Digital Tools in Architectural History and Identity of Virtual Space. Research and Teaching Experiences for the Enhancement of Cultural Heritage*

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Abstract

How can digital tools relate to the history of architecture, and what identities can virtual spaces have in respect of the monuments of the past? Recently, digital approaches have been applied in many different areas of the humanities, leading to the emergence of a major new cross-disciplinary field that brings together disparate. The digital approach is a common denominator in specialised research and teaching as well as in archival practices, dissemination and publishing. This paper aims to outline a panorama of current research issues, challenges and practices between Digital Humanities and Digital Cultural Heritage, and to present some case studies addressed in the DAda and PLAY Lab at the University of Pavia.

Keywords: Digital Humanities; Virtual Heritage; History of Architecture; Virtual Reconstruction

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Abstract

Come possono gli strumenti digitali rapportarsi alla storia dell'architettura e quali identità possono avere gli spazi virtuali rispetto ai monumenti del passato? Recentemente, gli approcci digitali sono stati applicati in molte aree diverse delle scienze umane, facendo emergere un nuovo importante campo interdisciplinare che riunisce competenze disparate. L'approccio digitale è un denominatore comune nella ricerca specialistica e nell'insegnamento, così come nelle pratiche archivistiche, nella divulgazione e nella pubblicazione. Questo articolo si propone di delineare un panorama delle attuali problematiche, sfide e pratiche di ricerca tra Digital Humanities e Digital Cultural Heritage, e di presentare alcuni casi di studio affrontati nel DAda and PLAY Lab dell'Università di Pavia.

Parole chiave: Digital Humanities; Patrimonio Virtuale; Storia dell'architettura; Ricostruzione virtuale

1. Introduction

This paper aims to explore the relationship between the use of digital tools and the history of architecture, and to examine the identities that virtual spaces can have in comparison with historical monuments. There are many different ways digital tools can be employed, therefore the first step in our methodology was to summarize, through the analysis of some realized projects, those we consider the most effective in our field.

Recently, digital applications in various sectors of the humanities have led to the creation of a major new cross-sector area which brings together disparate expertise and necessitates interdisciplinary cooperation (Gold 2012; Weller 2013). In this process, the digital approach should be viewed as a common denominator in specialized research and teaching, as well as in archival practices, dissemination and publishing. Digitization was just the first transformation brought about by the use of technology. In the following years online resources, open-access collections, and publications grew exponentially. As a result, historians suddenly gained access to vast amounts of new data – records, images, and information – from archives and collections around the world. In academia, digital history has created new opportunities for teaching and learning. Digital history can provide students with access to historical documents and texts as demonstrated by projects developed at the turn of the century by various universities (*Burdick 2012)*. Meanwhile, pioneering lab models such as the Stanford Humanities Lab developed by Jeffrey Schnapp, who now leads the Harvard MetaLab, have spawned research centres that integrate digital technologies into

humanities research[1]. These developments have significant implications, particularly given the changing cognitive methods of digital natives. New "digital historical products" could give rise to long-lasting effects, including impacting the meaning of history in society (Chapman 2016). The innovative use of digital approaches in history could make documentary research and information highly accessible, with an enormous impact on society, potentially leading to a significant increase in public knowledge of historical data (Quintero 2007). From a historical perspective, Digital Heritage and Digital Humanities approach different aspects of heritage. The former focuses on tangible and intangible cultural heritage objects and their preservation, education and research, while the latter focuses on the application of digital technologies to support research in the humanities (Bellotti 2013; Classen 2012).

2. The Methodologies and Questions

The history of architecture is a discipline that straddles the humanities and the technical sciences related to the field of building construction. Based on this premise, this paper aims to outline an overview of current research topics, challenges and practices at the intersection of Digital Humanities and Digital Cultural Heritage. Our research methodology is guided by fundamental questions: How are digital humanities and architectural history contributing to cultural heritage research? What are the objects, topics, concepts and research methodologies of Digital Humanities and Cultural Heritage?

