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Visualising the incomplete. Virtual representation and fruition of two maiolica tiled floors in Palermo

The paper describes a research experience conducted on the maiolica floorings of the Oratories of the Bianchi and San Mercurio in Palermo. The study focuses on the analysis, documentation, and digital reconstruction of the drawing of the two floorings, which, due to various circumstances, have been severely damaged, compromising their original image. The research aims to develop a multimedia application using motion tracking to digitally experience the lost configurations. The process involved archival research, surveys using laser scanning and photogrammetric techniques, graphic analysis, and comparison with similar elements. The survey, thoroughly documenting the state of preservation of the flooring, allows for accurately relating the 'reconstructed' drawing to the 'partial' state of affairs. Starting from survey data, it is possible to obtain three-dimensional digital models that enable users to explore objects or environments digitally in detail. User movement can be tracked to provide an engaging and personalised experience. The multimedia motion tracking application, developed for the flooring of the Oratorio di San Mercurio, constitutes a form of virtual restoration, allowing the exploration of an imaginary context without direct physical interventions on the artifacts. In this way, virtual reconstruction becomes an integral part of the interpretation process of the flooring.

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THE DRAWING OF TWO MAIOLICA FLOORINGS

Between the 18th and 19th centuries, Palermo witnessed an increased demand for polychrome maiolica flooring characterized by extensive drawings, intended for churches, monasteries, oratories, noble residences, and villas. Often created based on an architect's drawing, these floorings frequently exhibited bright and contrasting colours, particularly green, yellow and blue, usually complemented by the use of manganese. The floorings depicted allegorical figures, heraldic symbols, landscapes, and floral motifs, with two types of drawings: one with a religious character for churches, religious congregations, monasteries, and confraternities, and another with secular themes for private residences.
The study involves the analysis, documentation, and digital reconstruction of the drawing of two maiolica floorings that, due to various circumstances, have been significantly damaged, compromising their original image. Two examples were chosen, showcasing distinct chromatic characteristics, from two of Palermo's most important oratories.
The flooring of the Oratorio dei Bianchi covers an area of about 100 square meters, one of the most extensive among oratorial halls in Palermo. It is situated in a spacious room illuminated by large windows adorned with decorated pilasters and frescoed panels. It features a very refined drawing predominantly in blue, with some yellow accents in the outer frame. The drawing originally extended over a broad background whose light colour accentuated the brightness of the room, enhancing its dimensions.The flooring of the Oratorio di San Mercurio exhibits a rich drawing with elements of vegetation, fauna, human figures, and busts unfolding on the surface, starting from the ante-oratory, showcasing a chromatic range from green to turquoise to yellow. The presented research aims to develop a multimedia application using motion tracking techniques for digitally experiencing a now-lost configuration. Therefore, it was crucial to select a case study that allowed physical accessibility and the possibility of conducting surveys

Fig. 1 – Oratorio dei Bianchi (left), Oratorio di San Mercurio (right).

and video shoots necessary for the multimedia application. Among the two analysed cases, the Oratorio di San Mercurio was chosen since the Oratorio dei Bianchi was inaccessible during the research due to restoration work.
The maiolica flooring of the Oratorio di San Mercurio, made during the 18th century, exhibits signs of damage caused by moisture that has compromised the quality of the surface glaze. This deterioration has led to the loss of the original chromatic features, rendering the drawing illegible and incomplete. Additionally, some more extensive portions, especially near the altar, have been completely lost.
The operational process leading to the digital reconstruction of both floorings began with a preliminary phase of archival research. These investigations led to the retrieval of indispensable iconographic sources for formulating hypotheses regarding the original drawings of the floorings. This first phase was followed by surveys aimed at understanding the current state and documenting what remains of the original floorings. For the Oratorio dei Bianchi, inaccessible during the study, reference was made to the photogrammetric survey conducted by Fabrizio Agnello in 1996, which documented the state of the flooring before restoration work, completing extensive gaps with terracotta inserts [1]. Regarding the Oratorio di San Mercurio, photogrammetric and laser scanner surveys conducted in 2022 describe the current situation.In the subsequent phase, the process of redrawing the ideal configuration was undertaken, integrating real data from the survey with a detailed graphic analysis, the study of traces and persistences, and comparisons with similar elements visible in the decorative apparatus of the oratories in question or in other floors, to achieve an accurate result.
The laser scanner survey of the Oratorio di San Mercurio was also necessary in the final stage of the process, culminating in the production of a video where the digitally reconstructed flooring perfectly overlays and aligns with video footage of the actual site, seamlessly integrating with camera movements inside the oratory.
This application takes the form of a virtual restoration, using digital tools to explore and document an imaginary context without the need for direct physical interventions on the artifact. In this way, virtual reconstruction becomes an integral part of the process of interpreting the flooring.

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THE DIGITAL RECONSTRUCTION OF THE FLOORINGS

The study focuses on the virtual reconstruction of the maiolica floorings of the Oratories dei Bianchi and San Mercurio, located in the historic centre of Palermo. The former is situated in the Kalsa district, while the latter is upstream of the Albergheria district, between two highly significant monumental complexes—the Palazzo dei Normanni to the north and the Church of San Giovanni degli Eremiti to the south.
Both floors date back to the 18th century, specifically to 1765 for the Oratorio dei Bianchi and 1714 for the Oratorio di San Mercurio. Attributing authorship to the maiolica floorings is not a simple and immediate task since reconstructing the 'timeline' of their production or commissioning is complex and fragmented. Nevertheless, for both studied floorings, thanks to notarial documents confirming payments made to the craftsmen, two very important names among the ceramic masters of 18th-century Palermo are identified: Nicola Sarzana for the Oratorio dei Bianchi and Sebastiano Gurrello, along with Lorenzo Gullotta, for the Oratorio di San Mercurio.
The flooring of the Oratorio dei Bianchi represents a unique aspect in the history of 18th-century maiolica floorings in Palermo, being monochromatic (except for some yellow elements in the perimeter frame). In contrast, the flooring of San Mercurio exhibits a diverse and colourful drawing with various shades.
The hall of the Oratorio dei Bianchi, measuring one hundred square meters, featured a lavish maiolica flooring, of which only a few original fragments of the perimeter band remain. The extensive gaps left by repeated thefts were filled with monochromatic tiles during restoration at the end of the last century. The flooring had three distinct concentric registers. The first had a decoration with marbled ribbons and rosettes, emphasising a drawing with blue vines which ended around four shields with busts of classical figures. The second, richer than the previous one, had leaf and vine ornaments emanating from vases, filled with vegetal motifs, flanked by pairs of opposing eagles. The third register had a wavy frame that echoed the floral theme of the first register and enclosed in the centre the representation of Moses bringing forth water in the desert.
The geometric layout is highly symmetrical. Several axes of symmetry direct the entire composition and divide the flooring into eight squares; the two main axes are orthogonal to each other and intersect at the centre of the flooring. The diagonals of the four squares at the corners are also axes of symmetry.
The grid formed by the axes of symmetry identifies module a, measuring the side of the square, repeating in the composition and marking a rhythm. This module repeats twice on the short sides of the flooring and four times on the long sides. In two corners, the flooring's drawing remains visible despite degradation, allowing for its complete virtual reconstruction.
To virtually reconstruct the flooring drawing, reference was made to what is still visible despite the deterioration and some black and white photographs taken by Enzo Brai around 1978, which still show it in its intact state. Starting from the photogrammetric survey of the flooring conducted by Fabrizio Agnello in 1996, which reflects the condition before restoration, it was necessary to establish benchmarks to obtain certain elements for the digital reconstruction.
The carpet of Palermitan tiles (17.5 cm x 17.5 cm) was virtually recreated, forming the basis for the

