

Digital Cultural Heritage Twins Connections

Bridging Documentation, Analysis and
Education from Satellite to Ground



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TABLE OF CONTENTS

PRESENTATION	9
---------------------------	----------

INTRODUCTION	10
---------------------------	-----------

CONFERENCES

SESSION ON EDUCATION, KNOWLEDGE TRANSFER	15
---	-----------

Un marco evaluativo para la educación patrimonial: indicadores desde el Plan Nacional - An evaluative framework for heritage education: deriving indicators from the National Plan. Amaia Arriaga, Nerea de Diego, Mirari Echávarri, Alfredo Asiain, Isabel Merino. Universidad Pública de Navarra.	16
--	----

SESSION ON REMOTE SENSING	21
--	-----------

Métodos geofísicos en proyectos arqueológicos del Instituto del Patrimonio Cultural de España. Ministerio de Cultura. Juan José Gordón. Instituto del Patrimonio Cultural de España.	22
---	----

EO data integration for Environmental Heritage Analysis: from Landscape to Local Level Universita. Enrico Borgogno, Beatrice D'Agostino. Università di Torino.	26
---	----

Integration of field radiometry and multispectral analysis with UAV for the study of the archaeological site 'Forau de la Tuta' (Artieda, Zaragoza). Alessandro Mateos. UNITBV-UNIZAR.	32
---	----

Optical and radar data for analyzing the cultural heritage sites in Brasov area, Romania. Mihai Nita, Mihai Ivanovici. Universitatea Transilvania din Brasov.	36
--	----

SESSION ON VIRTUAL RECONSTRUCTION, ARCHITECTURE AND LEGAL FRAMEWORK	39
--	-----------

From Digitization to 3D Dissemination in Cultural Heritage: Case Studies in Virtual Reconstruction. Miguel Fernández, Pablo Aparicio y Néstor F. Marqués. 3DSTOA.	40
--	----

HBIM for the Study and Preservation of Built Heritage. The Case of the Medieval "Pallata" Tower in Brescia. B. Scala, P. Borin, I. Giustina. Università degli Studi di Brescia.	46
--	----

Finite Element Modelling of Brescia Cathedral's Dome. A Synergy of Historical Techniques and Structural Design. L. Facconi, I. Giustina, F. Minelli, E. Sala. Università degli Studi di Brescia.....	52
Digital Modelling and Architectural History. The Reconstruction of Montichiari Neomedieval Castle through Antonio Tagliaferri's First Designs. P. Borin, I. Giustina. Università degli Studi di Brescia.....	58
3D Digital Mapping Techniques for the Documentation of Cultural Heritage Sites with a Digital Twin Approach G. Vassena, L. Perfetti. Università degli Studi di Brescia.	64
Digitisation of Cultural Heritage and Copyright in the European Framework. Issues and topics. E. Fusar Poli, P. Morandi. Università degli Studi di Brescia.....	68
SESSION ON ARCHAEOLOGY AND ROCK ART	75
Altamira y su Gemelo Digital: historia de un anhelo. Lucía M. Díaz-González y Pilar Fatás. Museo Nacional y Centro de Investigación de Altamira. Ministerio de Cultura.	76
Geomatic Engineering and Geospatial Sciences Applied to Cultural Heritage Research. Jorge Angás. ARAID-Universidad de Zaragoza.	82
La aplicación de nuevas tecnologías en la presentación del Arte Rupestre, en el Parque Cultural del río Vero. Nieves Juste. Parque Cultural del río Vero.	88
Searching for the Origins of Rock Art in Aragón (SEFORA). Manuel Bea. Universidad de Zaragoza.	92
SESSION ON PROJECTS AND CASE STUDIES	95
Monitorización Ambiental y Conservación Preventiva del Arte Rupestre. M. Antonia Zalbidea Muñoz, Claudia Serrano Aranda y Ángel Perles Ivars. UPV.....	96
Knowledge Heritage Network (KHN): hacía una nueva conservación preventiva del patrimonio cultural. El eje Retech en Aragón. Miguel Ángel Pellés. Gobierno de Aragón.	102
DiGHER. Gemelos Digitales para la conservación del patrimonio cultural: gestión, monitorización e interpretación. Carlos Valladares. Universidad de Zaragoza.	106
SESSION ON GEOMATICS AND HIGH-PERFORMANCE COMPUTING (HPC)	111
Escáneres láser 3D y drones aplicados al patrimonio cultural. Jorge Miranda. 3DScanner.	112
Redescubriendo el pasado a través del trabajo multidisciplinar: el caso del Forau de la Tuta (Artieda, Zaragoza). L. Iñiguez, P. Uribe, J. Angás, J.Á. Asensio, M. Navarro, E.	