The data characterizing digital humanities include texts, images, and objects. The use of digital methods in text-oriented disciplines is currently well established and standardized (Münster 2019). In contrast, the field of digital methods related to images and other visual objects (or based on vision rather than close reading) remains – despite various attempts – largely unexplored. Possible reasons for this situation include the "different nature of the methods used" in disciplines focusing on these types of artefacts, such as art and architectural history, cultural heritage studies, or museology, as well as the varying levels of establishment of digital research methodologies in these disciplines. Based on these premises, this research attempts to classify and put forward five different and effective ways of using digital tools in architectural history: A. The first method consists in digitalising historical documents, drawings, and ancient texts; B. The second method centres on the analysis of drawings as documents that can reveal unpublished aspects and new interpretations; C. The third method entails studying and verifying historical hypotheses, and then make them known; D. The fourth method consists in applying virtualization to real buildings, such as those with degraded elements, by securing the original

1 https://mlml.io/

element and replacing it with a virtual replica; E. The last method concerns the forms of communication and dissemination of scientific studies, including processes of critical analysis and interpretation of historical-architectural facts or documents.

To analyse these five methods, some exemplary cases were studied. *The Digital Serlio project*, curated by the Avery Library and Francesco Benelli, is an appropriate example illustrating mode A. Digital Serlio provides access to the holdings of Columbia University and its Avery Library in a digital and user-friendly format[2]. The project directly links current research on Serlio's works with digital acquisitions of the works themselves. The method involves the use of visual, textual and material analysis processes based on high-resolution digital images. This structuring allows for a re-examination of Avery's corpus of Serlio to address questions about 16th century domestic architecture and Serlio's socio-economic model for early modern European town planning. Project outputs include a web page that collects digital versions of all existing manuscripts by Sebastiano Serlio. The page clearly indicates the holding institution and provides links to external sites maintained by each repository. The project also provides online access to new research on various topics, such as the materiality of manuscript paper and the definition of national typologies of domestic architecture. These are accessible in the form of essays contributed by international scholars, along with Avery's entire collection of published editions of Serlio's complete works.

In recent years, digitalisation has allowed us to see what was previously invisible to the naked eye. The virtual exhibition, organized a few years ago by Costanza Caraffa and Mauro Mussolin with the photo library of the Kunsthistorische Institut in Florenz [3], is an effective example of method B. The exhibition aims to reveal some of Michelangelo's drawings that are difficult to observe in photography or even with the naked eye, highlighting the artist's extraordinary ability to prefigure shapes before tracing them on paper. These almost imperceptible signs are imprinted on the paper, capturing gestures and transformations as if recorded. Some drawings by Michelangelo in the *Casa Buonarroti Museum* continue to raise questions for scholars (Mussolin 2012). The recognition of sketched figures is only partially possible: subsequent erasures, stratifications, or even the reuse of the sheets as writing paper by Michelangelo himself, have made it challenging. Paola Barocchi, in the 1964 catalogue, defined part of this collection as "indecipherable sketches." Through digital photography and the related technical reconstruction possibilities, lines and shapes that are barely perceptible to the naked eye can be made visible. Raking light,

2 In particular, the project focuses on Benelli's research on Sebastiano Serlio's works, including those published in multiple editions, and the manuscript of his unpublished masterpiece, *On Domestic Architecture*. For further details see https://library.columbia.edu/libraries/avery/digitalserlio.html.

3 https://www.khi.fi.it/it/aktuelles/ausstellungen/2014-11-visualisierung-des-unsichtbaren.php.

backlighting, or ultraviolet light reveals hidden signs. By further manipulating the image contrasts or digitally extracting successive layers, previously unknown conceptual ideas can be brought to light leading to new interpretations of Michelangelo's work.

