

THE MULTIMEDIA ARCHIVE OF THE ACADEMY OF FINE ARTS OF FLORENCE AS A TOOL FOR THE ENHANCEMENT, PROMOTION, AND PRESERVATION OF ARTISTIC HERITAGE.

Author: Giovanni Grimaudo

co-authors: Federico Niccolai, Giulia Vaccari, Juri Ciani

Enhancement and promotion → New media → Art and culture

Keywords: Multimedia archive, Photogrammetry, Digital conservation, Cultural heritage

1. Introduction

The Multimedia Archive of the Academy of Fine Arts of Florence was born from the need to digitize and preserve the vast artistic heritage housed within the historic Florentine institution. The project, which began in 2022, aimed to identify a tool capable of enhancing and promoting cultural and artistic content through the integration of art and technological innovation. By examining contemporary society and the tools through which it accesses content and information such as smartphones and computers it has become evident that an easily accessible web platform constitutes one of the most effective means. Furthermore, new technologies enable the delivery of interactive multimedia content capable of meeting the needs of younger generations who are approaching the world of art for the first time.



Figure 1: Homepage of the Multimedia Archive of the Academy of Fine Arts of Florence.

2. The Multimedia Archive of the Academy of Fine Arts of Florence

The Multimedia Archive is a web based platform, also accessible remotely, that allows users to access a wide range of multimedia content, including images, videos, audio, and texts. The order followed for the digitization of the archive was the same as that adopted for the historical archive, which is available in both paper and digital format (Excel file). At this stage, we did not proceed according to criteria based on the author or the type of material, nor by searching work by work, as this approach would have required a considerable amount of time and effort. Instead, we opted for a methodology based on the subdivision of physical spaces: the archiving was carried out classroom by classroom, office by office, room by room. This system made it possible, once the digitization was complete, to reorganize the extensive collection by author, technique, year of creation, and other specific criteria.

3. Digitization of Two-Dimensional Works

For two dimensional works such as images, prints, and paintings the digitization was carried out using a Panasonic A3 flatbed scanner, with a resolution of 1200 dpi and saved in TIFF format. This approach ensured high image quality, maintaining definition even at magnifications above 300%.

In the specific case of albumen prints, preserved in the Academy's library, special precautions were taken due to the fragility of the

support. Gloves were used to avoid direct contact and prevent damage.

3.1 Digitization of Large-Scale Works

Large-scale works, incompatible with flatbed scanners, were digitized through photographic shooting, dividing each work into sections and later recomposing the images into a single ultra-high-resolution view. The equipment used for the shooting included:

- Sony α 7R IV full-frame mirrorless camera (61 megapixels) with a 24–70 mm lens (avoiding wide angles to prevent optical distortion).
- 18" LED panel lights with softboxes for even light diffusion.
- Adobe Photoshop software for stitching, assembling, and image correction.

To ensure proper acquisition, it was essential to:

- Position the camera perpendicularly to the surface of the artwork to avoid perspective distortions that are difficult to correct in post-production.
- Use a professional tripod to ensure camera stability.
- Overlap images by 30–40% to facilitate automatic alignment by the software.
- Shoot in RAW format to preserve the highest amount of information for potential post-processing.

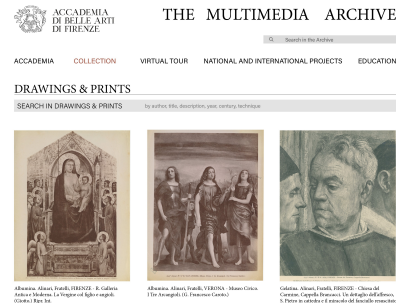


Figure 2: Drawing and print section within the media archive.

4.3D Digitization (Sculptures and Bas-Reliefs)

For three-dimensional works, such as bas-reliefs and sculptures, we went beyond simple photographic documentation by creating 3D models through photogrammetry. This process allowed, from simple photographs, the generation of ultra high resolution three dimensional models, viewable even in virtual and augmented reality environments.

Photogrammetry was carried out using:

- Sony α 7R IV camera (61 megapixels).
- Adjustable LED lighting (intensity and color temperature).
- Reality Capture software (by Capturing Reality, now part of Epic Games).

Preliminary operations included controlled movement and cleaning of the artworks, entrusted to specialized companies, to ensure a surface as faithful to the original as possible, avoiding distortions caused by dust and debris.