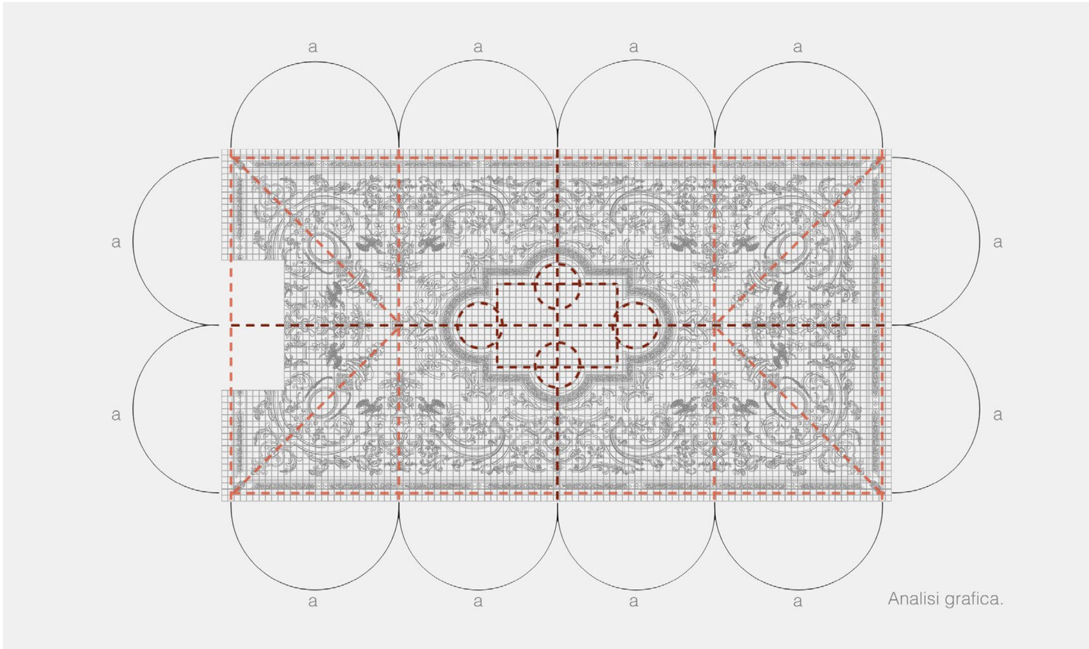

Fig. 2 – Oratorio dei Bianchi. Graphic analysis of the flooring.

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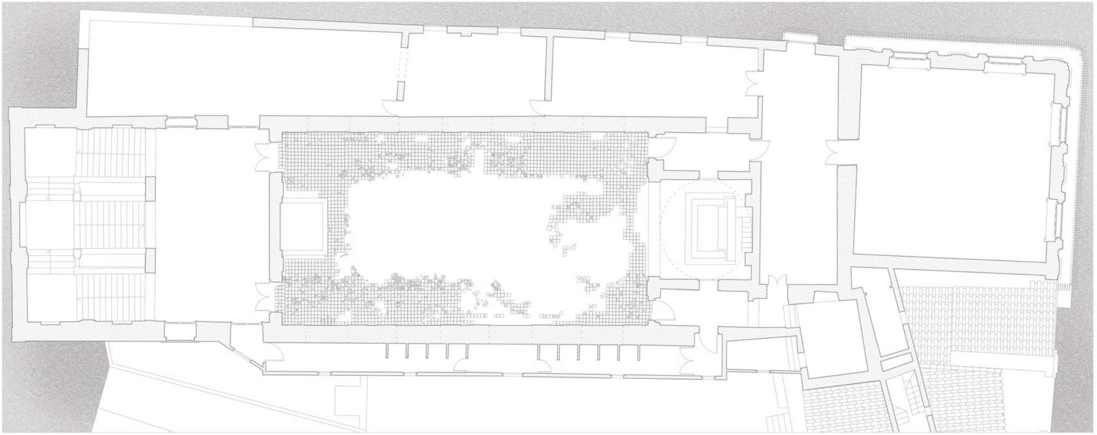

Fig. 3 – Oratorio dei Bianchi. Graphic restitution of the flooring from orthophotos.

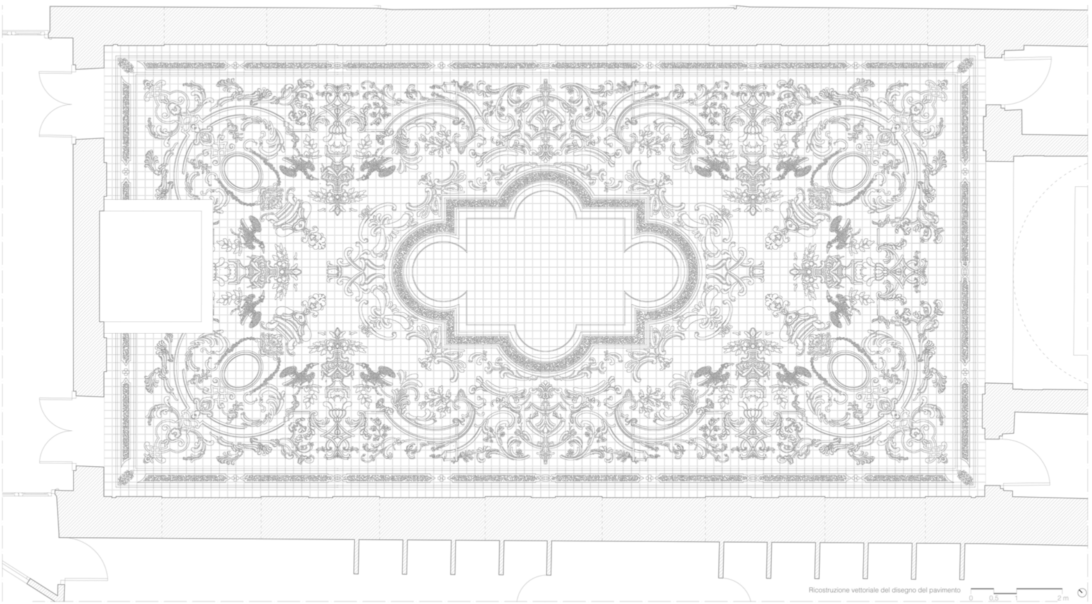

Fig. 4 – Oratorio dei Bianchi. Vector reconstruction of the original flooring drawing.

