumentata per il Museo della Specola dell'Osservatorio Astronomico di Palermo* [online at Edu Inaf]. URL: <https://edu.inaf.it/news/per-la-scuola/la-realta-aumentata-per-il-museo-della-specola-dellosservatorio-astronomico-di-palermo/> [access date: 12/11/2021]

Leonardi, L., Daricello, L. and Giacomini L. (2021). *Learning astronomy through Augmented Reality: EduINAF resources to enhance students' motivation and understanding*, in *Europlanet Science Congress* 2021 [online]. URL: <https://meetingorganizer.copernicus.org/EPSC2021/EPSC2021-530.html> [access date: 12/11/2021]

Randazzo, D., Coniglio, M, Chinnici, I. (2021). *Creating and sharing a LAM digital collection*, in *Proceedings of the IX LISA: Multidimensional Astronomy Librarianship* (online, 14-18 June 2021). (in press).

Salarelli, A. (2016). "Management of small digital collections with Omeka: The MoRE experience (A Museum of REfused and unrealised art projects)", *Bibliothecae.It*, 5(2), pp.177–200.

Zanazzi, A., Daricello, L., Leonardi, L., Di Benedetto, C. and Tuscano, M. L. (2021). *Attracting public interest in astronomy through art and cultural heritage*, in *Europlanet Science Congress* 2021 [online]. URL: <https://meetingorganizer.copernicus.org/EPSC2021/EPSC2021-740.html> [access date: 12/11/2021]