Biannual Conference

Programme

EUROMED2024

10th International Conference on Digital Heritage

Digital Heritage: Progress in Cultural Heritage Documentation, Preservation and Protection

Cyprus University of Technology, Limassol, Cyprus
2nd - 4th December 2024

unesco Chair

Cyprus University of Technology

Heritage Malta

SECreTOUR Sustainable Creative Tourism

GESTALTUNG HOCHSCHULE MAINZ UNIVERSITY OF APPLIED SCIENCES

EuroMed2024.EU

EuroMed2024 Programme Overview

Time	Monday 2 December	Tuesday 3 December		Wednesday 4 December
08:30-09:00	*Registration*	*Registration*		*Registration*
09:00-09:30	Opening Ceremony	**Professor Peter Stone** *Saving Cultural Property in Armed Conflict: The Work of The Blue Shield*		**Workshop 3: CoVHer Multiplier Event**
09:30-10:00	**Thomas Flynn** *Everything, Everywhere, All at Once*	**Workshop 2**	**Paper Sessions**	Hypothetical 3D Reconstructions & Documentation in Cultural Heritage
10:00-10:30	**Workshop 1** Paradata, Metadata, and Data in 3D Digital Documentation for Cultural Heritage: #DigitalTwins or #MemoryTwins	Cultural & Creative Tourism as a Driver for Sustainable Development		
10:30-11:00	*Coffee Break (30 minutes)*	*Coffee Break (30 minutes)*		*Coffee Break (30 minutes)*
11:00-12:00	**Workshop 1**	**Workshop 2.**	**Papers Sessions**	**Workshop 3**
12:00-13:00				
13:00-14:00	*Lunch Break (60 minutes)*	*Lunch Break (60 minutes)*		*Lunch Break (60 minutes)*
14:00-15:30	**Workshop 1**	**Workshop 2**	**Papers Sessions**	Conference Discussion & Brainstorming Session
15:30-16:00	*Coffee Break (30 minutes)*	*Coffee Break (30 minutes)*		Closing Comments **16:00 Close**
16:00-16:30	**Workshop 1**	**Workshop 2**	**Papers Sessions**	
16:30-17:15	Discussion & Brainstorming Session			
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Welcome

On behalf of the Organising Committee, we have the honour to invite you to the 10th International Euro-Mediterranean Conference (EuroMed2024).

Cyprus is the third largest island in the Mediterranean, situated at the crossroads of three continents, and with over twelve millennia of history, one of the most significant archaeological areas of the world. Cyprus' cultural heritage is a living treasure of its people, providing a unique identity through its historical continuity.

We live in a period of rapid change, from the climate crisis to war and political unrest, to changes in technology and social perceptions of culture, heritage and history. What will remain for future generations depends on how we respond to these challenges. Close cooperation and coordination between professionals, policymakers and authorities, local and international, is essential for new research and development if we are to keep pace with such change and discover more about humanity's common shared past.

Knowledge is the new capital, and data is its currency, whether digitising monuments, sites and artefacts or enriching digital assets enabling citizens to discover, understand and express their own identities, history and culture through the lens of the past, the integrity of data is paramount. The loss of Cultural Heritage, tangible or intangible, impoverishes us all, but digitisation can, if approached correctly, assist in monitoring, conserving and digitally preserving unique cultural resources. The confidence to act on "Cultural Heritage Intelligence" is only possible if digitisation is undertaken with the highest possible standards, academically and technically.

The agenda for the EuroMed2024 Conference includes oral and poster presentations, workshops and demonstrations from academia and industry, reflecting the broad spectrum of Cultural Heritage work. We aim to bring together policymakers, professionals, students and delegates from diverse backgrounds to create a critical mass of mutual understanding, requirements and solutions to the challenges facing Cultural Heritage and its digitisation.

EuroMed2024 focus is on interdisciplinary research – cutting-edge technologies for the protection, preservation, conservation, and massive digitalisation of Cultural Heritage – and the emerging cross-sector Cultural Heritage Knowledge Economy – innovations ready for market exploitation, novel sustainable approaches towards heritage management, and new technologies available to user communities, SMEs, owners, managers and conservators of cultural patrimony.

We welcome you to Cyprus for EuroMed2024, which promises to be a thought-provoking and informative event for all delegates.

Committee

Conference Chairs

- Marinos Ioannides, Cyprus
- Eleanor Fink, United States
- Antonella Fresa, Italy
- Janet Anderson, Ireland
- Tony Cassar, Malta
- Sander Münster, Germany

Local Organising Committee

- Athos Agapiou
- Drew Baker
- Elena Karittevli
- Panayiotis Panayiotou
- Petros Siegkas
- Dimitrios Skarlatos
- Savvina Markidou
- Sotia Tsimouri

Keynote Speakers

Thomas Flynn

Digital Cultural Heritage Consultant.
Founder, The Spatial Heritage Review
The United Kingdom

Thomas is a well-known and respected cultural heritage practitioner specialising in 3D digitisation, online publishing, open access, storytelling, and interoperability. He was the Cultural Heritage Lead at Sketchfab/Epic Games and cofounder of Museum in a Box Ltd.

