

(IN)TANGIBLE HERITAGE(S)

A conference on design, culture and technology
- past, present and future

AMPS Proceedings Series 29.2



AMPS PROCEEDINGS SERIES 29.2

AMPS, University of Kent. 15-17 June, 2022

(IN)TANGIBLE HERITAGE(S): Design,
culture and technology – past, present, and
future

EDITOR:
Howard Griffin

EXECUTIVE PRODUCTION EDITOR:
Amany Marey

© AMPS

AMPS PROCEEDINGS SERIES 29.2. ISSN 2398-9467

INTRODUCTION

(IN)TANGIBLE HERITAGE(S): Design, culture and technology – past, present, and future

The buildings, towns and cities we inhabit are physical entities created in the past, experienced in the present, and projected to inform the future. The same can be said of the artefacts we use daily: designed furniture in the home, the mobile devices in our hands, the vehicles we see on our streets. However, each of these places, buildings and products had, at their inception, social and cultural roles beyond their 'object' status. They continue to have them today. What we understand a designed object to be then, is a complex question of material and social import, and an intricate play of the tangible and intangible identities. Increasingly, it is also a question of hybrid experiences and overlaid histories. This conference addresses the range of issues connected to this scenario.

The complexity described above is even more pronounced in the case of digital artefacts and experiences such as computational design, VR simulations of ancient buildings, mobile apps, digital photography or virtual exhibitions. Intangible at the very moment of their inception, such designed artifacts not only blur the difference between the object and the experience, but, increasingly, the past and the present. Computer generated imagery creates 'life like' reconstructions of historic sites. Laser scanning gives archeologists glimpses of pasts erased long ago. Computational design gives designers instant recordings of their work in progress. Coupled with digital cataloguing, it gives us the instant asynchronous design archive.

Considered in this context it is not surprising that recently questions about the nature of heritage and design have opened up to redefinitions of the tangible and the intangible. In responding to this scenario the work of the authors collected in this publication present a diverse range of perspectives from various fields including art, architecture, design and cultural studies, to name but a few. They present reconsiderations of 'heritage' as both a tangible and an intangible concept and overlay our notions of the digital, on ideas of heritage and concepts of physicality and the present.

TABLE OF CONTENTS

Chapter 1		
A FACSIMILE HERITAGE: PHOTOGRAMMETRY AND THE CRITICAL RECONSTRUCTION OF BERLIN		1
Iman Ansari		
Chapter 2		
DIGITAL ENVIRONMENTS: UNDERSTANDING BUILT HERITAGE IN THE POST-MATERIAL AGE		13
Ethan Kocot, Raymund König		
Chapter 3		
MISSING ARCHITECTURES IN CHINA THE EUROPEAN PALACES OF THE ETERNAL SPRINGTIME GARDEN		23
Fanwei Meng, María Jesús Mañez Pitarch, Joaquin Angel Martinez Moya		
Chapter 4		
REJUVENATING LINKS BETWEEN ESTATES AND THEIR HINTERLANDS: A RELATIONAL LANDSCAPE HERITAGE APPROACH		40
Alia Shahed, Bieke Cattoor		
Chapter 5		
PAVED AND REPAVED: CIRCULAR AND SOCIAL SUSTAINABLE MATERIALITY IN THE STREETS OF COPENHAGEN		53
Torben Dam, Jan Støvring, Anna Aslaug Lund		
Chapter 6		
HISTORICAL AND TRADITIONAL TRADE:A FUNDAMENTAL ELEMENT OF THE CULTURAL IDENTITY OF CITIES. A REPORT ON THE SURVEY ON FLORENTINE HISTORIC SHOPS.		62
Federico Cioli		
Chapter 7		
DEVELOPMENT OF THE METHODOLOGY AND INFRASTRUCTURE FOR DIGITAL 3D RECONSTRUCTION		72
Igor Piotr Bajena, Piotr Kuroczyński		
Chapter 8		
REALITY OF THE VIRTUAL: REPRESENTATIONS THROUGH ARCHITECTURE		84
Berrin Terim		
Chapter 9		
TOWARDS DISSEMINATING CONTENT ON BUILDING PRESERVATION AS A SUSTAINABILITY STRATEGY		93
Fabian Kastner, Orkun Kasap, Aydin Faraji, Stéphane Magnenat, Silke Langenberg		
Chapter 10		
THE [IN] TANGIBLE NEO-ANDALUSIAN JESUIT HERITAGE. THE CASE OF ESTANCIA SAN IGNACIO DE CALAMUCHITA.		111
Gustavo-Adolfo Saborido-Forster, Eduardo Mosquera-Adell, Mercedes Ponce-Ortiz		
Chapter 11		
PATRIM, ABOUT A RESEARCH EXPERIENCE		124
Luisa Chimenz, M. Carola Morozzo Della Rocca, Chiara Olivastri, Giulia Zappia, M. Ivan Zignego		