actual reconstruction of the drawing. Once the 'container' was created, the study of basic geometry was undertaken to graphically reconstruct the representation of the maiolica flooring.
The study of symmetries was fundamental to complete the drawing, starting with the existing features. The flooring drawing was created using a graphics tablet and aided by digital drawing and illustration software. Once the drawing was obtained, it was vectorised through CAD software. The depiction of Moses, currently missing, was not included in the reconstruction. Any assumption or replacement would have been arbitrary, given the low resolution of the available photos documenting the intact design of the flooring.
The hall of the Oratorio di San Mercurio features a sumptuous maiolica flooring, composed of approximately 3870 square tiles, each with a side of 17 cm, excluding the perimeter frame and the area in front of the oratory. From a close perspective, subtle nuances in the plumage of birds and the minute details of leaves and flowers that adorn every portion of the drawing emerge.
The drawing begins in the antechamber and gracefully unfolds in the spacious main hall, oriented towards the entrance, following the iconographic path from the visitor's perspective. The entire drawing is framed by an element that varies in shape and subjects depending on the point of observation. Along the short sides, the frame takes the form of a tendril that winds from the centre towards the ends, enriching itself with leaves. In the section near the Presbytery, depictions of lemons and shells emerge, while on the opposite side, cherub heads and masks with feminine features appear.
On the long sides, the frame, which is a later replacement, alters the drawing and tile format. It has four bands on the left and three on the right. Each band contains a central row of blue tiles with six distinct motifs, such as busts, shields, and musical instruments, cyclically repeating. On the left, they are accompanied by strips displaying a white braid on a blue background, while on the right, this row is limited inside and bordered by strips. Along the edge near the walls, another band re-

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Fig. 5 – Oratorio dei Bianchi. Digital reconstruction of the original flooring drawing.

Fig. 6 – Oratorio di San Mercurio. Details of the maiolica flooring.

peats with green motifs on a yellow background.
The flooring drawing features a weave of green vegetal motifs and an intertwining of white and sky-blue ribbons forming broad volutes. This fabric of sinuous motifs accommodates birds, flowers, caryatids, musical instruments, and trophies. The central figure, winged and human-like, holds a trumpet, an evocative symbol of Fame. Other winged figures support armour, a shield, a helmet, presumably symbols associated with San Mercurio, and a warrior saint is present. Some of these motifs reappear in the stuccoes by Serpotta on the walls and between the windows. In less worn areas of the flooring, near the entrances, some garlands enclosing busts in green and yellow tones stand out clearly. To virtually reconstruct the flooring drawing, considering the complexity of the maiolica fabric, the approach was gradual. After acquiring the orthophoto of the entire flooring through photogrammetric survey, which we will discuss later, the first step was the vectorial rendering of the drawing and its vanishing points. This process allowed isolating the missing parts. Understanding the drawing proved challenging at times due to the absence of clear geometric references: some elements do not follow a symmetrical arrangement in the composition and sometimes repeat almost like modules. Consequently, a graphic analysis was carried out to identify the compositional rules of a set organised by the arrangement of symmetrical ribbons. In the compositional scheme, two modules, a and b, can be identified. Module a identifies a pattern of circles and elliptical compositions that repeat four times, progressing from the entrance towards the altar. Module b, traceable along the short sides, marks three longitudinal axes of symmetry that determine the entire composition. The central axis makes almost the entire drawing symmetric, and the lateral axes make the interweaving of branches and ribbons mirror, quadrupling them.
Although some parts are illegible, it was possible to identify the pattern and proceed with the study for the ideal reconstruction of the flooring drawing. A careful analysis of shape, dimensions, and the number of tiles allowed identifying some dif-

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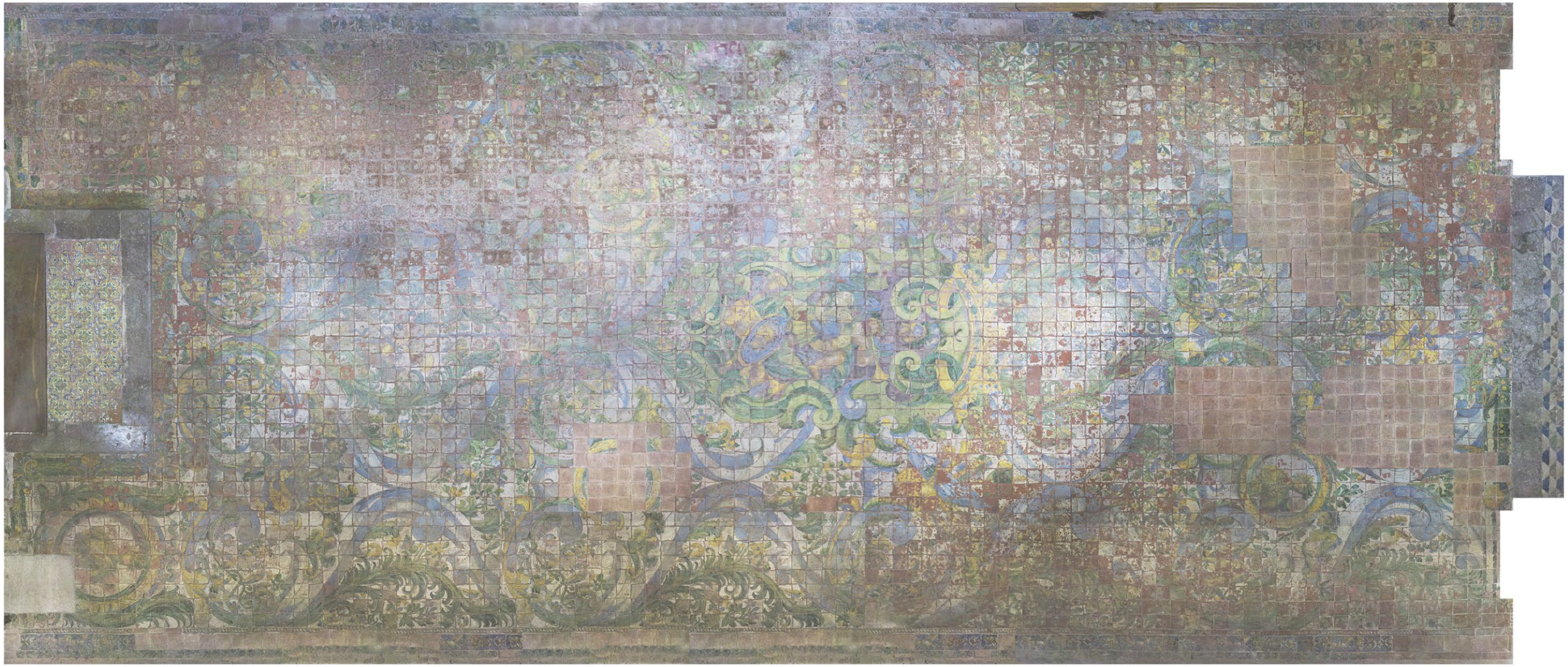

Fig. 7 – Oratorio di San Mercurio. Orthophoto of the maiolica flooring.

Ortofoto del pavimento 0 0,5 1 2 m

ferences. In the area of the base intended for the seat of the Superiors, some tiles change format, and near one of the two entrances to the hall, the joints cease to align with those of the remaining portions of the flooring. These irregularities could suggest the replacement of some tiles in subsequent interventions.

Once everything similar or modular was redrawn, to complete the image of the flooring, the still missing parts were virtually reconstructed. This was the most complex operation because the subjects are not always identifiable. Where clear gaps are present, reference was also made to the iconographic (painting and plastic) apparatus in the oratory itself. The drawing has strong analogies with the plastic decorative apparatus of Serpotta but also with the frescoes, such as the one on the ceiling of the antechamber depicting 'Christ visiting San Mercurio in prison'. In this case, the armour represented is the same as that found in the central drawing of the flooring. On one of the entrances to the oratory, two putti are placed holding a shield with volutes, from which the head of a dragon emerges and on which a crown is placed. This element is found in the flooring drawing, just as the shield held by a putto in a window of the hall is found in the central part and in a corner.