He has previously worked for the British Museum and acted as a consultant on 3D Cultural Heritage matters for UNESCO, The European Commission, Oxford University, Creative Commons, UK Research & Innovation, Columbia University, and University College London to list but a few.

Currently, he is an independent consultant to the Cultural Heritage community and serves as co-chair of the IIIF 3D Community Group and the advisory board of the Rijksmuseum's 2&3D conference. He also produces The Spatial Heritage Review, a monthly round-up of all things happening at the intersection of Cultural Heritage + Digital 3D.

▪ *Everything, Everywhere, All At Once.*

Digitisation technology, workflows, and standards continue to steadily advance, facilitating increases in the quality, depth, and volume of digital cultural heritage data being created. In parallel, new platforms for publishing and disseminating heritage data are connecting audiences new and old with this data in novel and engaging ways. With a focus on 3D data, and drawing on experience and examples from both the heritage and commercial sectors, this keynote will highlight some key challenges and opportunities apparent at the intersection of modern technology and historical knowledge.

Presenting
Monday 2nd December
09:30-10:00

Professor Peter Stone

UNESCO Chair in
Cultural Property Protection and Peace.
President. Blue Shield International
Newcastle University. The United Kingdom

Peter is currently the UNESCO Chair in Cultural Property Protection and Peace at Newcastle - the only such Chair in the world. In August 2020, Peter was elected as President of the Blue Shield having served as Vice President between 2017 and 2020. The Blue Shield is the international NGO created in 1996 to advise UNESCO on the protection of cultural heritage in the event of armed conflict. He was Chair of the UK national committee of the Blue Shield between 2013 and 2020. Peter was previously Head of the School of Arts and Cultures and Professor of Heritage Studies in the International Centre for Cultural and Heritage Studies at Newcastle. Before joining Newcastle, he had worked for English Heritage, as a field archaeologist, and history teacher.

In 2003 Peter was advisor to the UK's Ministry of Defence regarding the identification and protection of the archaeological cultural heritage in Iraq. He has remained active in working with the military to refine attitudes and develop processes for the better protection of cultural property in times of conflict. He has written extensively on this topic including co-editing, with Joanne Farchakh Bajjaly, The Destruction of Cultural Heritage in Iraq (2008) and editing Cultural Heritage, Ethics and the Military (2011). His article 'The 4 Tier approach' led directly to the establishment of a Joint Service Cultural Property Protection Unit in UK forces to become operational in 2019/20.

Peter was appointed to the University in 1997, as Director of the International Centre for Cultural and Heritage Studies (ICCHS) in the School of Arts and Cultures in 2001, and as Head of School in 2006 (until December 2015). Between 1998 and 2008 he was Honorary Chief Executive Officer of the World Archaeological Congress.

Peter was awarded an OBE in the 2011 Queen's Birthday Honours List for services to heritage education.

▪ *Saving Cultural Property In Armed Conflict: The Work Of The Blue Shield.*

In 1953 Luther Evans, Director General of UNESCO, addressed those drafting what was to become the 1954 Hague Convention on the Protection of Cultural Property in the Event of Armed Conflict, stressing that they had been brought together not only to draft the convention but also to create the "Red Cross for Cultural Property". Evans realised that cultural property protection (CPP) could not be delivered by the fledgling UNESCO but would need an independent, impartial, and neutral organisation. While the assembled experts renamed Evans' organisation the 'Blue and White Shield' after the formal emblem of the organisation it was not to be until 42 years later that the International Committee of the Blue Shield was actually established.

This presentation introduces the work of the international NGO, now simply referred to as 'The Blue Shield', which is committed to working in partnership with the heritage, uniformed, and humanitarian' sectors, encouraging them to see the relevance and importance of CPP to their disparate agendas. The Blue Shield stresses the intertwined nature and indivisibility of the protection of people and their cultural heritage and argues that cultural and natural heritage can be used as a vehicle for peace and reconciliation rather than simply as an excuse for conflict. Such work cannot be left until conflict breaks out but must become an integral facet of peacetime activity, concentrating on what unites, rather than what divides, us.

Presenting
Tuesday 2nd December
09:00-09:30

BLUE SHIELD
Protecting Heritage in Crisis

Schedule Monday 2nd December 2024

Workshop 1: Paradata, Metadata, & Data in 3D Digital Documentation for Cultural Heritage: #DigitalTwins or #MemoryTwins

Monday 2nd December: 2024 09:00-17:30

Since its adoption in 2006 as part of the London Charter, the concept of Paradata has appealed to many aspects of the digital documentation of the past; from expressing alternative interpretations, probability or confidence in visual-based heritage research to providing a basis for robust scholarly interrogation, and from describing workflows, data acquisition methods and parameters to supporting sustainability & high quality of & and its preservation approaches.

Now widely seen, along with Metadata and geometrical data, as part of the trinity that indicates high-quality 3D digital resources, both for enriching 3D assets, creating knowledge and promoting reusability, the DCH community still lacks a definitive description and differentiation of what Paradata and Metadata are, their benefits to stakeholders, owners, the multidisciplinary DCH community, digital scholarship, and compliance with the European Commission Recommendation for the collection of 3D-digitised CH assets.