Chapter 12		
THE DIGITALIZATION OF THE CREATIVE MARKET		134
Dho Yee Chung		
Chapter 13		
SEE-THROUGH: BUILDING FACADES AS CONTESTED GROUND		142
Malini Srivastava, Nathan Anderson		
Chapter 14		
MEDIA REHABILITATION IN SACRED PLACES		155
Jorge Duarte De Sá		
Chapter 15		
EXPLORING THE USE OF GENERATIVE ADVERSARIAL NETWORKS WITHIN THE WORKING PROCESSES OF FINE ART PRINTMAKING: AN AUTOETHNOGRAPHIC, PRACTICE-BASED PERSPECTIVE		161
Amy Van Den Bergh, Natalie Fossey		
Chapter 16		
PSYCHOLOGISING THE METAVERSE, A PLACE FOR CULTURAL EXTENSION		175
Tatjana Crossley		
Chapter 17		
POLITICAL IDEOLOGY-BASED GOVERNMENT POLICIES TO PROMOTE CULTURAL HERITAGE SITES OF RELIGIOUS IMPORTANCE AND USE OF INFORMATION AND COMMUNICATION TECHNOLOGY		185
Swati Jaywant Rao Bute		
Chapter 18		
CALLIMACHUS AND THE CORINTHIAN CAPITAL. ANIMATING FRANCESCO DI GIORGIO MARTINI'S INTERPRETATION OF VITRUVIUS 4. 1. 9-10.		197
Davide Benvenuti, Matteo Bigongiari, Stefano Bertocci, Andrea Nanetti		
Chapter 19		
A SHARED TERMINOLOGY FOR HYPOTHETICAL 3D DIGITAL RECONSTRUCTIONS IN THE FIELD OF CULTURAL HERITAGE		205
Irene Cazzaro		
Chapter20		
BHERA: THE HISTORIC CITY OF CRAFTS		218
Nimrah Jahangir		
Chapter 21		
MORE THAN BRIC-A-BRAC: BUILDING BRICKS AND MATERIAL CULTURE IN THE HISTORY OF THE WORLD'S LARGEST BIOMEDICAL LIBRARY		229
Jeffrey S. Reznick		
Chapter 22		
ARCHITECTURAL DESIGN IN SOCIAL HOUSING: UNDERSTANDING, DECISION-MAKING AND PARAMETRIC MODELLING		242
Antenor Coelho		

Chapter 23		
3D DIGITAL MODELS USING PHOTOGRAMMETRY APPLIED TO WORKS OF ART.		250
Fernández Alconchel, María, Bienvenido Huertas, José David, Marín García, David, Moyano Campos, Juan José		
Chapter 24		
SAFEGUARDING INTANGIBLE CULTURAL HERITAGE (TWO CASE STUDIES OF LIVING HUMAN TREASURES IN IRAN)		261
Nahal Haghdoost, Jan Marontate		
Chapter 25		
VIRAL CULTURAL HERITAGE: A CASE STUDY APPLYING HYBRID DISCOURSE ANALYSIS		270
Pedro Andrade		
Chapter 26		
'SOUNDPATHS: HEPTONSTALL'; USING PLACED SOUND AND AUGMENTED REALITY TO ENGAGE AUDIENCES WITH THE HISTORY OF A PERFORMANCE LOCATION		281
Yoni Collier		
Chapter 27		
REDEFINED-COMS		290
Austin Houldsworth, Alexander Gillott, Rilwan Olasun		
Chapter 28		
HERITAGE PRESERVATION IN THE WAY OF RESILIENT MICRO-REGENERATION: FINDINGS ON PARTICIPATORY HISTORIC COMMUNITY PRESERVATION IN BEIJING, CHINA		300
Tongfei Jin		
Chapter 29		
THE LIVES OF SPACES: 166 CAROLINE STREET, BRIXTON, JOHANNESBURG		309
Sally Gaule		
Chapter 30		
DESIGNING THE DIGITAL CHARLES WILLSON PEALE MUSEUM OF NATURAL HISTORY AND ART, INDEPENDENCE HALL, PHILADELPHIA 1802-1827, A WORK IN PROGRESS		319
Glen Muschio, Dave Mauriello, Nick Moy, Tyrone Bullock		
Chapter 31		
LAB-OURING: HERITAGE AS LAB WORK		330
Neelakantan Keshavan		
Chapter 32		
DOMESTICATING HERITAGE – AN EXPANDED HISTORY OF THE 1956 GRANT HOUSE		337
Angus Grant		
Chapter 33		
PLANTATIONS IN SÃO TOMÉ AND PRÍNCIPE: SPATIAL LAYOUT AND INDUCED BEHAVIOURS		348
Sara Eloy, Rui Brito		