The methodologies employed by Digital Humanities have introduced radical changes in the enjoyment of cultural heritage. At the same time, the use of digital and new media has profoundly changed historical research, which underpins the knowledge and understanding of cultural heritage (Svensson 2015; Sullivan 2016). The most obvious effect is a kind of "public use" of history. Method C concerns the new possibilities offered by virtualisation processes to study incomplete, deteriorated or demolished architectural structures, such as unfinished church façades or lost monuments and cities, such as the temples of Nubia in Egypt. For example, archaeologists often use virtual reality to "restore" (recreate and study) lost cities and environments (*Bawaya 2010;* Tamborrino 2016). As for unfinished façades, the case of the façade of the church of San Lorenzo in Florence is illustrative (Ferretti, Savorra 2015). The incompleteness of the façade has led many architects to attempt completion projects over the centuries, including Michelangelo, who made detailed drawings, studying the materials, and paying particular attention to the use, cutting, and arrangement of marbles. A wooden model of his design was also created. Digital reconstruction has allowed speculation on the façade conceived by Michelangelo. The outcomes of digital history are more accessible for the purposes of preservation and, at the same time, to the general public interested in cultural heritage. Cultural information becomes more comprehensible by linking data within spatio-temporal frameworks. Digital re-processing was thus used to study how the façade might have been realised. Projections were made on the façade with video mapping to disseminate the research results. The use of space and time creates an immediate user orientation that successfully influences the enjoyment of heritage sites. The digital approach also enhances full appreciation by activating user participation. However, the connection between historical information and its fruition is not as straightforward as the spatio-temporal link in historical approaches. Certain prerequisites must be met, which will be discussed below.

3. Methods and Tools

In the case of architectural or decorative elements which have deteriorated over time, a common practice is to replace the original element with a copy made from digital acquisitions (Balletti 2019). This approach has the dual benefit of preserving the overall image of the building and safeguarding the original element. This method, referred to as Scenario D, is increasingly applied and, recently – in parallel with rapid technological development – has been associated

with phases of experimentation and historical research for representing the investigated element across different temporal phases. An example is the project concerning the church of San Michele in Pavia[4]. Documentation and surveying with digital instruments enabled the creation of a metrically accurate redrawing of the church's exterior decorations. These were then redrawn in vector graphics with a high level of detail to facilitate upcoming restoration operations. The analysis revealed significant degradation of the façade stones, caused by incorrect restorative treatments over the years that drastically accelerated the stone erosion process.

Figure 1. Digitization process of the tile of Saint Giorgio and the Dragon of San Michele Church, Pavia, 2022, DAda-LAB, DICAr, University of Pavia. Above: integrated survey methodology of St. Michael's Church; middle: detail of photogrammetric models of the facade; bottom: digital and 3D-printed reconstruction of the tile of St. George and the Dragon. Project managers: Prof. Sandro Parrinello, Prof. Marco Morandotti. Research team: Prof. Francesca Picchio, PhD. Silvia La Placa, PhD Student Elisabetta Doria, Research Fellow Hangjun Fu, Research Fellow Alessia Miceli, Intern Alberto Pettineo. Image processing: Silvia La Placa.

4 The project, for which Marco Morandotti is the scientific director and Sandro Parrinello is the coordinator, concerns the analysis of the façade and external elevations of the church, aimed at developing architectural, material and structural reflections and analyses. The project, started in 2020 and still ongoing, is conducted by researchers of the DAda-LAB and PLAY laboratories of the DICAr of the University of Pavia and with Francesca Picchio currently as scientific coordinator.

As part of the larger research project, an experiment was conducted on a single decorative element: PhD students, scholarship holders and the DAda-LAB researchers digitally reconstructed the damaged tile depicting St. George through digital sculpting (Doria 2023). They used a digital duplicate of the actual tile, acquired via a structured light laser scanner survey. The digital copy was then modified based on historical archive drawings and photographs that depicted the tile in its original condition. Finally, as an additional experiment, the digital duplicates (both the current condition and the original status) were 3D printed at a scale of 1:5. Printing was done both with the classic PLA filament method[5] and in concrete, using a cast, to reproduce the material of the original stone as faithfully as possible (Fig. 1).