This workshop will review the outcomes and conclusions of two key webinars held under the auspice of the UNESCO Chair on DCH and the EU Eureka3D project in April and May 2024 with the intent to establish definitions for paradata and its applicability within the digitisation lifecycle.

unesco Chair

CYPRUS UNIVERSITY OF TECHNOLOGY · DIGITAL HERITAGE RESEARCH LAB

Dr Marinos Ioannides

Workshop Organiser

UNESCO Chair on Digital Cultural Heritage
Cyprus University of Technology, Cyprus

In cooperation with

- The Digital Europe EUreka3D Project.
- The Horizon Europe HERITALISE Project.
- The EU eArchiving Initiative.
- Heritage Malta, Malta.
- Alma Mater Studiorum-Università di Bologna, Italy.
- Hochschule Mainz-University of Applied Sciences, Germany.

Workshop
Monday 2nd December
09:50-17:30

Cyprus University of Technology

Time	Paper Title & Speaker
08:30-09:00	Registration
09:00-09:30	Welcome and Opening Ceremony
09:30-09:50	Everything, Everywhere, All at Once *Thomas Flynn, Independent Digital Heritage Consultant, The United Kingdom*
09:50-10:00	Why Digitise the Past? #DigitalTwin or #MemoryTwin: What's the Next Step in Cultural Heritage Documentation? *Marinos Ioannides, UNESCO Chair on Digital Cultural Heritage at Cyprus University of Technology*

10:00-10:15	Memory Twins: A new much needed Dimension in Preserving National Collections *Tony Cassar, Heritage Malta, Malta*
10:15-10:30	Generating Paradata by asking Questions or Telling Stories *Isto Huvila, Uppsala University, Sweden*
10:30-11:00	Coffee Break (30 minutes)
11:00-11:15	IIIF 3D & Data Dimensions - Countdown on Collaborative Standards for Sustainable Digital Heritage *Ronald Haynes, IIIF, University of Cambridge, The United Kingdom*
11:15-11:30	3D Data Documentation – From Theory to Automation *Sander Münster, Friedrich Schiller Universität Jena, Germany*
11:30-11:45	Representation & Preservation of Traditional Crafting Techniques *Xenophon Zabulis, FORTH, Greece*
11:45-12:00	3D & Annotations: Towards a Semantic Web for Cultural Heritage? *Öyvind Eide, University of Cologne, Germany*
12:00-13:00	My 3D Model is Wonderful Now, but will it Last? How the EU's eArchiving Initiative's E-ARK Specifications Can Help Future-Proof 3D DCH Documentation *Janet Anderson, David Anderson, Sven Schlarb & Stephen Mackey, eArchiving Initiative*
13:00-14:00	Lunch Break (60 minutes)
14:00-14:15	Introducing Scientific Reference Model & Critical Digital Model – Methodological Approach in Hypothetical Source-Based 3D Reconstruction of Built Cultural Heritage *Piotr Kuroczyński, Hochschule Mainz - University of Applied Sciences, Germany* *Fabrizio Ivan Apollonio, Alma Mater Studiorum - University of Bologna, Italy*
14:15-14:30	Developing the Core Data Model for 3D – Exploring Metadata & Paradata Throughout Current 3D Infrastructure Projects *Igor Piotr Bajena, Hochschule Mainz – University of Applied Sciences, Germany*
14:30-14:45	Benefits, Opportunities, Risks and Gaps in the Management of Cultural Heritage Digitisation. A Critical Literature Review. *Marco Rendina, REEVALUATE project, European Fashion Heritage Association, Italy*
14:45-15:00	Reviving Europe's Architectural Heritage: The CoVHer Project's Standards for 3D Digital Reconstructions *Federico Fallavollita, Alma Mater Studiorum – Università di Bologna, Italy*
15:00-15:30	Illicit Trafficking of Cultural Goods: A Challenge for AI in a Time Without 3D Standards *Valentina Vassallo, ANCHISE Project, STARC, Cyprus* *Axel Kerep, Protection Avancée contre le Recel (PARCS), France*
15:30-16:00	Coffee Break (30 minutes)
16:00-16:15	*The Future of 3D Digitization & Access in the Data Space* *Jolan Wuyts, Europeana Foundation, The Netherlands*
16:15-16:30	HERITALISE: Digitisation of Tangible & Intangible Heritage to Achieve HBIM-based Digital Twins Including Digital Twin Memories *Mikel Borrás-Morrison, IDP Engineering and Architecture Iberia, Spain*
16:30-16:45	3D Digitisation of Cultural Heritage: A Question of Competence, Quality & Infrastructure *Antonella Fresa, PHOTOCONSORTIUM, Italy*
16:45-17:15	All participants: Discussion & Brain Storming Session *Rapporteur Robert Davies, Chair of the Europeana Network Association, The Netherlands*
17:15-17:30	Closing Comments

Abstracts

Everything, Everywhere, All at Once

Thomas Flynn — *09:30:-09:50*

Digitisation technology, workflows, and standards continue to steadily advance, facilitating increases in the quality, depth, and volume of digital cultural heritage data being created. In parallel, new platforms for publishing and disseminating heritage data are connecting audiences new and old with this data in novel and engaging ways. With a focus on 3D data, and drawing on experience and examples from both the heritage and commercial sectors, this keynote will highlight some key challenges and opportunities apparent at the intersection of modern technology and historical knowledge.