Chapter 34		
BRIDGES IN PUNE AND COLLECTIVE MEMORY		360
Pranali Musale		
Chapter 35		
SAFEGUARDING OF IRANIAN INTANGIBLE CULTURAL HERITAGE FROM IRANIAN PHOTOGRAPHERS' APERTURE		366
Ehsan Dorosti		
Chapter 36		
MONTAGE AND DIALECTICAL HISTORY: THE ACCESSION DAY TILTS, WHITEHALL AND EMBODIED PARTICIPATION		378
Constance Lau		
Chapter 37		
MATERIAL VERSUS IMMATERIAL DICHOTOMY: THE TERRITORIALIZATION OF INTANGIBLE HERITAGE AS URBAN ENTREPRENEURIALISM		386
Barbara Guazzelli		
Chapter 38		
BETWEEN PERMANENCE AND CHANGE THE LIVING-MUSEUM OF FÁBRICA DE CONSERVAS PINHAIS & Cia. Lda. FROM MATOSINHOS (PORTUGAL)		395
Francisco Costa		
Chapter 39		
TOWARDS A HOLISTIC DIGITAL RECORD SYSTEM OF A HERITAGE BUILDING IN JEDDAH HISTORICAL CITY, SAUDI ARABIA		405
Walaa Taha A Albouree, Stuart Walker, Paul Cureton		
Chapter 40		
RECONSTRUCTION OF ANCIENT SETTLEMENT OF AKROTIRI, THIRA IN 1613 BC IN THE CONTEXT OF AN INTEGRATED VIRTUAL REALITY SERIOUS GAME		418
Thomas Varelas, Alexandros Pentefountas, Dionysios Kehagias, Dimitrios Tzovaras		
Chapter 41		
THE ARCHAEOLOGICAL SIMULATION: BLENDING TIMES AND TIME TRAVEL THROUGH METAVERSE?		428
Pedro Da Silva		
Chapter 42		
ARCHIVAL CHALLENGES IN EMERGING FORMS OF DIGITAL ARCHITECTURAL CONTENT		437
Jason Shields		
Chapter 43		
DIGITAL PRACTICES FOR GENERATING INTERACTION: EXHIBITS AND MUSEUMS AS PHYGITAL ENVIRONMENTS.		449
Marco Borsotti		

Chapter 44		
LA PROMENADE ARCHITECTURALE: LE CORBUSIER, HADRIAN'S VILLA AND THE DIGITAL WORLD		456
Michael R. Ytterberg		
Chapter 45		
AN APP TO MAKE VISIBLE THE CINEMATOGRAPHIC ECOSYSTEM OF VALLADOLID, SPAIN.		473
Eusebio Alonso-García, Sara Pérez-Barreiro, Iván Rincón-Borrego		
Chapter 46		
SEARCH FOR ARCHE: STANISŁAW WYSPIAŃSKI IN THE DIGITAL ERA		482
Michał Strachowski		
Chapter 47		
A TEMPORAL PERSPECTIVE IN PÓVOA DE VARZIM: ENVIRONMENTAL CONDITIONS, LANDSCAPE AND HUMAN SPACE DEVELOPMENT		496
José Filipe Silva		
Chapter 48		
SYMBOL OF PESSIMISM OR A WISE PROPHET? A CONTEMPORARY READING OF VELHO DO RESTELO AS A KEY CHARACTER IN CAMÕES' EPIC NOVEL OS LUSÍADAS.		506
Aleksandra Kosztyła, Heitor Alvelos, Pedro Cardoso		
Chapter 49		
FROM ANCIENT TO META ARTEFACTS: EXPLORATIVE PARTICIPATORY MUSEUM EXPERIENCE.		519
Dragana Koceska, Bence Henz, Zuzana Kocurova, Pablo Villalba Galiano		
Chapter 50		
MATTER AND MEMORY OF THE GREAT NORTHERN		530
Beth Tauke, Gregory Delaney		
Chapter 51		
PUBLIC INTERIORITY: REVELATORY HISTORIES		544
Liz Teston		
Chapter 52		
TANGIBLE PHILOSOPHY WITH VIRTUAL REALITY FOR TOEGYE'S TEN DIAGRAMS ON SAGE LEARNING, <SUNGHAKSIPDO VR>		552
Hyun Jean Lee, Wonjean Lee, Jinhun Park		
Chapter 53		
MAPPING HERITAGE(S) OF ÉVORA: HERITAGE URBANISM IN OBJECT AND EXPERIENCE		562
Shajjad Hossain, Filipe Themudo Barata		

CALLIMACHUS AND THE CORINTHIAN CAPITAL. ANIMATING FRANCESCO DI GIORGIO MARTINI'S INTERPRETATION OF VITRUVIUS 4. 1. 9-10.

Authors:

DAVIDE BENVENUTI¹, MATTEO BIGONGIARI², STEFANO BERTOCCI², ANDREA NANETTI¹

Affiliations:

¹ NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE, SCHOOL OF ART, DESIGN AND MEDIA, SINGAPORE. ² UNIVERSITÀ DEGLI STUDI DI FIRENZE, DIPARTIMENTO DI ARCHITETTURA, ITALY

INTRODUCTION

Animation has a long-standing history as a form of communication that can translate abstract or complex concepts into intuitive visualisations. However, these competencies and experience are challenged when animation is asked to communicate the visual content of depicted objects from illuminated codices that document the early stages of modern science, technology, engineering, mathematics, medicine, and architecture. The reason is that the relationship between text and images crafted for practitioners centuries ago needs to be decoded with philological accuracy and encoded into a new medium to communicate to a diversified audience. To accomplish this objective, the research team assembled competencies from fields like codicology, palaeography, history of architecture, and animation.