To recreate the actual tones in the digital drawing, colours were sampled, and a reference palette was created. These colours were applied with various shades, also sampled, and virtual brushes were used to emulate, as much as possible, the real stroke. Once the redrawing process was completed, it was essential to apply a chromatic shift to make the digital replica more faithful to the real situation.

THE SURVEY

The need to survey with advanced digital technologies, specifically through the use of laser scanning and photogrammetric techniques, arises from the desire to thoroughly document the state of preservation of the flooring. Through the restitution based on the data obtained with these techniques, it was also possible to accurately relate the 're-constructed' drawing of the flooring to the 'partial'

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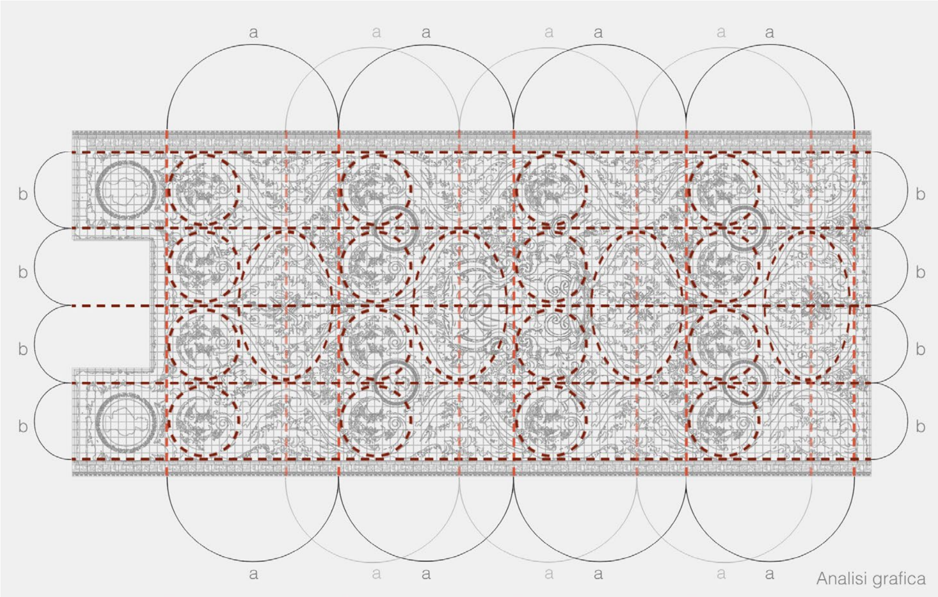

Fig. 8 – Oratorio di San Mercurio. Graphic analysis of the flooring.

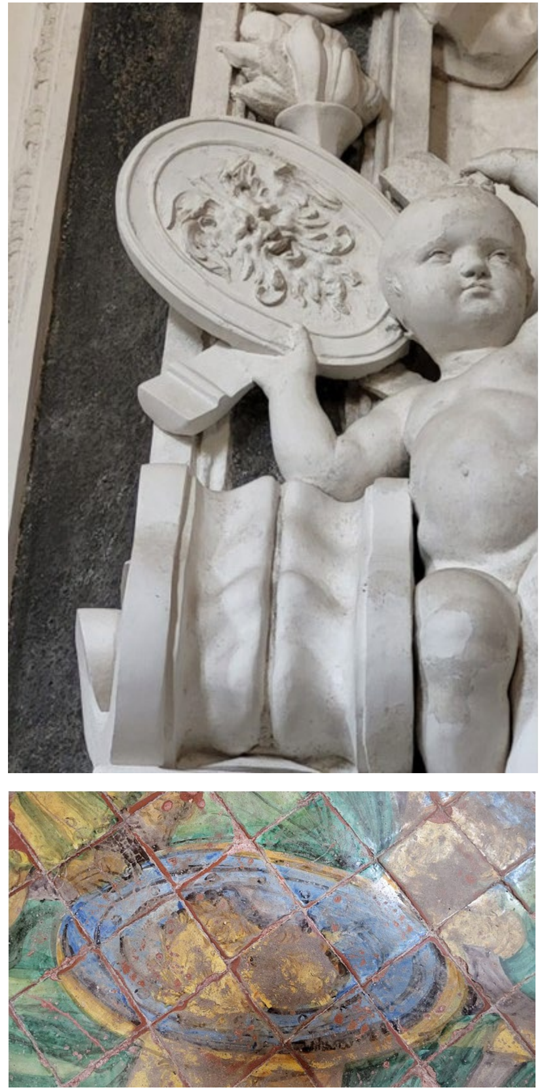

Fig. 9 – Oratorio di San Mercurio. Comparison of decorative apparatus and majolica tiles.

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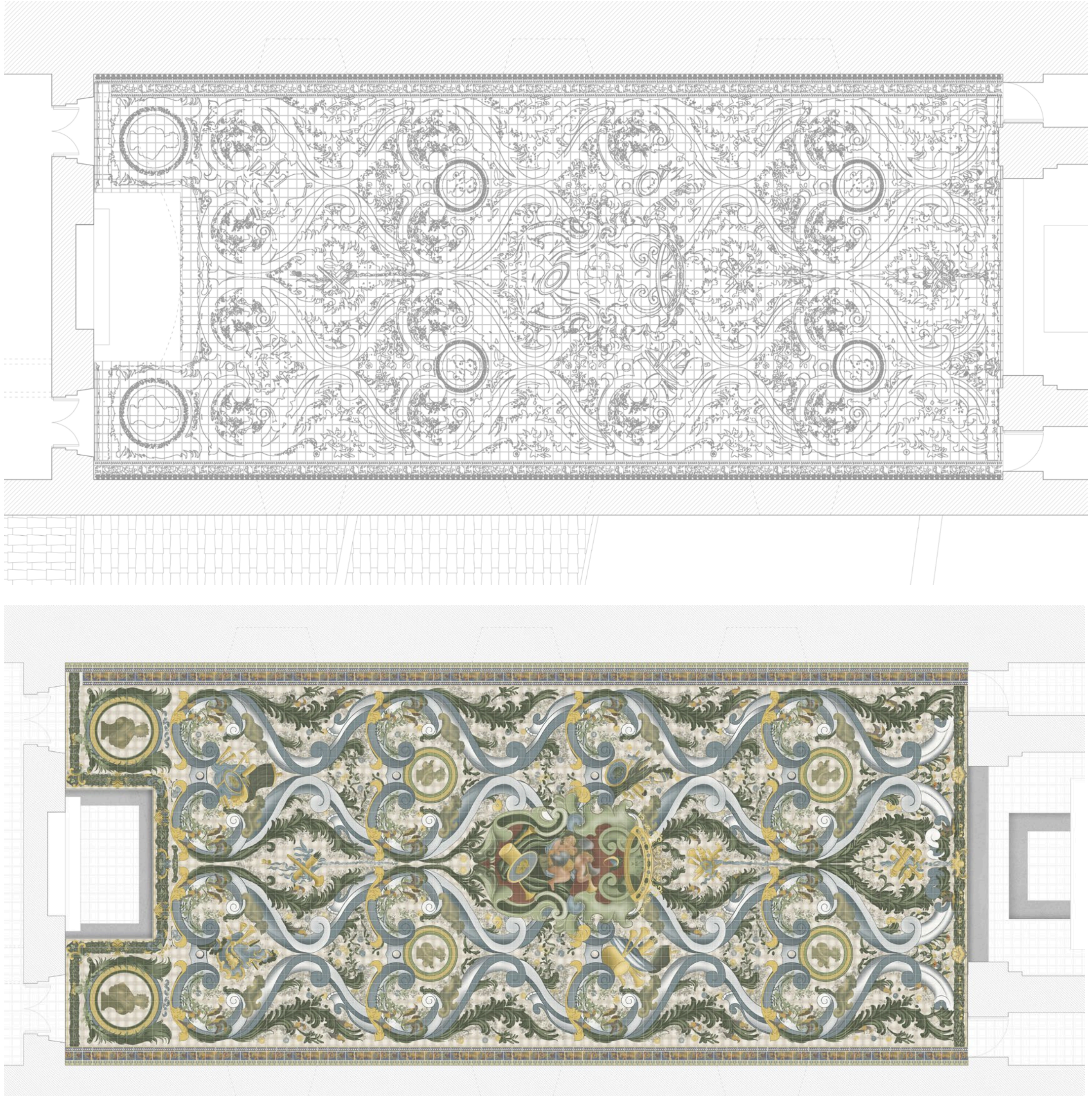