Why Digitise the Past? DigitalTwin or #MemoryTwin: What's the Next Step in Cultural Heritage Documentation?

Marinos Ioannides, Elena Karittevli, Panayiotis Panayiotou & Drew Baker
Cyprus University of Technology, Cyprus

09:50-10:00

Memory Twin, an innovative framework born at the UNESCO Chair on Digital Cultural Heritage, represents a ground-breaking evolution of the digital surrogate concept. Unlike the conventional Digital Twin that focuses on creating virtual replicas of physical heritage, the Memory Twin integrates the tangible and intangible aspects of cultural assets. This approach preserves not only buildings, artefacts, and landmarks but also their associated culturally significant stories, rituals, and knowledge. As an approach to holistic preservation, Memory Twin reflects an understanding that cultural heritage is not solely defined by its material aspects but by the traditions, memories, and narratives that give it life and meaning.

Memory Twin provides a new model for heritage preservation that captures the interconnectedness between physical heritage and cultural context. This dynamic interaction enriches the digital representation of heritage, ensuring future generations receive a legacy that includes both the material and the experiential dimensions of culture. Memory Twin's framework allows for the full expression of heritage, making it globally accessible and minimising the need for physical travel that can lead to over-tourism and environmental stress on heritage sites.

As a forward-looking approach, Memory Twin invites a global audience to engage with digital cultural heritage in an authentic and meaningful way. It supports cultural sustainability by offering experiences that convey the essence of heritage through both its physical and intangible qualities. This inclusive, digitally enhanced framework goes beyond preservation, encouraging an interactive, evolving relationship with cultural heritage that respects and builds on its complex identity.

Memory Twins: A New Much Needed Dimension in Preserving National Collections

Anthony Cassar
Heritage Malta, Malta

10:00-10:15

The “Memory Twin” concept is an exciting new approach in the field of heritage preservation, adding depth to how we understand and interact with historical sites and collections. It goes beyond the physical preservation of buildings and objects, focusing also on the memories, stories, and experiences that surround them. In this framework, buildings are not just architectural structures, but monuments imbued with the cultural significance of the past. Similarly, collections are transformed into living museums, where the memories associated with artefacts are just as valuable as the objects themselves.

At the heart of this concept is the integration of a multidisciplinary approach, blending digital heritage, conservation, and information technology to create a holistic framework. By leveraging Building Information Modelling (BIM) techniques, combined with emerging technologies like 3D digitisation, augmented reality, and interactive storytelling, the Memory Twin aims to preserve not only physical aspects but also the intangible cultural elements that breathe life into heritage.

In the context of digitising the Maltese National Collection, the Memory Twin concept can be adapted to capture not only the physical attributes of artefacts but also the rich cultural narratives that surround them. I will speak about three case studies where we are trying to achieve this – the Dockyard Collection, Villa Portelli and Villa Gwardamangia. By integrating memories into advanced technologies like 3D modelling, virtual reality, and digital storytelling, this approach will ensure that Malta’s heritage is preserved in a way that reflects its full historical and emotional depth, creating interactive experiences that resonate with both local and global audiences.

Generating Paradata by Asking Questions or Telling Stories

Isto Huvila
Uppsala University, Sweden

10:15-10:30

Earlier studies point to a broad diversity of information – paradata – that can convey understanding of practices and processes underpinning the making of different types of research materials, including digital 3D visualisations. Similarly, a large number of practices relating to generation and use of such information have been identified. What remains under researched so far is, how the practices of generating and using paradata intersect.

This presentation draws from on-going research on paradata creators and users paradata preferences to identify and analyse two major categories of paradata generation based on requesting input from researchers through asking them to provide answers to specific questions and asking them to provide narrative descriptions of their activities. The presentation discusses examples and differences of the two approaches — including conversational agents and structured metadata of the first, and data narratives and argumentation chains of the second — and their outputs, and contrasts them to findings on the preferences of paradata creators and users. The tentative conclusion suggests that despite overlap the two broad approaches are likely to lead to ontologically distinct kinds of paradata that vary in their capacity to inform of practices and processes for different purposes in spite of their possible superficial similarity with each other.

IIIF 3D & Data Dimensions – Countdown on Collaborative Standards for Sustainable Digital Heritage

Ronald Haynes
University of Cambridge, The United Kingdom

11:00-11:15

The expanding considerations of intangible as well as tangible cultural heritage, and memory twins along with digital twins, has extraordinary potential for adding more human aspects, if we can find ways to express it in a common and supported framework. In a related way, the IIIF (International Image Interoperability Framework) provides a vital model for a communal approach to successfully developing and adopting a framework for pairing essential data and metadata, shared via documented APIs and expressed within a clearly-specified manifest structured in a JSON-LD file. This presentation will explore the potential to create a similar structured document for essential paradata, to complement the extensive digital collections using IIIF to enable sharing, extending and blending collections globally.