The interdisciplinary method described in this paper can be adopted by scholars in the humanities and practitioners in animation to map and decode the knowledge embedded in drawings depicted in Renaissance treatises on architecture and science, technology, and medicine manuscripts. The investigation focuses on the visual communication of Callimachus' invention of the Corinthian capital as recorded by Vitruvius (*De Architectura*, 4. 1. 9-10) according to Francesco di Giorgio Martini's visual interpretations in MS Ashburnham 361 (Biblioteca Medicea Laurenziana, Florence, 1479-1481, folio 13 *verso*) and MS Saluzzo 148 (Musei Reali, Biblioteca, Turin, 1481-1486, folio 14 *verso*). The 3D visualisation of the drawings related to the Corinthian capital demonstrated that digital animation could be an effective tool to visually investigate and reverse engineer the creative process of Francesco di Giorgio and produce philologically correct 3D models of the depicted objects. This kind of virtual reconstruction can be displayed on different innovative platforms and contribute to the advancement of learning in the study of Renaissance treatises on civil and military architecture.¹

HISTORY-BASED ANIMATION

The potential for animation to contextualise and disseminate ideas and abstract knowledge has long been documented within the archives of academia. However, the relationship between text and images crafted centuries ago that we can find in Renaissance Manuscripts like Francesco di Giorgio Martini's treatise on Architecture and Military needs to be decoded with philological accuracy encoded into a

new medium to communicate to a diversified audience². With the use of animation, complicated topics and abstract ideas are made easier to understand. In addition, as Roe notes, the "intermediality" of animation and other audio-visual media allows the audience to understand a subject in a more nuanced light while providing an immersive experience concerning the subject matter.³

From scientific to medical films, many examples can be highlighted with different objectives, from educational to propaganda to training, with information embedded within pseudo storytelling to data-driven infomercials where the information is almost dry and devoid of any narrative and entertainment-driven connotation. In the 1965 essay titled, 'Computer Animation: A new Scientific and Educational Tool,' Zajac argues that the educational material that can be produced with animation has the potential to "build into a library for subsequent uses of sorts." By utilising animation, scientists and scholars could communicate directly through the "film medium" in their "native language of mathematics and sciences."⁴

As a scientific communicative tool, Zajac notes that animation has the "great potential" for scientists to communicate with one another and other non-specialists. In addition, animation can help individuals "absorb vast amounts of data"; thus, the audience can "see" the study results instead of perusing complicated papers.

Training type of films is another example of established practice where animation can aggregate information for a specific audience; as a well-known example, we can mention the films that the Walt Disney Studios and the Schlesinger Studios created during WW2 for the USA government. These animations contained "military training materials" that included "schematic explanations on how to use the firearm Boy MK-1 Anti-Tank rifle", from loading/reloading, aiming, unloading, and cleaning.⁵

These films are part of a larger discourse, and the audience addressed plays a significant role in shaping the type of animation produced. For example, in a 2009 study, Riaza Rias notes how animation is part of a more extensive multimedia learning aid that "enables individuals to memorise concepts leading to an increased clarity".⁶ In 2017, Chris McGillion led a team of animators from the Charles Sturt University of Australia to produce an animated video to help disseminate agricultural knowledge to subsistence labourers in Timor-Leste. McGillion argued that because of the low literacy rate in Timor-Leste within the subsistence farmers' community, textual resources and similar knowledge might not be the most efficient way to inform farmers on high-yielding agricultural practices.⁷

The examples above rely heavily on the established theories and practices to produce an animation that helps contextualise and present abstract ideas and critical information to a wide range of audiences.

"Animated-Documentary" and "History-Driven Animation" are among the most innovative emerging fields in contemporary global communication. By the general trend in our societies toward an ideal of dynamic and increasingly specialised knowledge. Both animated documentary and history-driven animation can bridge linguistic, cultural and age boundaries due to the versatility of their "language", making it a potent vehicle for disseminating complex contents. The difference is that the former is narrative-laden, while historical sources drive the latter as its primary impetus. The idea of "inform-animation" is an opportunity and potential research area and application for animators and communication designers. Animation is a versatile communication tool for anyone in need of efficiently conveying complex and structured content.

We can argue that if animation relies on primary historical sources to objectively present historical and scientific data, it can be classified as 'History-Driven Animation.' Theoretically, this subgenre is typically devoid of a traditional "storyline" instead of other animation types that centre around a linear narrative. The primary and historical sources used in these animations become the main driving force of its final product and content. Due to the nature of its "language," History-Driven Animation have the potential to bridge textual, ethnic, and age boundaries, thus making it an effective medium for disseminating historical content that would otherwise be too convoluted in print format. As noted by

Wells, this “history-driven animation” should be defined by a “visual, technical and subject-oriented consistency.” It “recognises certain visual and iconography” that serve as “key signifiers of an implied common language shared by the creator and their audience, which in turn defines the cinematic construction” of the historical text. These historical contexts and facts comprise the “mode of order and integration and may be recognised as the determining factor maintaining the core historical narrative.” Most importantly, “history-driven animation” as a sub-genre can invite “traditional models but encourages re-definition through pastiche, exaggeration and intertextual play”.⁸ This framework can identify History-Driven animation as a subgenre that is not constrained by a “linear narrative” or “story arc” but instead focuses on bridging the gap between the philological and the visual representation of historical data interdisciplinary level.⁹