Ariño, Ó. Lanzas, C. Concha, M.A. Magallón. Universidad de Zaragoza, Institut Ausonius CNRS-Université Bordeaux Montaigne, Universidad de Salamanca.116

Recent Trends and Applications of Artificial Intelligence in Archaeology. Cristian Iranzo. Universidad de Zaragoza.....120

Automatización y visualización avanzada del patrimonio cultural en entornos web. Gonzalo Ruiz. BIFI-Universidad de Zaragoza.....124

PARTICIPANTS - HerOn.....126

DIGITAL ARCHAEOLOGY

FROM SATELLITE TO GROUND EXHIBITION

¿POR QUÉ ARQUEOLOGÍA DIGITAL?. Why Digital Archaeology?128

CIENCIAS GEOMÁTICAS APLICADAS AL PATRIMONIO CULTURAL. Geomatics Sciences Applied to Cultural Heritage134

ARQUEOLOGÍA AÉREA: DEL SATELITE AL DRON. Aerial Archaeology: from Satellite to Drone140

LA DIGITALIZACIÓN DE LOS GRABADOS RUPESTRES DE LA CUEVA DE ALTAMIRA, UNA CUESTIÓN COMPLEJA. The digitization of the rock engravings in the Cave of Altamira: a complex issue146

PRESERVACIÓN Y FUTURO: ANTROPOLOGÍA DIGITAL. Preservation and future: Digital Anthropology152

PROYECTO SEFORA. SEArching For the Origins of Rock Art in Aragón157

MONITORIZACIÓN AMBIENTAL Y CONSERVACIÓN PREVENTIVA DEL ARTE. Environmental Monitoring and Preventive Conservation of Rock Art.....163

BUILT-ENVIRONMENT CULTURAL HERITAGE: From historical analysis to modeling for preservation172

TÉCNICAS GEOFÍSICAS EN ARQUEOLOGÍA. IPCE - MINISTERIO DE CULTURA. Geophysical methods in archaeology. IPCE-Ministry of Culture.....179

DiGHER: GEMELOS DIGITALES PARA LA CONSERVACIÓN DEL PATRIMONIO CULTURAL. DiGHER: Digital Twins for the Conservation of Cultural Heritage185

INTELIGENCIA ARTIFICIAL (IA) Y TELEDETECCIÓN EN ARQUEOLOGÍA. Artificial Intelligence (AI) and Remote Sensing in Archaeology	191
PATRIMONIOS Y EDUCACIÓN. Heritages and education.....	196
EL FORAU DE LA TUTA (ARTIEDA, ZARAGOZA). Un gemelo digital para la investigación, conservación y difusión. El Forau de la Tuta (Artieda, Zaragoza). A digital twin for research, conservation and dissemination	205
LA ROMA DE CONSTANTINO: INVESTIGACIÓN Y DIVULGACIÓN A TRAVÉS DE UN LIBRO ILUSTRADO. Constantine's Rome: Research and Dissemination Through an Illustrated Book.....	210
VIRTUALIZACIÓN DEL PATRIMONIO: FOTOGRAMETRÍA 3D Y ESCANEADO LÁSER COMO TÉCNICA HÍBRIDA. Virtualizing Cultural Heritage: 3D Photogrammetry and Laser Scanning as a Hybrid Technique.....	214
DE LO VISIBLE A LO DIGITAL: TECNOLOGÍAS 3D APLICADAS AL ESTUDIO DE LA PINTURA MURAL ROMANA. From the Visible to the Digital: 3D Technologies Applied to the Study of Roman Wall Painting.....	218
VIRTUAL EXHIBITION	223

SESSION ON VIRTUAL RECONSTRUCTION, ARCHITECTURE AND LEGAL FRAMEWORK

HBIM for the Study and Preservation of Built Heritage. The Case of the Medieval “Pallata” Tower in Brescia. B. Scala, P. Borin, I. Giustina. Università degli Studi di Brescia.