To complement the impact of the IIIF in 2D and Audio/Video (A/V) digital collections around the world, the IIIF 3D Technical Specification Group (TSG) has a road map to draft standards for 3D content, incorporating established open web standards, to complement and expand the potential of all IIIF-based collections worldwide. Engaging with specialists and representatives across user communities, international and standards bodies, the TSG are expanding options for better data sharing across institutions, to help overcome barriers for sustainable digital collections.

This presentation will provide a detailed introduction to current proposed changes to the IIIF Presentation API specification that will enable presentation and display of 3D resources using IIIF tools. There will be draft examples of IIIF Presentation documents encoding 3D resources and demos of viewers that support these documents to display 3D web content, and ways of storytelling and interacting by combining 3D, 2D and A/V.

There will be open discussion of the specification draft work-in-progress, and use cases that involve more advanced 3D implementations, especially those involving annotation, interaction, and/or animation, that are planned to be supported in the standard's specifications.

3D Data Documentation – From Theory to Automation

Sander Münster
Friedrich Schiller Universität Jena, Germany

11:15-11:30

Digital 3D modelling technologies have been widely used to support research and teaching in the humanities, especially but not exclusively for historical architecture. Despite the immense efforts made to establish information technologies, and in particular 3D technologies such as digital 3D modelling and visualisation, as everyday tools for humanities researchers, the current situation is still ambiguous. On the one hand, humanities researchers often use a wide range of digital tools for information retrieval, communication, publication and research support (e.g. reference management or personal organisation). There is also a large number of projects investigating and using these technologies in different settings. On the other hand, the use of digital tools for research work varies widely between the sub-disciplines of the humanities, and the development of this field is driven by language and text-related disciplines such as linguistics or edition studies.

A major challenge is the documentation of 3D modelling in terms of results and workflows. This is usually done through data, metadata and paradata. This paper proposes to (a) highlight the core concepts and challenges of documenting 3D models of built heritage, and in particular 3D reconstructions as usually hand-modelled digital representations of non-existent or never realised buildings and cityscapes. (b) A subsequent part quantifies the state of the art of 3D data and infrastructure. Several technologies and in particular AI-based approaches are used to support and automate the documentation and metadata generation process. (c) Within the DFG 3D Viewer repository we use and test different LLM and VLM models for data enrichment – supporting tasks like classification of 3D content, extraction of location information, generation of descriptions and translation of captions. All approaches have been applied to a sample of 1,000 3D meshes so far.

Representation & Preservation of Traditional Crafting Techniques

Xenophon Zabulis
The Foundation for Research and Technology - Hellas (FORTH), Greece

11:30-11:45

Despite notable progress in digitising tangible cultural heritage artefacts and monuments, the systematic documentation of their making processes remains relatively underexplored. Contemporary initiatives in the field of traditional crafts are beginning to address this gap by focusing on digitising and documenting crafting methods. Such documentation goes beyond capturing the geometry and appearance of tools to include insights into how these tools are used, as well as their significance in constructing buildings and manufacturing objects. The use of digital tools thus holds potential not only for preserving knowledge essential to traditional making techniques but also for supporting conservation efforts that respect the original crafting methods of artefacts and monuments.

Traditional practitioners employ sensory judgement to assess material properties of individual workpieces and environmental conditions, influencing their choices of specific techniques and treatments. Therefore, the digitisation and visualisation of workspaces, tools, and materials used in creating objects and buildings is required, for educational and training application that safeguard crafting knowledge. This aspect underscores the importance of standardising the ways in which these activities and associated knowledge are documented to ensure accurate representation and preservation.

This work explores methods for the semantic representation of crafting knowledge, integrated with the digitisation of craft products, spanning from small artefacts to large structures, including buildings and monuments, developed in the Craft Research and Innovation action of the European Commission. Furthermore, it provides an outlook on the challenges inherent in formally representing this knowledge within interoperable formats, aligned with established best practices in the cultural heritage domain. The presented approach aims to advance the preservation of traditional craft knowledge and techniques in a digital form, fostering a comprehensive understanding of heritage-making processes for future generations

3D & Annotations: Towards a Semantic Web for Cultural Heritage?

Øyvind Eide
University of Cologne, Germany

11:45-12:00

The EPOCH network of excellence was a significant collection of cultural heritage institutions in Europe, with around 100 partners involved. Its goals included the integrating of cultural heritage resources and the improvement of production pipelines for digital resources. Towards the end of the project a need for better integrating 3D resources to textual sources was identified, and an ontological approach was tried out for the concrete connection between resources. The results of this experiment were published in Havemann et al. (2009).

Annotations was traditionally a way to add comments and extensions to manuscripts, which developed into the footnote as a formalised system for second layers in texts (Grafton 1997). It was also used to add information to images and grew into text encoding as part of digitisation of paper-based resources—mainly texts, but later also documents as spatial objects, also with images being annotated (TEI Consortium 2024).

With the development for 3D modelling as a means to digitise physical objects, as well as to make born digital models, annotation was also extended to such objects. The Kompakkt annotation tool does not only enable annotations of different digital objects including 3D models, but also the annotations themselves are extended multimodal objects, and they can be linked together for storytelling. In the ARTEST Project a digital lab is being developed as a WordPress system where storytelling in text and image includes 3D annotated models using embedded Kompakkt windows as part of the narrative structure.