The final method, Scenario E, concerns the forms of communication and dissemination of scientific studies, focusing on the processes of critical analysis and interpretation of historical-architectural facts or documents. This mode raises several questions that research and literature have attempted to answer over the years. What kind of relationship or interaction can cultural heritage have with digital space today? Here, cultural heritage refers to a set of historical, artistic, and architectural assets. These questions are challenging to answer, especially given the rapid evolution of digital technology and the consequent swift changes in the perception of environments, architectural structures and memories affected by it. A few years ago, William Mitchell, in *City of bits* described an immaterial condition of cultural heritage (Mitchell 1995). According to him, the diminishing importance of physical heritage is leading to a dramatic increase in access to a multiplicity of knowledge tools. Today, over twenty years later, the windows onto the world of immaterial communication now map a global network that overlaps with the physical landscape of objects. A distant reading replaces consulting books, studying documents, contemplating works of art, or the study of architectural structures that were designed or merely imagined. It is therefore pertinent to discuss the implications of this radical shift: moving from a focus on documents to a focus on images to be consumed.

This mode of consumption seems to lead to addiction. However, there is no need to be apocalyptic a priori. Quoting Sergio Solmi, when "crazy explorations of future worlds," a "chain explosion" of fantastic discharges between the ingenious and the childish, influence human lives, it indicates a state of crisis. In his *Divagazioni sulla science-fiction* [Digressions on science fiction], Solmi explained these symptoms as reflecting "the individual's unsuitability to the terms of destiny, and societies to their determined historical configuration and their ordinary ways of development" (Solmi 1978, 47). These observations still serve as a warning against using the "fantastic" as something for more than mere

5 A low-cost Creality Ender-3 FDM2 type printer was used to produce the model, using a white PLA (polylactic acid) filament. The FDM method is based on a nozzle that deposits a molten polymer layer by layer to create the geometry of the part.

entertainment. It is urgent to investigate the limits and conditions of applying immaterial communication: both for creating popular entertainment processes and, more importantly, for organizing and managing stratified databases of the past. These include libraries, documentary archives, and archives of artists or architects, which collect the heritage of our past.

Today, these reflections should be revisited and reframed, focusing on the most interesting aspect, linked to the current use of the dematerialisation of interventions on architectural heritage, as an act of "reduction" (De Fusco 1976). Among the many examples, immersive virtual environments accessible through Oculus headsets and the artistic expressions of video mapping are notable. The latter are fundamental not only as creative acts but also as tools for understanding the past. For example, video mapping can be used to understand the history of built architectural structures and to show unfinished projects or places that no longer exist due to their destruction. One example is the performance that took place in Florence[6], where Michelangelo's projects were projected onto the unfinished facade of the church, to explain the artist's intentions to the general public. This performance illustrated what the facade might have looked like if completed and possibly emphasized the significance of leaving it unfinished.

4. Teaching and Research Applications

The Department of Civil Engineering and Architecture at the University of Pavia has a Drawing Archive that brings together various collections, which have never been sorted and are even distributed within university spaces without a specific known location. Since January 2023, a process of collecting, counting, and analysing different types of architectural drawings and documents has begun, to consolidate them into a single physical space[7]. To date, more than two thousand drawings have been counted, and the process is ongoing. The collection space is insufficient, given its size, current equipment, and furnishings, to conserve and simultaneously make usable larger papers as well as older and more fragile ones. To safeguard the memory of these works, it was decided to create a virtual space in parallel with the physical one.

This digital container is intended to bring together different types of data, allowing researchers to virtually navigate between the author, the work, the architectural typologies connected to it, the references, and more. In the digital space, it becomes possible to establish immediate connections between

6 https://www.ultraprime.net/project/la-facciata-di-michelangelo-costruita-con-le-luce/.