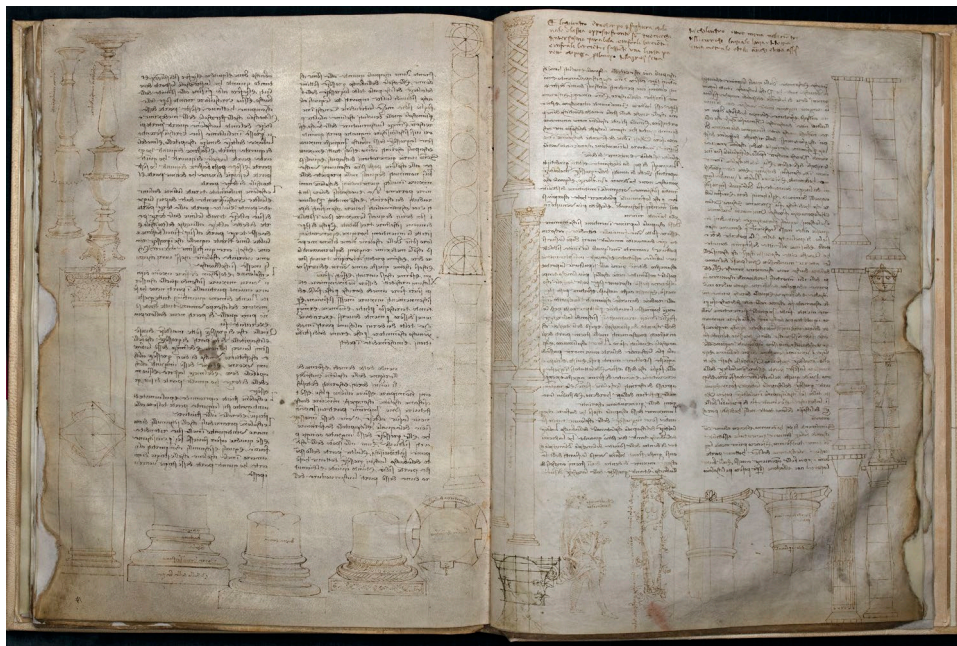


Figure 1. Folium 13V-14R

The subsequent section will discuss the interdisciplinary research to study the fifteenth-century renaissance manuscript (Francesco di Giorgio Martini’s MS Ashb. 361 (ca 1479-1481 CE) on folio 13 verso fig1 and the visual elements embedded within the text to produce a short video.

The virtual reconstruction of the depicted objects in the manuscript complements the virtual critical edition of the Francesco di Giorgio Martini treatise on civil and military engineering. The website that houses the virtual reconstruction is an ongoing research project and involves multiple international and multidisciplinary collaborations with the mission to deliver historical knowledge virtually with interactive applications.

VISUALISATION TECHNIQUES FOR THE STUDY OF FRANCESCO DI GIORGIO MARTINI’S INTERPRETATION OF VITRUVIUS 4. 1. 9-10

The illuminated manuscript of Francesco di Giorgio Martini's Treatise on Architecture, preserved at the Laurentian Library in Florence, has been digitally reproduced at high resolution to appreciate the extensive iconographic apparatus accompanying the text in its first version. In writing this work, Francesco di Giorgio Martini interprets and translates into Italian (vernacular) parts of Vitruvius' treatise De Architectura written around 30 B.C. and dedicated to Octavian Augustus, the future emperor of Rome. The sources of Greek literature are thus very close to the Roman author and are taken up in various parts of the treatise that inspired Francesco di Giorgio's Architecture. In the treatment of the

classical architectural orders, these references are explicit in the text and in the intentions of the figures that illustrate it, particularly the story of the invention of the Corinthian order by the Greek sculptor Callimachus.

By observing the drawings accompanying the text, however, one notices vague contaminations between the orders that later critics classified as Corinthian and Composite. In drafting these drawings, Francesco di Giorgio (or the illuminator who edited the copy of our manuscript under his supervision) probably refers to examples of classical architectural fragments that could be seen in various reuses of ancient architectural materials in medieval churches or buildings in Tuscany, Umbria and Lazio¹⁰.

When adequately conceived, the philologically accurate 3D models made from the drawings have the potential to aid in the analysis of depicted artefacts in the Renaissance treaties on architecture and engineering; to provide scholars of the Humanities and the animation field with a design process to understand the visual detail and the embodied in texts connection. However, in practice, this paper will demonstrate that this design process is much more complex than one could anticipate as the competencies of experts from various fields to analyse the narrative of the birth of the Corinthian capital architectural order described in the text.

Before modelling the 3D elements, it is crucial to grasp the narrative behind the designs. The ultimate goal is not to extrapolate a realistic image of the capital but to extrapolate the information hidden in the drawing and, at the same time to remain faithful to the manuscript iconographic representation. One important decision was on how far the reconstruction representation should go in creating a 3D model; do we recreate an actual real object or omit details that are not there but are somehow implicit for a trained eye? The intervention of an expert familiar with classical architectural orders is fundamental in helping to establish the starting parameters on which to build a proper methodology.