The paper will describe this development and discuss where it might go from here, seeing annotations as mechanisms for the integration of complex objects across media borders.

My 3D Model is Wonderful Now, but Will it Last? How the EU's eArchiving Initiative's E-ARK Specifications Can Help Future-proof 3D DCH Documentation

Janet Anderson[1], David Anderson[1], Sven Schlarb[2] & Stephen Mackey[3]
[1]Highbury Research & Development Ltd, Ireland [2]AIT Austrian Institute of Technology, Austria,[3]Penwern Ltd, The United Kingdom

12:00-13:00

The eArchiving Initiative is a European Commission programme that provides necessary specificity and guidance for implementing conformant and interoperable Open Archival Information Systems (OAIS, ISO 14721) via core package specifications, software, a reference architecture, training and a Conformance Seal. Content Information Type Specifications (CITS) further extend this core to support data types such as relational databases, geospatial data, and record management systems in domains such as eHealth, Engineering and Cultural Heritage.

In the last two years, the Initiative has produced a new specification for 3D Product Model data that supports the domain of engineering product models (such as Computer Aided Design) and builds on the existing standards LOTAR (Long Term Archiving and Retrieval, EN/NAS 9300) and STEP (Standard for the Exchange of Product Model Data, ISO 10303). This CITS has recently completed public review and is due to be published by the DILCIS Board (https://dilcis.eu/).

Continuing this work, eArchiving is now working with domain experts, including Marinos Ioannides (Mnemosyne) and Franco Niccolucci (Prisma) to develop a new CITS for 3D models in Cultural Heritage.

This presentation will introduce the eArchiving initiative and its core specifications, an overview of work done so far on specifications for 3D models in Engineering and Cultural Heritage and future work planned for a construction domain CITS for Building Information Models (BIM). In particular, the presentation will highlight accommodations and requirements made in the Cultural Heritage CITS for paradata and metadata and considerations concerning technical metadata and authentication of models.

The presentation will then look forward to the establishment of a framework for the archiving of complete product designs, construction projects or heritage memory twins via collections of archival packages (AIPs) linked via the new Records in Contexts ontology (RiC) in development by the International Council on Archives (ICA).

Introducing Scientific Reference Model & Critical Digital Model – Methodological Approach in Hypothetical Source-Based 3D Reconstruction of Built Cultural Heritage

Piotr Kuroczyński[1] *& Fabrizio Ivan Apollonio*[2]
[1]Hochschule Mainz - University of Applied Sciences, Germany, [2]Alma Mater Studiorum - University of Bologna, Italy

14:00-14:15

In 3D digital documentation for Digital Cultural Heritage (DCH), the integration of Scientific Reference Models (SRM) and Critical Digital Models (CDM) offers a structured approach to managing metadata and paradata, and geometrical data — key elements for ensuring high-quality, transparent, and reusable 3D heritage assets. These models directly address the pressing challenges identified by the DCH community: achieving rigorous documentation standards, fostering scholarly transparency, and aligning with international charters and EU standards on quality for 3D digitization.

SRM establishes a foundational framework prioritizing web-based publication, metadata and paradata, and technical reliability based on standardized data exchange formats. It emphasizes interoperability and FAIR principles (Findable, Accessible, Interoperable, Reusable), making it possible to create models that meet diverse application needs and serve as foundational references for ongoing digital heritage study and reusability. CDM delves into the interpretive dimension of documentary sources, highlighting paradata necessary to ensure the transparency of hypothetical 3D reconstructions. This approach tracks interpretive and conjectural decisions and represents the level of uncertainty that informs digital heritage models. In this way, CDM addresses the inherent gaps and ambiguities present in source-based reconstructions, which can be used as a three-dimensional reference document for scholars, supporting informed critical engagement.

Jointly, SRM and CDM form a cohesive methodology that brings structure, interoperability, reusability, reliability and interpretive clarity to 3D heritage documentation. This unified framework closes existing gaps in 3D reconstruction and documentation standards by offering an application related methodological approach. It allows 3D models to function as “Memory Twins,” encapsulating the artefact and the scholarly interpretation behind its digital reconstruction. The proposal to the DCH community is to consider SRM and CDM as practical, standards-driven solutions that advance the field of 3D documentation by bridging data rigor and harmonization with interpretive transparency, essential for sustainable and insightful heritage preservation.

Developing the Core Data Model for 3D – Exploring the Metadata & Paradata Throughout Current 3D Infrastructure Projects

Igor Piotr Bajena & Piotr Kuroczyński
Hochschule Mainz - University of Applied Sciences, Germany

14:15-14:30

3D models have become essential tools for preserving our contemporary heritage and for visualizing historical legacies. However, without standardized approaches to describing and documenting these digital assets, 3D models risk becoming unreliable, as they can convey mere fantasy instead of authentic representations. Thus, it is critical to include metadata with each 3D model, allowing for at least a minimal level of classification and identification of the digital asset.