7 The activities of collecting the documents in a single space were coordinated by Prof. Massimiliano Savorra. The current temporary physical space of the DICAr Drawings Archive is a room located within the Library of Science and Technology of the University of Pavia. The possibility of using and setting up the room is due to a collaboration with the Director of the Library, Dr. Anna Bendiscioli, and the Technical Office of the University of Pavia.

different works, facilitating the development of new interpretations and the deepening of established knowledge.

The initiation of this digital construction involved a comparison with the five methods described in the previous section. To determine the most suitable method for describing the contents of the Drawing Archive, a teaching and applied research path was started. The experiments focused on the relationship, in the digital age, between the researcher, the history of architecture and representation, and heritage, whether existing or now missing without trace. Due to the vast number of catalogued drawings, only one collection was selected for research: that of architect Sebastiano Giuseppe Locati (Fig. 2).

Locati gained prominence in the late 19th and early 20th centuries and was appointed professor at the University of Pavia in 1899. At Pavia, he taught ornamentation and architecture, architectural composition and practical architecture (Di Marco 2005). Among his many architectural works, he designed and realised the setting up the 1906 Milan International Exhibition in Parco Sempione. The exhibition, dedicated to the opening of the new Sempione railway tunnel, was a temporary event. This aspect makes it a particularly suitable case study for our purposes. The pavilions, architectural structures and infrastructures built for the Exhibition were all demolished at its conclusion[8].

An experiment combining didactics and research was thus initiated, involving students from the History of Architecture Laboratory 1 (academic year 2022/23). The theme for the academic year concerned analysing the possibilities offered by virtually reconstructing environments and places from the past that no longer exist, have been damaged or were designed but never built. Activities were conducted in the utopian workshop "LaBUR / Laboratory Built, Unbuilt, Rebuilt," which examined architectural structures which were ephemeral, destroyed or solely designed for competitions. The aim was to understand the importance of virtual reconstruction for exceptional architectural structures. Among these, the 1906 Milan International Exhibition was examined. Following a methodological process "from the archive to the model", three-dimensional models of the demolished pavilions were created based on the original graphic design drawings[9].

Widely used in ex-ante design and architectural surveys, 3D models are powerful tools for studying and understanding historical sites and buildings, as they

8 Only the Aquarium building, designed by Locati, remains of the 1906 Milan Exhibition, and is still visible in Parco Sempione in Milan.

9 Coordinated by Massimiliano Savorra, Silvia La Placa and Paola Barazzoni, the process of research, historical documentation and reworking with two-dimensional graphic renderings and 3D models, told through the creation of exhibition panels, was the subject of an exhibition in the second edition of the Pavia Digiweek international event. The exhibition, promoted by the University of Pavia, was open from 26 September 2023 to 5 October 2023, in the spaces of the Department.

allow for deeper, richer and more controlled interaction with places and spaces. Historical research can thus be represented in digital environments, visualising the relationships between buildings and sites, landscapes and changes which have taken place there.