The photographic shooting process was divided into four phases:

1. 360° full-figure photographic acquisition.
 2. Full-figure acquisition from different angles (low and high).
 3. Division of the work into sections (upper, central, lower) with close-up 360° captures.
 4. Close-ups of complex details (drapery, faces, hands, recesses).
- Once the shooting was completed, the photos were processed in Reality Capture, which, through a complex sequence of algorithms applied to the collected data, generates a dense point cloud with spatial coordinates. A polygonal surface (mesh) is then reconstructed on this "net," and a texture is applied. After setting a reference measurement from a single element, the model is scaled and finally exported.



Figure 3: 3D photogrammetry of the bust of Pietro Leopoldo d'Asburgo Lorena.

5. Structure of the Multimedia Archive

In addition to the section dedicated to the digitization of the historical-artistic heritage—divided into drawings and prints, paintings, sculptures, and architecture the Multimedia Archive includes three additional sections:

1. Virtual Tour: allows users to virtually explore the spaces of the Academy of Fine Arts of Florence through photographic mapping. Users can pause in specific areas and access associated multimedia content. Interaction occurs via keyboard, mouse, touchscreen, or joystick when using VR headsets. The concept is inspired by digital tours offered by Google Arts & Culture.
2. National and International Projects: includes cultural documentaries and performances created by the Academy in collaboration with other institutions.
3. Academy: contains lessons, workshops, and student work, organized by school and discipline. Content was produced by the Academy's Audiovisual Office, of which I am a part. The material is categorized as follows:
 - Productions by faculty.
 - Productions by students.
 - Academic events: workshops, seminars, cultural meetings.

In addition to the aforementioned content, an essential digital section has also been included, consisting of texts, audio recordings, and video documentaries. This multimedia component is designed to enhance the visitor's cultural understanding and foster a deeper awareness of the works on display.



Figure 4: Screenshot of the virtual tour inside the library of the Academy of Fine Arts of Florence.

6. Archiving

The content produced by the Academy of Fine Arts of Florence over the years including images, videos, and other various documents has far exceeded one terabyte in size. It's worth noting that this refers only to finalized content, without considering all the material necessary for producing a finished product. The total volume of content amounts to approximately 9 terabytes. All archived material has been stored on multiple 16-terabyte hard drives, with backups on solid-state drives (SSD).

7. Potential of the Multimedia Archive

The Archive stands out for the following capabilities:

1. Remote accessibility, eliminating the need for physical displacement.
2. Fast and intuitive browsing through an enhanced search engine.
3. Virtually unlimited storage capacity.
4. Long-term preservation.

This last aspect deserves further consideration: digital content, being immaterial, is not subject to wear and tear over time. If properly stored on servers and backup systems, it can last indefinitely. The 3D models generated through photogrammetry also serve as a valuable digital historical record, capable of preserving the integrity of artworks even in the event of natural disasters or destructive events. These models can, in fact, be used for faithful reconstruction of works, for example, through 3D printing.

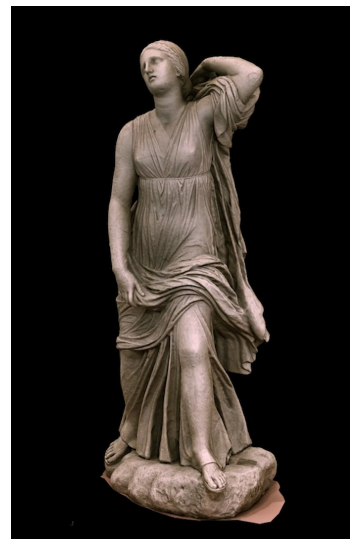


Figure 5: 3D fotogrammetry of Daughter of Niobe by Giovanni Arnaldi, Academy of Fine Arts, Florence.

8. Conclusion

The Multimedia Archive of the Academy of Fine Arts of Florence is an innovative and unique project, combining the preservation of cultural heritage with the possibilities offered by new media. It represents a cutting-edge center for digital preservation and a powerful tool for enhancing the extraordinary richness of Italian art. Through digitization and the creation of interactive multimedia experiences, it makes a wealth of information and images that would otherwise remain confined accessible to scholars, students, and the general public. In this way, the Multimedia Archive actively contributes to shedding light on and amplifying the extraordinary richness of Italian art, promoting research, education, and the dissemination of culture nationally and internationally. Ultimately, it represents a bridge between tradition and innovation, projecting the Academy's invaluable legacy into the future and, with it, a fundamental part of the global cultural heritage.