The team has broken down the process of creating a philologically correct digital visualisation of these drawings into five main steps:

- Visual translation
- Visualisation of the decomposition
- Non-Photorealistic Rendering
- 3D visualisation
- Short, animated video

The short film focuses on five designs at the bottom of Folium 13 and the text that describes these drawings. Based on Martini's text, the Corinthian order is an imitation of the slenderness of a maiden. The lady's figure depicts the column in the drawings, and the lady is drawn inside a basket surrounded by leaves. The original story describes the burial of a maiden where a vase (calathus) containing offering was placed over the tomb and covered with a tile. A plant of Acanthus grew under, wrapping the vase with his leaves. Callimachus, the architect who, according to tradition, designed the Corinthian capitals, was inspired by what he saw. There is a difference in the textual description from the original Vitruvian text: Vitruvius describes the leaves growing around the vase; Martini's translation results in the leaves coming up from the capital; hence, he draws the Acanthus leaves growing between the Abacus and the 'Ovolo and associates the leaves with the Volute.

The team had to examine existing architectural elements and break down the different parts composing Corinthian and Composite capitals, exemplifying the proportions between the various aspects. These proportions can be found in the description of the ideal Corinthian Order in the text associating the proportions of a Human head with the different elements.

The team looked at the architectural elements that are still extant and used them as a reference. For example, we examined capitals close to the time of Vitruvius's descriptions and then looked at aspects of architectural reuse in churches, Renaissance buildings, or elements that Martini and his disciples designed.

The animators considered the visual and textual description to give a dimensional view of an axonometric drawing and used non-photorealistic rendering based on the drawing in Ashb.361. The final 3D models were done using Maya and Zbrush and rendered non-photo realistically to mimic the manuscript drawings with a rendering software developed in Singapore.¹¹

For the final rendering, a very long lens of 150mm was used so that the rendering perspective is flattered to approximate the design further.

A short animation was created to show how the different elements can be separated and assembled. The downfall of this approach was that, for a non-scholar, this visualisation could be misleading as these elements were carved from a single piece of stone and not made of different parts and then plastered together. If correctly executed, 3D visualisation and digital animation become an effective tool to reverse engineer the architect's creative process. For instance, the *campana* is shaped as a cup instead of a vase, bell or “basket” described in the Vitruvius. The embellishments in-between the Abacus and the *campana* are not typical features of the Corinthian capital.

Furthermore, the ovolo/voluta proportions must follow the golden ratio. This level of detail is essential to produce philologically accurate models; classical architecture adhered to a strict proportion and system when carving the Corinthian capital from a single piece of material. User interpretation falls short without the proper knowledge and contextual information necessary to reproduce the drawings located within the manuscript.

Grey notes that “the founding theory of drawn pre-visualisation accompanied by processing persists even in entirely interactive mediums”.¹² In other words, the well-established animation pipeline (concept and storyboard production) still exists. It should be a fundamental practice in producing all animation types, primarily when one must deliver structured information that requires the marriage of different disciplines. Hence, storyboards were created based on the text in Martini’s Trattato (translation by John Melville Jones; for a diplomatic transcription, refer to Marani 1979, 115).¹³ These storyboards also gave direction for the short-form animated video. The storyboard was done to explain the drawings located within the Vitruvius by carefully selecting each drawing to explain the historical context behind each illustration.

The research team has collated, analysed, and compared different sources of information, drawing from all the other competencies and created the final video shared on the EHM web page.

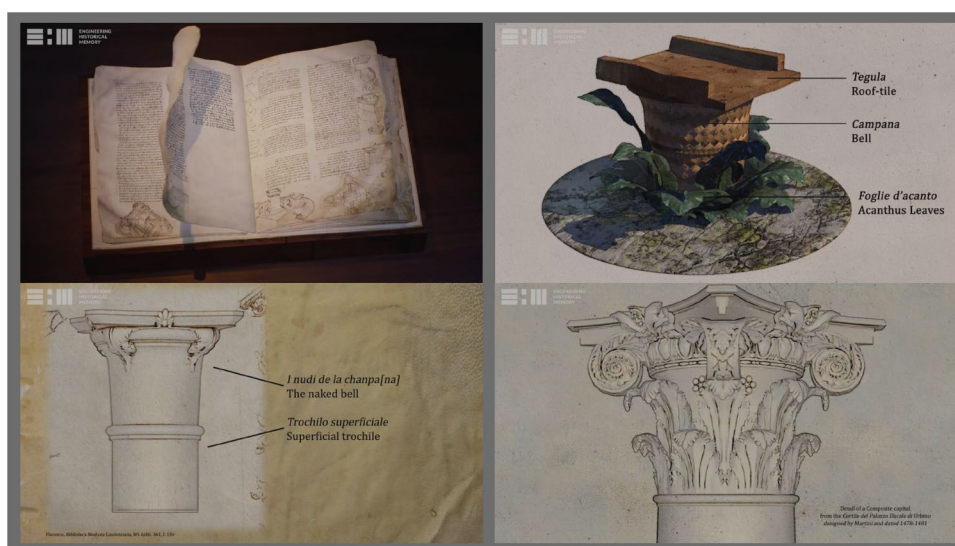


Figure 2. Frames from the final video

CONCLUSION

The research team has collated, analysed, and compared different sources of information, drawing from all the other competencies and creating a video shared on the EHM web page. This methodology can contribute to the advancement of learning in the study of Renaissance treatises on civil and military architecture.