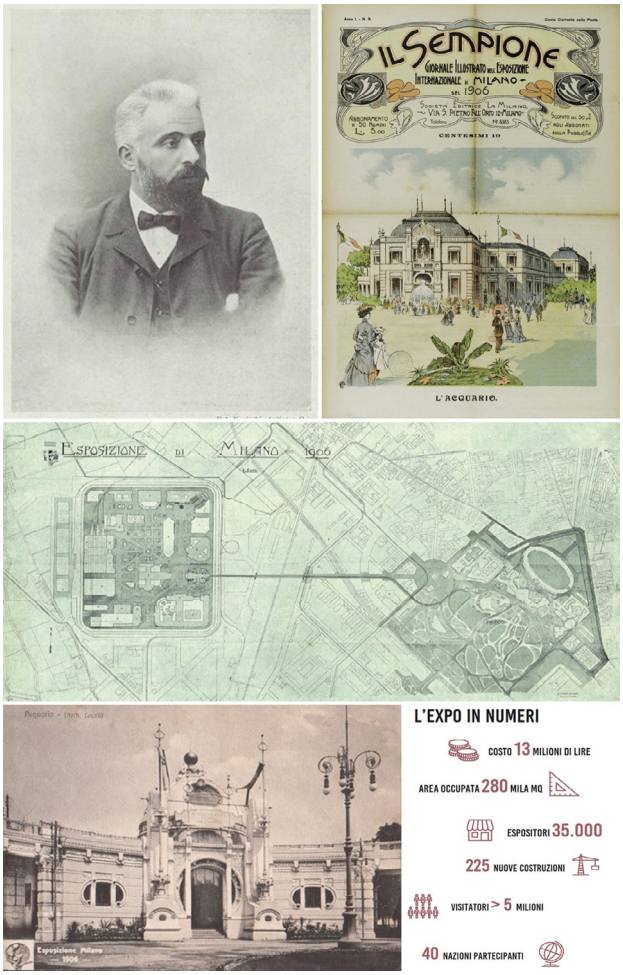

Figure 2. Overview of the 1906 International Exposition. From top: photograph of Architect Sebastiano Giuseppe Locati, in charge of the exhibition area of Parco Sempione; middle: map of the two exhibition areas in Milan, connected by a raised electric railway for the transportation of visitors; bottom: historical photograph of the aquarium building, designed by Architect Locati and the only building still visible of the temporary Exposition. All the images that make up the composition were scanned from the originals in the Drawings Archive (director Prof. Massimiliano Savorra) of the DICAr of the University of Pavia. Image processing: Silvia La Placa.

Three-dimensional digital models are useful not only for describing the current state of things, but also for illustrating processes related to the building of architectural structures that no longer exist. The overall aim of the workshop was to explore the possibility of laying the groundwork for the construction of 3D virtual reality environments.

The model construction methodology followed scientific and systematic reconstruction principles, enabling a metrically reliable reconstruction of the Exhibition based on drawings, graphs, maps and historical documents[10]. The archive research, initially conducted at the Drawings Archive of the DICAr of the University of Pavia, was later expanded to include archives in Milan and throughout Lombardy. Project drawings (such as plans, sections, axonometric views, study perspectives) were scanned and used as the basis for digital vector redrawing. Using AutoCAD software, two-dimensional graphic drawings were produced, serving as the basis for developing three-dimensional hybrid NURBS-mesh models of the vanished pavilions[11]. In addition to the metric drawings, postcards, historical photographs, and posters from the time were employed to reconstruct the Exhibition's architectural form. These sources allowed for an understanding of not only the purely architectural aspects of the Pavilions but also the material components of the structures, the overall complexity, the artefacts and objects displayed inside, and the ways in which the external spaces and infrastructures were used.

These aspects are crucial for developing a virtual environment in which users can relive the experience of the 1906 Exposition. Based on this premise, initial experiments were developed to integrate digital duplicates into game engine platforms for interactive use of the Expo[12]. Following the gaming methodology widely applied to virtual reconstructions of lost archaeological sites (Anderson 2009), the goal is to contribute, by shaping a hybrid analogue-digital methodology, such as that "from the archive to the model", to the valorisation of this heritage, which is no longer visible today (Fig. 3).

10 For more details on the method, see Galasso 2023. On these topics, see also Parrinello 2024.

11 Sketchup and Rhinoceros software were used for modelling, working with extrusion, cutting and subtraction of shapes.

12 The experiments, still in progress, are conducted within the DAda-LAB Drawing Architecture Document Laboratory of DICAr, University of Pavia. Action by research fellows Silvia La Placa and Francesca Galasso. A first experiment sees the comparison between the possibilities of user-model and user-user interaction within Unity and Mozzilla Hub.

