Journal of Cultural Heritage 16 (2015) 741–746

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Case study

# An immersive information system for the communication of the restoration of Simone Martini's Polyptich

Marcello Carrozzino[a,*,1], Chiara Evangelista[a,2], Caterina Bay[b,3], Franco Tecchia[a,4], Dario Matteoni[b,5], Massimo Bergamasco[a,6]

[a] Scuola Superiore Sant'Anna, Pisa, Italy
[b] Soprintendenza BAPSAE, Pisa, Italy

ARTICLE INFO

*Article history:*
Received 19 August 2014
Accepted 4 December 2014
Available online 29 December 2014

*Keywords:*
Restoration
Immersive Multimedia
Cultural heritage
Documentation
Interaction

ABSTRACT

The paper describes the multimedia museum installation realized on the occasion of the restoration of the Polyptych of Simone Martini, introducing objectives in terms of communication, fruition and documentation, presenting design and architectural solutions, and discussing the obtained results against the set objectives, demonstrating also the adaptability of the developed concept to other contexts.


## 1. Research aims

The multimedia installation presented in this paper represents a real-world example of using interactive and immersive technologies inside museums serving multiple purposes at the same time: documenting the restoration of an important artwork, not only for professional operators but also to elicit the involvement of the public at large; acting as temporary replacement for the original artwork; providing an engaging tool able to support custom-tailored educational programs; enabling novel ways for experiencing art based on interaction.

An additional aim is to assess the usability and the communication efficacy of the installation, whose reproducibility is also evaluated in other contexts, different from the original one.

## 2. Introduction and related work

Virtual reality and immersive multimedia are increasingly used in the cultural heritage sector, mainly for communication and educational purposes [1], commonly aiming at the general public as the end user. ICT tools are starting to be adopted also as an aid to professionals such as museum curators [2], conservators and restorers. An example is SICAR [3], a Web-based GIS for the documentation of ongoing restoration works, mainly dealing with planar artworks. A similar approach is used in the cultural heritage information system (CHIS) project [4], which is, instead, devoted to 3D artworks such as sculptures. Other software tools support teaching in this field [5] or directly assist the operational phase [6]. Nevertheless, documenting a restoration is commonly assumed as a need concerning professional operators only; hardly ever the documentation of a restoration intervention is purposely produced and used for communicating to the public at large. On the occasion of the restoration of Simone Martini's Polyptich, the National Museum of San Matteo in Pisa, the institution hosting the artwork, has decided to broaden the involvement of its public in this operation, by setting up together with the PERCRO Laboratory of Scuola Superiore Sant'Anna in Pisa, and its spin-off Mnemosyne, a technology-based tool for communication, involving immersive multimedia and interactive information access.

* Corresponding author.
*E-mail addresses:* carrozzino@sssup.it (M. Carrozzino), c.evangelista@sssup.it (C. Evangelista), caterina.bay@beniculturali.it (C. Bay), f.tecchia@sssup.it (F. Tecchia), dario.matteoni@beniculturali.it (D. Matteoni), bergamasco@sssup.it (M. Bergamasco).
[1] Tel: +39 050 882515; fax: +39 050 883333.
[2] Tel: +39 050 882562; fax: +39 050 883333.
[3] Tel: +39 050 926511; fax: +39 050 926542.
[4] Tel: +39 050 882553; fax: +39 050 883333.
[5] Tel: +39 050 926519; fax: +39 050 926542.
[6] Tel: +39 050 882548; fax: +39 050 883333.

http://dx.doi.org/10.1016/j.culher.2014.12.003
1296-2074/

## 3. Materials and methods

The Polyptich of Santa Caterina was painted around 1320 by Simone Martini for the high altar of the Pisan church of Santa Caterina. It is the most complex and complete work of the painter to come down to us. On each of the six large tables put side-by-side to the central one (portraying the Madonna with Child) the figure of a saint appears, surmounted by a pair of apostles and a prophet in the cusp. The elegant composition scheme has a total of 43 characters. The altarpiece has undergone a complex history, common to many medieval multi-paneled works. Towards the middle of the seventeenth century the high altar of Santa Caterina was renovated and the polyptich was disassembled, removed and stored in a building adjacent to the church. Towards the end of the eighteenth century some tables were withdrawn to private collections, while other pieces remained the church property. The altarpiece was reconstructed in 1946, and ever since it has been exhibited in the premises of the National Museum of San Matteo, although at first with an arrangement of the tables different from the current one. In the seventies, based on the first scientific analyses, a new reconstruction hypothesis has been formulated by following the marks of the wood grain on the back of the tablets. The diagnostic surveys completed in July 2011 have confirmed this new hypothesis.