Visualisation techniques to empower the study of depicted objects in Renaissance codexes/treaties on architecture and engineering can be adopted by humanities scholars and practitioners in animation to map and decode visual information and knowledge embodied in manuscripts.

In describing our process, we have highlighted how the dialogue between the codicology experts, architecture history, and animation is necessary for the successful conclusion of this interdisciplinary research. The animator needs to have a basic knowledge of architectural history and a rich repertoire of suitable reference images to understand and adequately render the drawings. These drawings are more than a simple diagram and exist together with the text for a specialised audience. Through a lengthy translation and connection of textual and visual, the researchers found the need to fill a "cultural gap," i.e., the repertoire of figurative archetypes hidden in the expert's mind and formed from study and experience. As animators can turn to references and materials readily available on the world wide web, they still need to grasp the "hidden" parts of the drawings. As the project's various attempts demonstrate, many trials and errors were required before a satisfactory result could be reached, from understanding the primary volumes of the classic architectural orders to unfolding the storytelling embedded in the figures at the bottom of Folium 13. It can be argued that transferring visual knowledge to different experts is a common problem that affects many fields dealing with visual communication and information. The recipient's knowledge, bias, and expertise drive how one image can be interpreted. The paper concludes by unfolding the final goal derived from analysing the 2D iconographic elements and the textual information. All the parts are coherently presented in an assembled video showing philologically correct narratives and 3D accurate reconstruction of the architectural aspects described by Francesco di Giorgio Martini.

ACKNOWLEDGEMENTS

Since 2019, "Francesco di Giorgio Martini's Treatise I on Civil and Military Architecture (1479-1481 CE)" has been an ongoing interdisciplinary research project carried out by Andrea Nanetti (history) and Davide Benvenuti (animation) at Nanyang Technological University (NTU) Singapore in collaboration with Stefano Bertocci and Matteo Bigongiari (architecture) at the *Università Degli Studi di Firenze* (UNIFI) within the framework of a Research Collaboration Agreement signed between the parties (NTU and UNIFI) on 30 October 2020. The authors undertook the research presented in this paper between November 2019 and June 2022. The Singapore Ministry of Education supports the research project under its Academic Research Fund Tier 1 (PI Andrea Nanetti, Co-PI Davide Benvenuti, 2019-2022, RG45/19NS) and by the DIDALABS of UNIFI (PI Stefano Bertocci).

The digital photographs of MS Ashb. 361 have been taken by Matteo Bigongiari and used with permission of the Biblioteca Medicea Laurenziana of Florence ("su concessione del Ministero dei beni e delle attività culturali e del turismo, MiBACT - BML - Prot. 2789/28.13.10.01/2.29").

The authors thank Antonio Corso, who contributed with discussions and consultancy that were of the essence during the work of classification and description of the drawings of MS Ashb. 361 between October 2019 and November 2020.

NOTES

¹ See Andrea Nanetti, Davide Benvenuti, Matteo Bigongiari, and Khoi N. Vu, "Francesco di Giorgio Martini's Treatise I on Civil and Military Architecture (1479-1481 CE)," in *Engineering Historical Memory* (October 2020), <https://engineeringhistoricalmemory.com/FGM.php>.

² See Jessabel Teng, Davide Benvenuti, and Andrea Nanetti, "Animation Solutions for the Exploration of Science, Technology and Medicine manuscripts. The Corinthian Capital in Francesco di Giorgio Martini's Treatise on Architecture (First Version, 1475-1480) as a Showcase," 32nd Annual Conference of the Society for Animation Studies *Animate Energies* (USA, New Orleans, online, 15 June 2021), <https://ehm-video.s3.ap-southeast-1.amazonaws.com/VIDEO+SAS+conference+video.mp4>.

³ See Annabelle H. Roe, *Animated Documentary* (Houndmills, Basingstoke, Hampshire: Palgrave Macmillan, 2013).

⁴ See Edward E. Zajac, "Computer Animation: A New Scientific and Educational Tool," *Journal of the SMPTE* 74, no. 11 (November 1965): 1006-1008, <https://doi.org/10.5594/j05978>.

⁵ See Nicolò Ceccarelli, "Historical Perspective of Animation in Documentary Film," in *I.P. InformAnimation 2011: research, education and design experiences*, ed. Carlo Tunì (Milano: FrancoAngeli, 2012), 118-123.

⁶ See Riaza Perveen Mohd Rias, and Halimah Badioze Zaman, "Using 3-D Animation in Multimedia Learning for Memory Management Concepts," in *Proceedings of the 2009 International Conference on Signal Processing Systems (15-17 May 2009, Singapore)* (Los Alamitos, CA: IEEE Computer Society, 2009), 748-753, <https://doi.org/10.1109/icsp.2009.145>.

⁷ See Chris McGillion, "Animation as a Science Communication Tool in Timor-Leste," *Science Communication* 39, no. 2 (2017): 278-285, <https://doi.org/10.1177/1075547017696164>.

⁸ See Paul Wells, *Animation: Genre and Authorship* (London, UK: Wallflower, 2007).