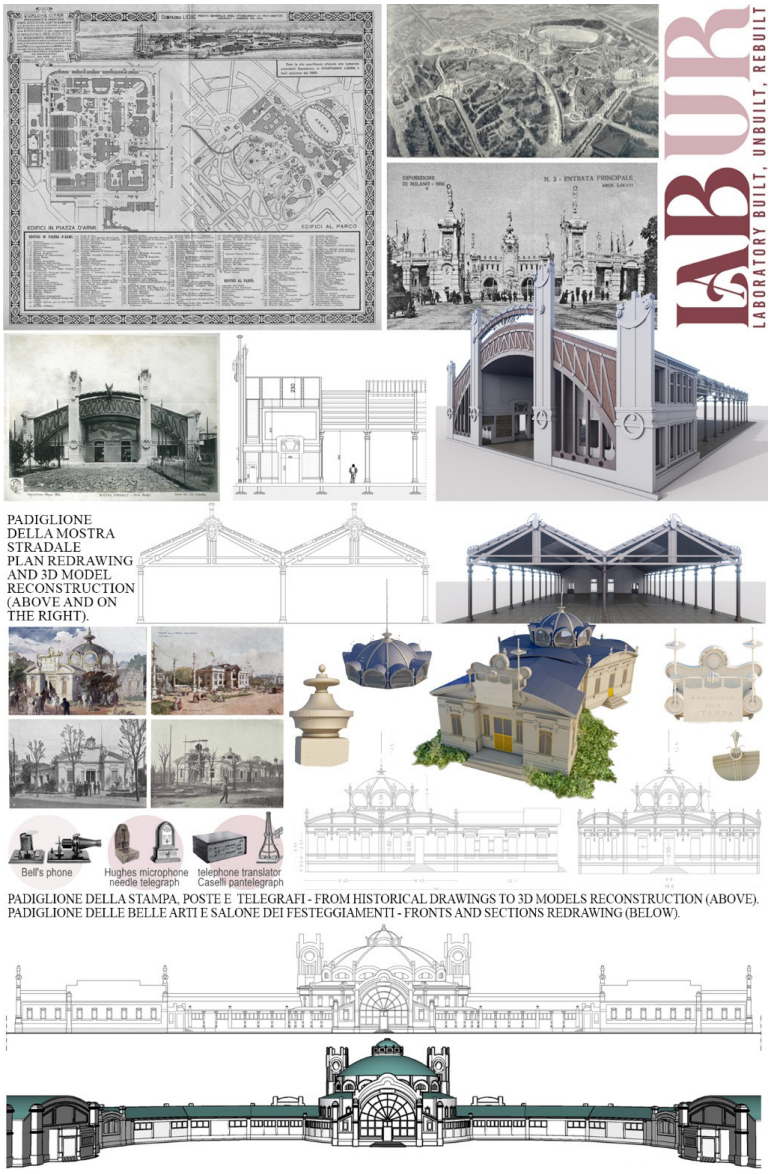

Figure 3. Overview of the activities of the LaBUR (Laboratory of Built, Unbuilt and Rebuilt) Laboratory, within the course of History of Architecture I, academic year 2022/2023 (course director Prof. Massimiliano Savorra, assistants: Arch. Silvia La Placa, Arch. Paola Barazzoni) in the Building Engineering and Architecture degree course at the University of Pavia. The image narrates the process from the archive to the three-dimensional digital model. The historical images are taken from the Drawings Archive of the DICAr of the University of Pavia. The 2D digital drawings and 3D models were made by students during the course. Image processing: Silvia La Placa.

5. Conclusions

In the early 2000s, several "thinking network" studies raised questions about the role of digitization. At that time, concerns were related to the danger of the proliferation of methods for creating images and information, along with various cataloguing approaches, which could result in a chaotic communication landscape akin to Babel. This chaotic scenario has become a reality, not only because of the myriad languages used, but also because miscommunication is fuelled by an increasingly diverse array of images, which are becoming a necessity. The demand for images has intensified in recent years, as "creative" individuals– not only artists and architects, but anyone capable of producing images – have made, and continue to make, representation a unique communication device (Sisto 2022).