Fig. 10 – Oratorio di san Mercurio. Vector and digital reconstruction of the original flooring drawing.

one of the actual state. The digital survey also provided the necessary dimensional references (with a very high degree of precision) for subsequent Virtual Reality processing.
The laser scanning survey was carried out in three different environments:
1. The hall of the Oratorio di San Mercurio, where the large majolica flooring is located;
2. The antechamber, which is located between the hall and the outdoors;
3. The Southeast front of the complex, namely the main facade of the oratory.
In indoor environments, 7 scans were acquired at an average resolution of 6.3 mm at a distance of 10 meters from the sensor using a Leica HDS 7000 phase-modulation laser scanner available at the 3DArchLab Laboratory of the Department of Architecture at the University of Palermo.
Additional scans, acquired at the crossing points and in the external courtyard, allowed the referencing of the scans of the flooring, hall, and antechamber to a single coordinate system within the urban system of Palermo. Such data could serve as a starting point for further research aimed at investigating possible connections between the oratories of Palermo.
The processing of the acquired point clouds with the scanner involved the following phases:
a) Orientation.
During scanning, each point cloud assumes the centroid of the scanner as the origin of its local coordinate system. To construct a complete point cloud of an environment surveyed from multiple acquisition points, it is necessary to relate each scan to another, sharing an adequate overlapping area, applying a roto-translation to connect to it correctly. This orientation was performed semi-automatically (using the recognition of homologous points between two scans) using Autodesk Recap pro software;
b) Export of oriented individual point clouds.
The point clouds were exported from Recap in *.e57 format. This format associates the coordinates of the scanner's station point with each scan;
c) Normal calculation.

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This calculation was performed using the freeware MeshLab software developed by CNR in Pisa, thanks to the function called 'Compute normals for point set'. The software calculates the normals of the points, i.e., the vectors that go from each point in the cloud to the scan point, and the coordinates were manually entered.
Recently, Autodesk Recap pro software has also increased its functionality by including normal values at the point during export;
d) Downsampling.
Before proceeding to calculate the polygonal surface model, it was deemed useful to reduce redundant points through the process known as 'downsampling'.
This phase was automatically executed with the freeware software Cloud Compare, indicating a 'minimum' distance between two adjacent points. This reduced the computational weight of the cloud while maintaining its information;
e) Merging the point clouds.
The individual point clouds, now downsampled and with computed normals, were merged into a single point cloud that describes the surveyed environments in its entirety. This cloud was again downsampled and exported for the subsequent Mesh model construction phase.
f) Calculation of the Triangular Mesh Model.
The mesh calculation was performed once again using Cloud Compare software through the 'Poisson surface reconstruction' algorithm: recognising proximity relationships between three points in a point cloud, a triangulated surface is calculated by interpolation. The resulting mesh surface, formed by interconnected triangles that faithfully follow the point cloud, effectively describes the morphology of the maiolica floor surface and the oratory room.
Photogrammetric survey aimed to transfer the colours of the flooring onto the mesh model, extracted from laser scanning data.
The process leading to the 'colouring' of the three-dimensional model is called texturing. It involves projecting the pixels of multiple photographic images onto the previously obtained mesh model, for which the position of the capture point and the direction of the capture axis have been calculated. These values must be consistent with the coordinate system of the 3D model.

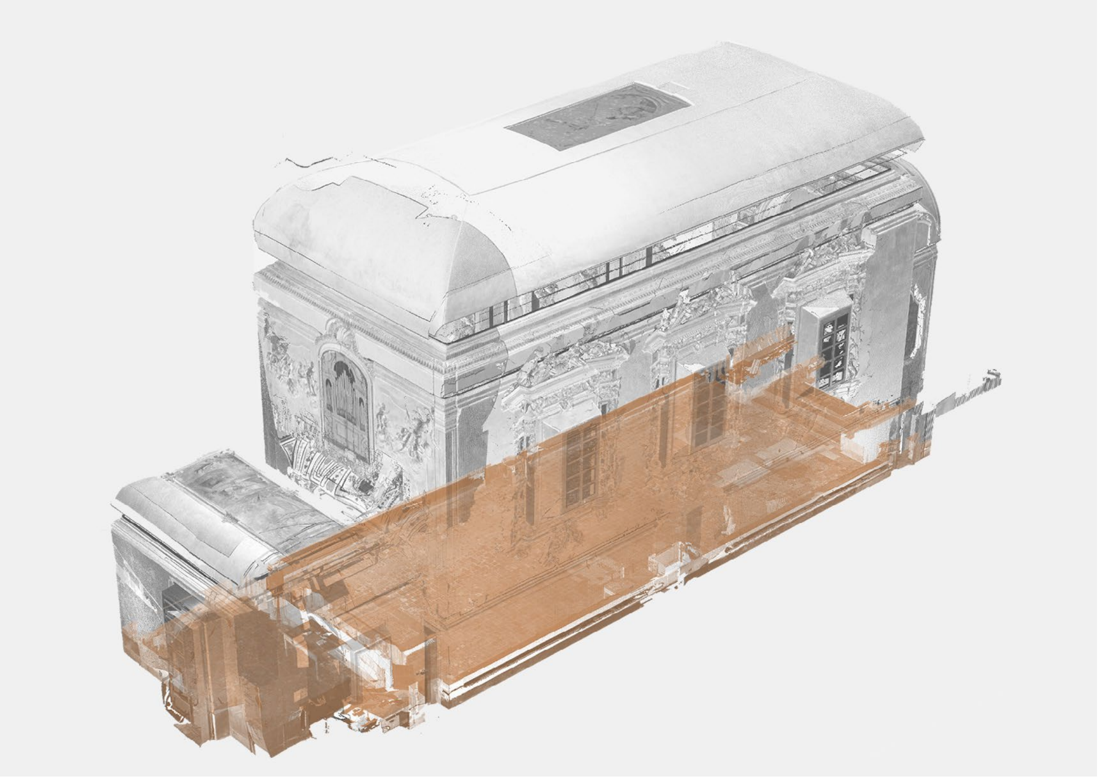

Fig. 11 – Oratorio di san Mercurio. Laser scanner survey. Point cloud.