⁹ See Mahpuz, and Hariman Bahtiar, "Visualization of the Traditional House Architecture of Belek Sembalun Lawang Village by Using 3D Animation," *Journal of Physics: Conference Series* 1539, no. 1 (The 5th Hamzanwadi International Conference of Technology and Education, 5-6 October 2019, Lombok, Indonesia) (2020): 2-5, <https://iopscience.iop.org/article/10.1088/1742-6596/1539/1/012021>.

¹⁰ See Andrea Nanetti, Davide Benvenuti, Matteo Bigongiari, Zaqeer Radzi, and Stefano Bertocci, "Animation for the Study of Renaissance Treatises on Architecture. Francesco di Giorgio Martini's Corinthian Capital as a Showcase," *SCIRES-IT (SCientific RESearch and Information Technology)* 10, no. 2 (December 2020): 19-36, <http://www.sciresit.it/article/view/13390/0>.

¹¹ See Santiago E. Montesdeoca, Hock Soon Seah, Hans-Martin Rall, and Davide Benvenuti, "Art-directed watercolor stylization of 3D animations in real-time," *Computers & Graphics* 65 (2017): 60-72, <https://doi.org/10.1016/j.cag.2017.03.002>.

¹² See Gray Hodgkinson, "Symbolism and the Unreality of Animation," *CONFIA 2020. 8th International Conference on Illustration and Animation (23-24 October 2020)*, (Barcelos, Portugal: Instituto Politécnico do Cávado e do Ave, 2020), 139-145.

¹³ Gray Hodgkinson.

BIBLIOGRAPHY

Ceccarelli, Nicolò. "Historical Perspective of Animation in Documentary Film." In *I.P. InformAnimation 2011: research, education and design experiences*, edited by Carlo Tunì, 118-123. Milano: FrancoAngeli, 2012.

Hodgkinson, Gray. "Symbolism and the Unreality of Animation." *CONFIA 2020. 8th International Conference on Illustration and Animation (23-24 October 2020)*, 139-145. Barcelos, Portugal: Instituto Politécnico do Cávado e do Ave, 2020.

Mahpuz, and Hariman Bahtiar. "Visualization of the Traditional House Architecture of Belek Sembalun Lawang Village by Using 3D Animation." *Journal of Physics: Conference Series* 1539, no. 1 (2020): 2-5. <https://iopscience.iop.org/article/10.1088/1742-6596/1539/1/012021>.

McGillion, Chris. "Animation as a Science Communication Tool in Timor-Leste." *Science Communication* 39, no. 2 (2017): 278-285. <https://doi.org/10.1177/1075547017696164>.

- Montesdeoca, Santiago E., Hock Soon Seah, Hans-Martin Rall, and Davide Benvenuti. "Art-directed watercolor stylization of 3D animations in real-time." *Computers & Graphics* 65 (2017): 60-72. <https://doi.org/10.1016/j.cag.2017.03.002>.
- Nanetti, Andrea, Davide Benvenuti, Matteo Bigongiari, Zaqeer Radzi, and Stefano Bertocci. "Animation for the Study of Renaissance Treatises on Architecture. Francesco di Giorgio Martini's Corinthian Capital as a Showcase." *SCIRES-IT (SCientific RESearch and Information Technology)* 10, no. 2 (December 2020): 19-36. <http://www.sciresit.it/article/view/13390/0>.
- Nanetti, Andrea, Davide Benvenuti, Matteo Bigongiari, and Khoi N. Vu. "Francesco di Giorgio Martini's Treatise I on Civil and Military Architecture (1479-1481 CE)." In *Engineering Historical Memory* (October 2020). <https://engineeringhistoricalmemory.com/FGM.php>.
- Rias, Riya Perveen Mohd, and Halimah Badioze Zaman. "Using 3-D Animation in Multimedia Learning for Memory Management Concepts." In *Proceedings of the 2009 International Conference on Signal Processing Systems (15-17 May 2009, Singapore)*, 748-753. Los Alamitos, CA: IEEE Computer Society, 2009. <https://doi.org/10.1109/icsp.2009.145>.
- Roe, Annabelle H. *Animated Documentary*. Houndmills, Basingstoke, Hampshire: Palgrave Macmillan, 2013.
- Teng, Jessabel, Davide Benvenuti, and Andrea Nanetti. "Animation Solutions for the Exploration of Science, Technology and Medicine manuscripts. The Corinthian Capital in Francesco di Giorgio Martini's Treatise on Architecture (First Version, 1475-1480) as a Showcase." 32nd Annual Conference of the Society for Animation Studies *Animate Energies* (USA, New Orleans, online, 15 June 2021). <https://ehm-video.s3.ap-southeast-1.amazonaws.com/VIDEO+SAS+conference+video.mp4>.
- Wells, Paul. *Animation: Genre and Authorship*. London, UK: Wallflower, 2007.
- Zajac, Edward E. "Computer Animation: A New Scientific and Educational Tool." *Journal of the SMPTE* 74, no. 11 (November 1965): 1006-1008. <https://doi.org/10.5594/j05978>.

AMPS PROCEEDINGS SERIES 29.2

Front cover image: Jim Higham

AMPS, University of Kent
15-17 June, 2022

© AMPS