In recent years, numerous projects have emerged to address 3D model preservation, yet a shared metadata standard for the community remains undeveloped. This contribution presents efforts from the DFG 3D-Viewer project (Infrastructure for Digital 3D Reconstructions) through metadata workshops conducted with German and European infrastructure projects on 3D in Mainz (December 2022) and Munich (March 2023). These discussions explored whether a shared framework could exist between infrastructures with varied goals and audiences, whether a universal documentation scheme for 3D cultural heritage models is possible, and how to define a minimum metadata set that could serve as a foundation for a standard.

However, human-readable metadata alone is no longer sufficient, especially given the increasing impact of the digital turn. To achieve effective and sustainable documentation, published data must also be machine-readable. Therefore, this work also considered digital cultural heritage ontologies, analysing their potential application in documenting 3D digital models, identifying gaps, and proposing solutions based on frameworks like CIDOC CRM, CRMdig, and OntSciDoc3D.

The results of this contribution offer proposals for documenting digital 3D models through metadata and ontologies, serving as initial examples for further discussion

Benefits, Opportunities, Risks and Gaps in the Management of Cultural Heritage Digitisation. A Critical Literature Review.

Marco Rendina[1], Maria Drabczyk[1], Anastasia Dimou[2], Jasper de Koning[3], Francesca Mafredini[1], Jiri Svorc[3] & Ruben Peeters[2]
[1]European Fashion Heritage Association, Italy, [2]Katholieke Universiteit te Leuven, Belgium,[3]Arthurs Legal, The Netherlands

14:30-14:45

The digitisation of cultural heritage enhances accessibility, enabling Cultural Heritage Institutions to share collections widely for research, education, and public engagement. This paper reviews literature on digitisation management in Europe, focusing on six areas: access and engagement, technology, legal and policy considerations, ethical considerations, skills and competencies, and sustainability. This critical literature review highlights benefits and risks, opportunities and challenges related to digitisation of cultural heritage. Benefits include increased access and preservation, while challenges encompass framework gaps, copyright and ethical issues, and long-term digital preservation.



Reviving Europe's Architectural Heritage: The CoVHer Project's Standards for 3D Digital Reconstructions

Fabrizio I. Apollonio[1], Federico Fallavollita[1], Riccardo Foschi[1], Piotr Kuroczynski[2], & Igor Piotr Bajena[2]
[1]Alma Mater Studiorum - University of Bologna, Italy [2]Hochschule Mainz - University of Applied Sciences, Germany,

14:45-15:00

The CoVHer project focused on enhancing the digital documentation and study of European Architectural Cultural Heritage (CH) that no longer existed or was never built by establishing standards for creating and assessing scientifically accurate 3D reconstructions. Addressing the previous lack of standards, CoVHer clarified the difference between credible reconstructions and amateur models. Through practical guidelines and a shared vocabulary, the project improved the quality, transparency, and accessibility of Computer-based Visualisation of Cultural Heritage (CVCH) models.

The project involved five universities and two companies across Europe, as well as museums and municipalities, to create a collaborative framework. CoVHer's methodologies were aligned with international frameworks, including the UNESCO Charter on the Preservation of Digital Heritage and FAIR principles, ensuring accuracy and interoperability. Its objectives included establishing standards for model construction, ensuring source traceability, promoting accessibility across digital platforms, and developing scientifically grounded visualization techniques.

One of the main outputs of CoVHer was the creation of an Open Access platform, a unique repository for 3D models specifically dedicated to vanished or unbuilt European architectural heritage. This digital repository allowed scholars to share, evaluate, and critically assess 3D models with comprehensive source documentation. For the general public, the platform offered insights into the value of these historical sites, enriching collective knowledge of European CH.

As part of its educational impact, CoVHer developed a Massive Open Online Course (MOOC) to educate both students and the public on the scientific aspects of virtual reconstructions, bridging digital skills gaps in higher education. This MOOC provided accessible training on best practices in 3D modelling, quality evaluation, and historical visualization. By engaging academic and public audiences, CoVHer fostered a deeper understanding of European CH and strengthened cultural identity through innovative, digital learning.


Illicit Trafficking of Cultural Goods: A Challenge for AI in a Time Without 3D Standards

Valentina Vassallo[1] & Axel Kerep[2]
[1]STARC, Cyprus, [2]Protection Avancée contre le Recel (PARCS), France

15:00-15:15

The potential benefits of technology are now well known to the various stakeholders involved in the fight against the illicit trafficking of cultural goods. As in other fields, Artificial Intelligence (AI) is emerging as a solution to combat smuggling networks.

AI is already being called upon to provide answers to several challenges in the fight against illicit trafficking: rapid detection to improve controls, especially for cultural objects that are not listed in repositories, and identification in a multitude of Internet sites (e.g., web scanning, data crawling), to automate time-consuming monitoring operations that cannot be carried out on such a scale by human inspection alone.

However, there are still difficulties in its application. Increasing amounts of multimodal data are needed to feed the ever-growing machine learning processes. In archaeology, where typologies are uneven in number and quality, this growing demand poses the challenge of digitising our heritage. Furthermore, the increasing use of AI tools also increases the need for data access and standardisation.