The photographic shots were taken with a Sony ILCE-7R mirrorless camera, featuring a full-frame Exmor® CMOS sensor of 35 mm (35.9 × 24 mm), with an aperture size of f/3.5 and exposure times of 1/100 sec.
The acquired frames were processed using Agisoft Metashape Photogrammetry Software.
The photogrammetric project was referenced to the same coordinate system by extracting coordinates from the point cloud acquired with the scanner, recognisable in the photographic images.
The working phases are summarised as follows:
1. Importation of photos into the software;
2. Alignment of frames and estimation of the capture position;
3. Sparse point cloud generation;
4. Dense point cloud generation;
5. Orientation of the photogrammetric model;
6. Importation of the mesh model;
7. Texturing of the model.
The survey and processing phases allowed obtaining a textured 3D model photogrammetrically, which, besides having documentary value, served

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as the basis for subsequent study phases.
The laser scanner survey also served as a reference for producing conventional graphic works (plans, sections, elevations).
The photogrammetric survey documented the coexistence, and thus the state of preservation, of the flooring.

A MOTION TRACKING APPLICATION

Thanks to the evolution of computer graphics and the development of more powerful hardware devices, the concept of immersion has significantly expanded and developed, reaching high quality. Just think of the latest head-mounted displays, which allow users to immerse themselves in a virtual world, or augmented reality, which allows you to blend and enhance a real scenario with digital objects. In recent years, these immersive technologies have been increasingly used to disseminate and present research and studies on architecture, making them accessible and shareable with a wider audience, including non-specialists, offering an engaging and realistic experience.
The use of spherical or equirectangular images, for example, is common for creating interactive applications that guide the observer through a virtual scene, which can be observed from preset viewpoints and offers a 360° view to the viewer. These images can reproduce a real or virtual context. In the first case, to ensure 360° coverage, image acquisitions are performed by positioning a standard camera on specific mechanical devices or using special cameras equipped with two or more wide-angle lenses. In the second case, the panoramic image of the virtual context, featuring reconstructions of architectures and urban scenarios that no longer exist, is generated by specific software. The combination of real and virtual panoramic images can lead to the creation of hybrid scenarios in which the virtual reconstruction and the real image are integrated through a photographic editing process that fuses multiple equirectangular images, making the virtual reconstruction appear integrated into the real scenario. Spherical images are now widely used in applications for mobile devices aimed at experiencing specific contexts on-site or in desktop applications, providing the same experience remotely and on demand. Although the use of spherical images requires predefined observation points, it offers the advantage of easy computational management and ensures a high level of engagement and immersion for the viewer in the virtual scenario.
Among the multimedia products widely used for disseminating studies and research on lost heritage are digital videos, created from entirely virtual or hybrid environments in which a real scenario merges with the virtual world. Although significantly less interactive than a 360° panoramic tour, such products still offer an effective and immediate communication solution. Our choice specifically falls into this category of products.
To revive and share the evocative image of the now-lost tiled floor of the Oratorio di San Mercurio, a video was developed in which the reconfiguration of the flooring emerges from the current context using camera tracking techniques. Camera tracking procedures, as is well known, allow you to virtually replicate the position and movements made by a video camera during filming in a given environment. This procedure, based on operations of Camera Solving and Scene Solving, allows the processing of video animations generated by 3D models combined with real scene footage to create a new augmented reality. Specifically, camera solving processes allow you to identify the intrinsic parameters of the lens used during filming (focal length, radial distortions, principal point position), as well as the relative external orientation of the individual frames, thereby defining the path and animation of the virtual camera. The referencing is finally established through Scene Solving procedures, allowing you to define the correct scale factor and the origin of the reference system.
The video footage taken inside the oratory was shot using a Sony ZV-1 camera with a 35mm lens

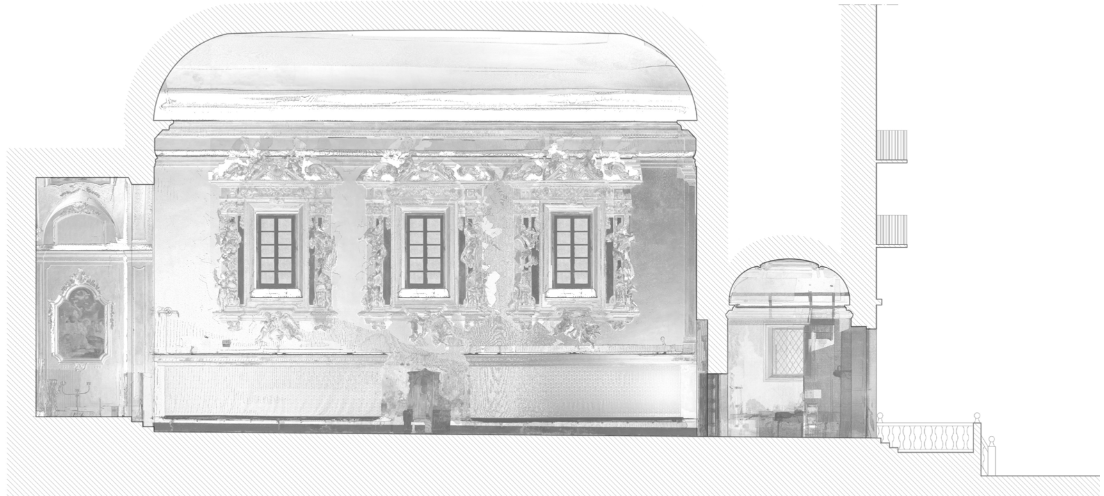

Fig. 12 – Oratorio di san Mercurio. Cross section.

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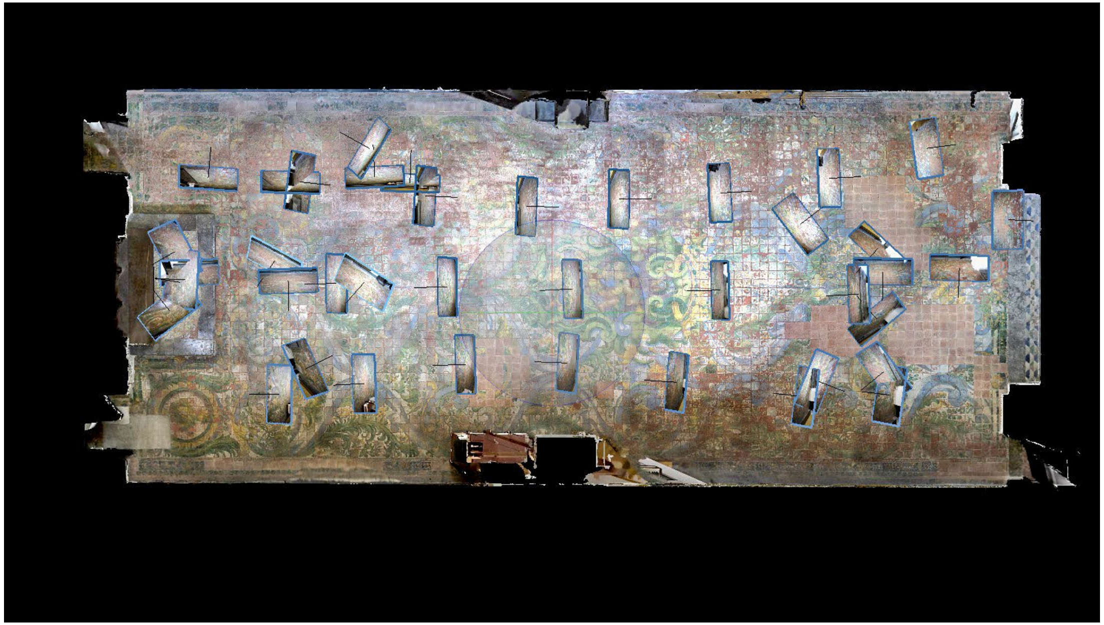