In 2011 the artwork has undergone major restoration and the Museum sought to find a solution to compensate for the absence of one of the most renowned pieces of its collection for two years. It was hence decided to create a multimedia installation with the purpose of temporarily filling in this gap, also in terms of physical space (the Polyptich is a majestic artwork, sized approximately $95 \times 340$ cm). One of the requirements was therefore the use of a large screen to be put in place of the painting. The second requirement was to make the installation a container of information related to the artwork, to the artist and, not less importantly, to the restoration itself. In fact, the Museum decided to give great relevance to the restoration operations, not only by providing a "live" window on the restorers at work (all the operations were carried out inside the museum, in a laboratory placed in a location accessible to visitors), but also by giving access to the huge documentation produced during the diagnostic stage and the restoration works.

Given that most of the available information was relevant only to researchers and scholars, another important requirement for the installation was to enable user interaction, in order to allow visitors to setup custom-tailored knowledge paths.

These requirements were addressed by designing an installation presenting a layout similar to other existing projects such as the TimeFrame [7] or the Portalada [8] kiosks. The installation is composed of a touch-screen console directly accessible by visitors and placed in front of a large screen on which a digital representation of the Polyptich is depicted in high resolution on a 1:1 scale. The touch console and the large screen are synchronized through an exchange of network messages in order to coordinate the visualizations. The console presents a touch-based graphical user interface available in two languages (Italian and English) and structured on five main information levels:

- artwork, presenting information related to the painting and its history;
- characters, with the iconography of all the characters present in the artwork;
- technique, providing technical information about the procedures followed by Simone Martini in the realization of the painting;
- beyond the visible, including an extensive collection of diagnostic data and images (UV, infrared, x-rays etc.);
- restoration, collecting all the information gathered during the restoration process.

The selected information is presented on the console screen in the form of text descriptions, images, or movie clips (Fig. 1, top). The large screen is devoted to more dynamic and enticing content, such as 3D animations or the interactive exploration of the painting. Using the touch console it is possible to pan/zoom the painting image and watch the effects of this exploration on the big screen, making it possible to view details not visible to the naked eye. During the interaction the full image of the painting is constantly visible in the touch-screen, with a red box delimitating the portion of the painting (active portion) currently displayed on the large screen. Visitors can move their virtual viewpoint by dragging the box with the finger, or zoom in/out either with the classic pinch-zoom approach or via a zoom bar.

In other cases the synchronization between the two content is automatic and depending on the user selection. For instance, in the "characters" section a set of sensible hotspots (Fig. 1, center) is visualized on top of the painting in the touch console, each corresponding to an underlying character. When users select one of these hotspots, an automated pan-zoom motion is triggered in order to place the selected character at the center of the scene in the large screen. At the end of this movement, a descriptive card with additional information appears in the foreground on the touch console. Touching again the screen makes the card disappear, enabling the interactive exploration once again. In general, all the information in the console are available by means of both submenus entries and hotspots, placed on the digital reproduction of the painting and providing a spatially referenced context for the information.

An interesting interaction mode is provided in the section "beyond the visible" (Fig. 1, bottom). This section contains a set of information coming from the diagnostic investigations carried out prior to the restoration operations. In particular, digital images coming from infrared reflectography, ultraviolet fluorescence, x-rays, and so on, can be visualized on the large screen. In this mode, the active portion on the touch-screen works as a plate superimposed on the painting, and the related content (i.e. the portion of the diagnostic image at the current level of zoom) is displayed on the large screen with the same pan/zoom features available in the "normal" exploration.

Additionally, upon particular selections, movie clips presenting 3D animations and/or other more "engaging" multimedia content are displayed on the large screen.

Particular care has been put on the selection of content. With the objective of addressing different segments of public, information is almost everywhere structured on two levels: the first, basic, targeting the general public, the second, more detailed, aimed at specialists. It must be considered, in fact, that due to the peculiar type of its heritage – a large collection of Medieval and Renaissance art – the National Museum of San Matteo is very much appreciated especially by scholars and art historians.

### 3.1. Architecture

From the technical point of view the system is organized as follows: the touch-screen console is an all-in-one touch MS Windows PC, connected via Ethernet to another PC driving the projection on the large screen (Fig. 2, top-left). The touch PC runs an HTML 5 application launched via Node Webkit[7], a toolkit based on the Chromium[8] browser enabling web technologies on desktop applications and providing an excellent kiosk-mode. The large

[7] https://github.com/shama/nodewebkit.
[8] http://www.chromium.org/.