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SESSION ON VIRTUAL RECONSTRUCTION, ARCHITECTURE AND LEGAL FRAMEWORK

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Barbara Scala

Associate Professor at the DICATAM Department of the University of Brescia. Her interests concern the architectural restoration with particular attention to rural architecture, identifying methodological guidelines for its conservation and application of BIM information models in historic building for project management, construction and monitoring over time. From 2024 she participates in the working group set up with the Ministry of Culture for the energy improvement of historic buildings and since 2025 she is a member of UNI/CT 033/SC 01/GL 01 "Guidelines and terminology".

Paolo Borin

Associate Professor at the DICATAM Department of the University of Brescia. His interests include open standards for BIM modeling and management of projects and infrastructures, the application of advanced geometries for the built environment, and the history of representation methods related to the fabrication of structural elements. Since 2023, he has been the Head of the Technical and Scientific Committee of buildingSmart Italy. Since 2022, he has been the Scientific Director of the Digital BIM Design master's program at the Iuav University of Venice.

Irene Giustina

Associate Professor of History of Architecture at DICATAM, where she teaches History of Architecture, History of Architectural Techniques and History of Contemporary Architecture. With more than 140 scientific publications, speeches at conferences, coordination of and participation in national and international research projects, she deepened in particular architecture and architectural techniques of the modern and contemporary age, with a particular focus on late Renaissance and Baroque, Neoclassicism, Eclecticism and the early 20th century.

Abstract

The application of Historic Building Information Modeling (HBIM) to the medieval “Pallata” tower in Brescia represents a significant example of how digital methodologies can enhance the knowledge, documentation, and conservation planning of architectural heritage. Erected in the late 13th century as a defensive structure within the medieval walls, the Pallata has long been a symbolic landmark in the city’s skyline. Over centuries, it has become deeply integrated within the dense urban landscape, and its exposed surfaces reveal the traces of time, with widespread phenomena of erosion and material decay that compromise the legibility of the original masonry. The masonry of the tower, largely composed of Medolo, a local limestone characterized by variable porosity and mechanical resistance, shows vulnerability to environmental stress and atmospheric agents, resulting in granular disintegration, alveolization, and chromatic alteration.

The HBIM project, promoted by the Municipality of Brescia in collaboration with the University, was conceived as a multidisciplinary platform aimed at collecting, structuring, and correlating data from different research domains. The construction of the digital model was preceded by an in-depth phase of historical and archival research, combined with an extensive campaign of direct survey, diagnostic analysis, and material characterization. The integration of data obtained through laser scanning, close-range photogrammetry, and traditional metric restitution allowed for a precise three-dimensional reconstruction of the geometry of the tower, while the subsequent

semantic structuring of the model enabled the systematic organization of its architectural components, building materials, and degradation patterns.

The model operates as an advanced knowledge system, capable of visualizing the spatial distribution of decay phenomena, monitoring the state of conservation, and supporting conservation planning.

Through the correlation between material typologies, environmental exposure, and decay mapping, it becomes possible to interpret deterioration not as an isolated phenomenon but as a dynamic process connected to the construction history and environmental context of the building. In this sense, the HBIM of the Pallata represents a cognitive framework where geometric precision and interpretative layers coexist, enabling a deeper understanding of the monument's transformations over time.

Beyond its technical outcomes, the project has also fostered a new approach to cultural heritage management, based on the continuity between research, documentation, and conservation practice. The HBIM model becomes a shared tool among different disciplines - architectural history, materials science, conservation, and urban studies - encouraging the exchange of information and promoting long-term strategies for the sustainable preservation of the monument. At the same time, its visual dimension contributes to increasing public awareness and appreciation of the tower, reinforcing its role as a cultural and urban landmark.

In this context, the Pallata project stands as a reference case for the application of digital technologies to historical architecture, where the model does not replace the physical reality of the monument but rather complements it, serving as an evolving repository of knowledge and as an operational instrument for informed conservation decisions.

Key bibliographic references:

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