Fig. 13 – Oratorio di San Mercurio. Photogrammetric SfM survey.

Fig. 14 – Sony ZV-1 Camera mounted on a 3-axis stabilized DJI Ronin-SC.

mounted on a 3-axis stabilized DJI Ronin-SC system fixed to the end of a telescopic rod. Thanks to this configuration, a shot angle from a height of about 3 meters from the floor was obtained, allowing an optimal view of the flooring for an easy reading of the overall details of the decorative surfaces. This video acquisition was subsequently processed with Blender software and the specific tools dedicated to "Motion Tracking." The Camera Solving procedure involved a first phase of tracking homologous characteristic points that can be identified in a long sequence of frames. This operation is carried out both automatically, thanks to the software's ability to identify points characterized by contrast conditions, and manually, through the identification of natural or materialized points on-site. These points, defined as markers, are then tracked by the software to evaluate their position within each individual frame. The automatic procedure often generates errors, so manual intervention is necessary for markers that may have been tracked incorrectly due to various factors such as sudden changes in lighting and contrast conditions or occlusion by other elements in the scene. Once the intrinsic and position parameters of the camera have been defined, scene solving is performed to determine the orientation and scale of the 3D scene. This involves identifying three markers to define a vertical or horizontal reference plane, an origin, and a direction to establish the orientation of the coordinate system. Finally, the distance between two known points is used for scaling. The use of known points identified through the survey allows for the use of the same reference system as the reconstructive models already developed. This enables easy and coherent integration of the new models with the background defined by the clip. The mesh model of the current state of the Oratory, generated as mentioned earlier from the point cloud, was also oriented according to the same reference system. This model was then associated with a specific

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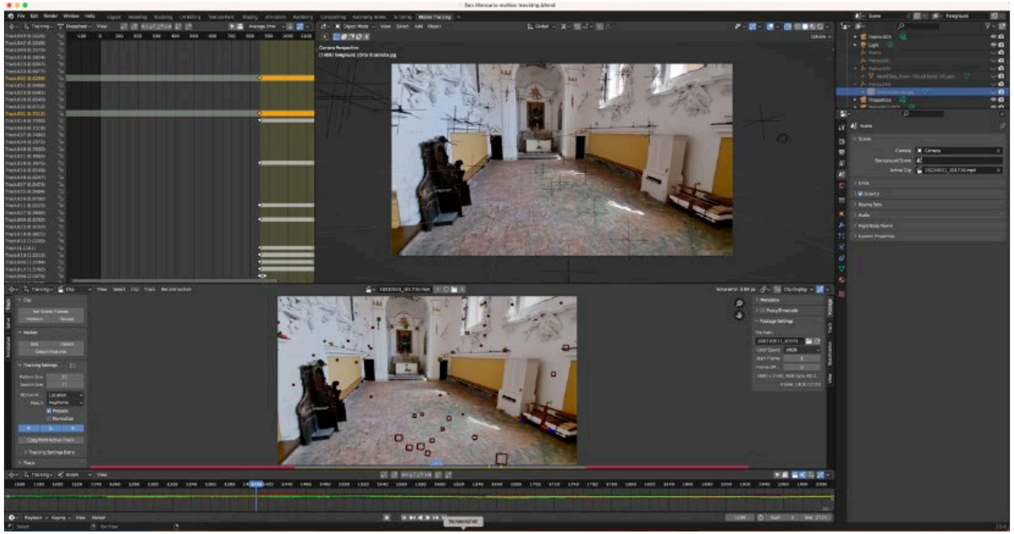

Fig. 15 – Oratorio di San Mercurio. 3D Camera Tracking processing procedure

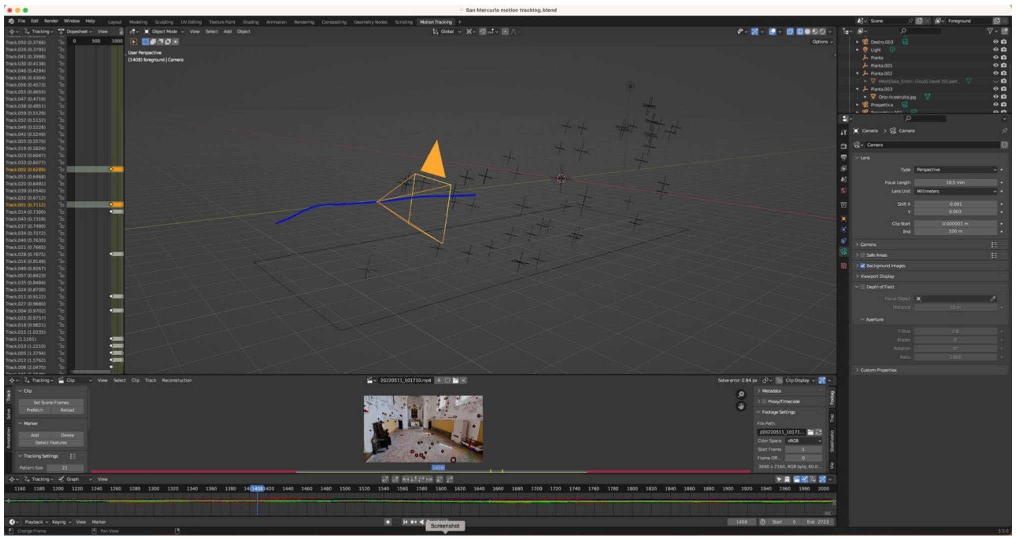

Fig. 16 – Oratorio di San Mercurio. 3D Camera Solving procedure and identification of the camera path.

shader that allowed the removal, in the rendering phase, of those areas of the digital restoration of the flooring that were not visible due to some furnishings present in the scene. Before being imported into Blender, the model of the digital restoration of the flooring was translated and rotated using Rhinoceros software, using the same points identified during the Scene Solving as a reference. Once the lights were set to match the daylight conditions during shooting, all the frames were rendered. Finally, the compositing module of Blender was used to combine the two distinct video streams and ensure a consistent color rendering by applying appropriate color correction and defining and managing the transitions.