In a present and future time in which technological forces – interdependent and unstoppable – reshape society (Kelly 2016), word and critical thinking are irremediably "reduced" to images.[13] In the past, architecture, also understood as "imago," could have been compared to a mass medium, namely an information tool that influenced behaviour and characterized urban civilizations. The question of the "gap" between poverty and opulence, between politics and culture, between professions and universities, between architecture and society, and between the image and substance of things, seems to resurface more than half a century later. Now, in addition to these age-old questions, there are new ones concerning representational referentiality. The changes in the means of presentation, reproduction and diffusion of images have consequences comparable to those that René Berger (1972) feared for all artistic expressions, due to the non-existence of artistic objects.

In virtual reality, experienced by means of headsets, one immerses oneself in environments that stimulate actions and movements. This results in the loss of that freedom to "look outside the field, outside the image". In this regard, Andrea Pinotti recently wrote: "The property of presence (the effect of 'presentification', i.e. of making the environment present to the experimenter and the experimenter present to the environment) seems to undermine the foundations of a paradigm that has informed the main theories of the image since ancient times, evolving and articulating itself in different variations in the contemporary world: the paradigm of representation." (Pinotti 2021, XIII)

Pinotti reminds us that the image is the "representation of a reality that pre-exists and exists independently of the image that depicts it." (Pinotti 2021, XIII) Immersive virtual environments, due to their strong sense of presence, seem, however, to openly challenge the assumptions of vision (Girvan 2018).

13 The term "reduction" is here used according to its Latin etymological root of *re-ducere* [to bring back].

But if the image is "mimesis" according to the classical formulation, then we should speak of unreality for virtual representations.

It is no coincidence that in physics, the term "virtual" contrasts with the term "real." Video mapping, on the other hand, does not produce a loss of senses, nor does it generate a simulated world alternative to the real one, though it is equally complex and compelling. Monuments serve as a surface for images. The images are in front of those who view them, distant from them. Yet video mapping can also generate destabilization. This happens when video mapping intersects with historical heritage considered untouchable. Even if non-invasive, video mapping interventions are often controversial and debated, precisely because they alter the perception of the representation of an architectural structure or monument. Beyond the controversies, cartographic projection interventions are certainly useful. Consider, for example, cases where, for ideological reasons or to preserve the memory of destruction, it is not possible to undertake restoration work on architectural structures or cities (Pavoni 2017).

Beginning in 19th century France, young apprentice architects at the Ecole des Beaux-Arts, known as *pensionnaires*, were required to imagine, in their fourth year of study, a "restitution" of the image of lost monuments. Paradoxically, it was the seductive watercolours of entirely invented environments – more than the *ex-novo* projects of the fifth year – that contributed to the success of many architects. Today, one could argue that this line of historical study – of virtually hypothesizing a past world – is still relevant. The attempts to answer the questions posed at the beginning of this discussion suggest that our relationship with new technologies – both in the production and consumption of images – is not at all secondary (Messinger 2008; Klinger 2022). We modify images and images modify us. The "gigantism" of virtual worlds can create a wasteland, eliciting loneliness. In the 1960s, scholars such as Jean Gottmann warned of the risks associated with the gigantism of true megacities, the oversized metropolises springing up worldwide (Gottmann 1961). Now, the megalopolis is virtual, formed by the network, which gave substance to the global village prophesied by Marshall McLuhan. The virtual megalopolis is inhabited by the societies of the new millennium, which choose to dematerialize images in systems made up of masses of data. Paraphrasing observers of the time, we can hope that in the virtual megalopolis, a digital "urbanization" of consciences will advance to define an identity for digital space. However, it may be more appropriate to speak not of a single identity of digital space, but rather of multiple identities. Adriano Prosperi recalled an idea of the American writer Saul Bellow in a 1988 speech: the identity of a human being is that defined by the story of their life (Prosperi, 2016: VIII). By extension, Prosperi deduced that the identity of a people or society would be its history. Again, by extension, it would be possible to say that the multiple identities of digital space interacting with cultural heritage are those with which we attempt to safeguard and narrate real space.

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