CONCLUSIONS

More and more often, monumental sites, museums, and cultural institutions adopt applications and multimedia installations to disseminate and enhance Cultural Heritage, making it accessible in virtual modes. This is made possible through the extensive use of advanced technologies that offer more immersive and engaging experiences, going beyond traditional passive visits. The creation of digital products aimed at enabling the virtual enjoyment of aspects that cannot be experienced directly significantly contributes to the understanding of cultural heritage. Furthermore, it represents a unique opportunity to narrate real or conceptual paths through an innovative approach. Augmented Reality and Virtual Reality are already employed in archaeological, architectural, and urban investigations. These techniques, through the use of common devices and technologies, allow for the digital exploration on-site of artifacts preserved in museums (Cannella, Gay 2018). They also enable the simultaneous viewing, during a real visit, of digital reconstructions of transformations over time (Agnello et al. 2022), configurations now vanished (Cannella 2018; Pierdicca et al. 2015; Younes et al. 2016), or never realised design solutions (Avella, Schilleci 2020).
Motion tracking applied to the visualisation of lost

configurations in the field of cultural heritage is a technology that allows for the digital recovery and recreation of elements or structures that have been lost over time. This methodology is particularly useful for the study of historical artifacts, works of art, archaeological sites, or buildings that have suffered damage or destruction. Starting from survey data, it is possible to obtain three-dimensional digital models that allow users interactive views to explore objects or environments in detail. User movement can be tracked to provide an engaging and personalised experience.
Recently, motion tracking and virtual reality applications in museums have allowed visitors to explore artifacts through virtual reality experiences, providing an accurate perspective of objects in their original form. Consider, for example, the immersive experience conducted by the Louvre Museum in 2019 through the exhibition 'Mona Lisa: Beyond the Glass,' where, using virtual reality, visitors could explore the Mona Lisa in a digital version that revealed details of the painting invisible to the naked eye (Maida 2019).
The case studies presented here proposed the hypothetical digital reconstruction of the flooring drawings of the Oratories dei Bianchi and di San Mercurio in Palermo. These reconstructions, which required a thorough survey and analysis of the current state, were carried out by analogy with motifs already present in other sections of the same floorings. In some cases, specific gaps were virtually integrated with figurative elements depicting the same subjects, part of the decorative apparatus of the Oratories. The aim of this contribution lies not so much in the exact and certain reconstruction of the image but in experimenting with a method applicable to other similar case studies.
The future development of research could lead to the creation of an Augmented Reality application for the enjoyment, in the real environment, of the ideal configurations of the floorings and for

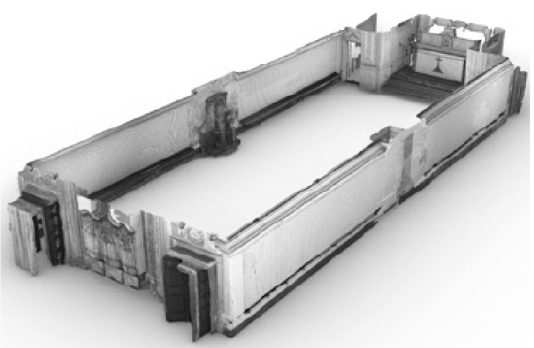

Fig. 17 – Mesh model of the lower part of the oratory walls

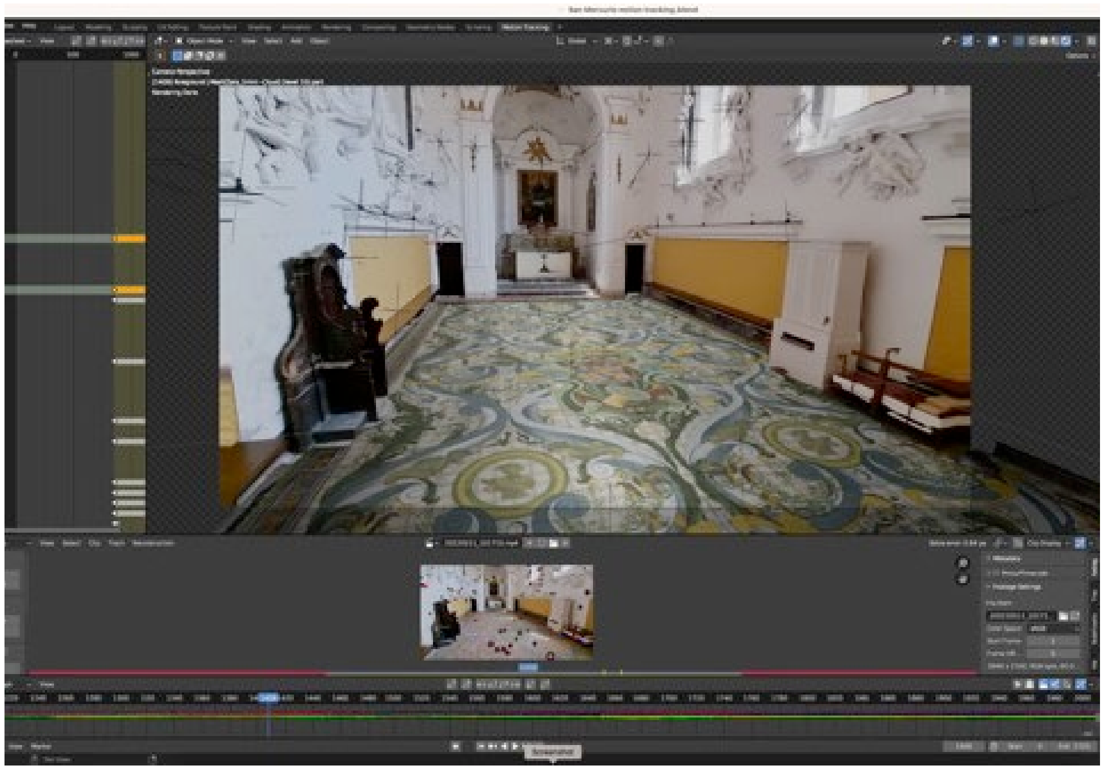

Fig. 18 – Rendering of digital scene and compositing process

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Fig. 19 – Some frames of the multimedia video.

the visualisation of additional virtual content that would enrich the user's sensory experience.
Future experiments of this nature should not be limited to the documentary or informative aspect of Cultural Heritage but should be extended to the preservation of the Heritage itself. Consider, for example, the possibility of digitally visualising a restoration before executing it, to support restorers in preliminarily identifying the most suitable intervention choices on the Heritage. Or the project 'Virtual Museum of stolen cultural objects' that UNESCO has launched, in collaboration with Interpol, to design "the first virtual immersive reality museum of stolen cultural objects at a global scale. It will contribute to raising awareness among general public to the consequences of illicit trafficking of cultural property and contribute to the recovery of stolen objects. Visitors will be able to explore virtually spaces as in a real museum and get access to educational digital materials" [2].

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CREDITS

The paragraphs The drawing of two maiolica floorings and Conclusions were written by Vincenza Garofalo; Marco Rosario Geraci curated the paragraph The Survey; Ludovica Prestigiovanni curated the paragraph The digital reconstruction of the floorings and all the drawings; the paragraph A motion tracking application is written by Mirco Cannella.

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NOTE

[1] The dark colour of the terracotta inserts, used to distinguish the original floor from the restoration additions, inevitably changed the perception of light inside the Oratory.

[2] Retrieved September 27, 2023, from https://core.unesco.org/en/project/505GLO4000.

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