In this context, the contribution from the EU-funded HE ANCHISE project will present and provide operational AI tools as well as data access and standardisation capabilities. Its toolkit of five AI applications ranges from site monitoring, field object identification, web crawling, big data market analysis and specific object characterisation. All five solutions are linked in an interoperable repository. The tools developed within ANCHISE and their different application areas will provide practical solutions for the so-called source, transit and destination countries of illicit cultural goods trafficking, facilitating the work of stakeholders involved in the fight

The Future of 3D Digitization & Access in the Data Space

Jolan Wuyts
Europeana Foundation, The Netherlands

15:15-15:30

After the successful “Twin It! 3D for Europe’s Culture” campaign came to a close in Brussels in May 2024, the Twin It Call to action was launched. What does this call to action mean for the upcoming projects and data space work in the next few years? How do we tackle storage and viewer concerns? How do we bring 3D heritage closer to different audiences and enable reuse? Jolan Wuyts will show Europeana’s perspective on these challenges, highlight Europeana’s priorities towards 3D heritage in the data space, and brings an open call for discussion and collaboration.

HERITALISE: Digitisation of Tangible & Intangible Heritage to Achieve HBIM-Dased Digital Twins Including Digital Twin Memories

Mikel Borrás-Morrison
IDP Engineering and Architecture Iberia, Spain

16:00-16:15

HERITALISE mission is to research and develop advanced digitisation techniques and solutions for documenting and representing diverse CH assets, giving a full comprehension of the diverse CH features, visible and non-visible. In addition, AI-powered tools including Machine Learning (ML) will be developed for improved and optimised data post-processing and integration based on standard and expanded methodologies. All this will be connected through a knowledge graph environment that allows the individual aspects known about the CH object to be related and retrievable. As with Wikipedia, by following links it will be possible to learn more about a particular object, what research has been done, and what results have been derived from it. HERITALISE will provide the upcoming ECCCH with a interoperable web-based Ecosystem, advanced input data from improved digitalisation methodologies and preservation supporting tools

3D Digitisation of Cultural Heritage: A Question of Competence, Quality & Infrastructure

Antonella Fresa
Photoconsortium Association srl, Italy

16:15-16:30

The paper aims to discuss three main questions that are related to the successful implementation of digitisation actions in the cultural heritage sector, namely: competence, quality and infrastructure.

The three questions are strictly interrelated, but equally urging to enable a factual response of the cultural heritage sector to the 2021 Recommendation of the European Commission about promoting and accelerating the digitisation of cultural heritage.

The objectives of the Recommendation are very ambitious – “to digitise by 2030 all monuments and sites that are at risk of degradation and half of those highly frequented by tourists” –.

To be ready to cope with these objectives it is necessary to accelerate the pace of digitisation, which is challenging, in particular, for the case of 3D digitisation.

3D digitisation is a very complex task that requires competences that must be shared with the European cultural heritage institutions, with a special attention to the small ones.

Furthermore, standards, methods, tools must be promoted, to guarantee high quality digitisation, to avoid that investments are wasted in low quality or perishable collections that are outdated and unusable in few years.

Finally, a robust digital infrastructure is needed to secure that contents produced by European institutions remain in Europe. The infrastructure should cover the whole digitisation process being accessible from the stakeholders that provide contents until the users that take advantage of these contents.

The Eureka3D and Eureka3D-XR projects, co-funded by the Digital Europe Programme, are providing answers to these questions.

Future work may consider building on previous and ongoing EU-funded projects, continuing to improve capacity building in 3D cultural heritage across Europe, developing a common language to enable the collaboration among multiple disciplines, enhancing the understanding of media transformation, acknowledging the role of artistic reflection and human creative process, networking, establishing cooperation agreements and adopting bottom-up approaches.

Schedule Tuesday 3rd December 2024

Workshop 2: Cultural & Creative Tourism as a Driver for Sustainable Development

Tuesday 3rd December: 2024 09:00-18:00

Cultural Heritage has always been a net attractor for tourists from ancient times (Pausanias' Description of Greece 2nd century AD) through to the medieval pilgrimages (*Codex Calixtinus: Iter pro peregrinis ad Compostellam – Pilgrim's Guide to Santiago de Compostela* 12th century AD) and from the "Grand Tour" of the 17th and 19th centuries to modern bucket list destination package deals. Figures for EU tourism in 2019 placed the value of the whole EU tourist market sector at approximately €572 billion, and that 40% of all destination selections are based on cultural offerings.

Tourism can significantly contribute to local economies, bring investment and infrastructure developments into regions and support employment. As a tool to revitalise marginalised or underdeveloped regions and promotion of cultural tourism can bring significant benefits to communities, but this is not without risk or consequences. Notably since the anthropause of the global pandemic, there has been a global backlash to tourism from local residents with high profile destinations like Venice, Italy, Mount Fuji, Japan and The Canary Islands, Spain, rethinking tourist activities and access.

This workshop will consider the role that Digital Cultural Heritage can play in supporting informed, responsible and sustainable Cultural Tourism from both sides the service provider and the consumer tourist.

Antonella Fresa

Workshop Organiser

Horizon Europe SECreTOUR Project, Italy
Director of Design & General Manager, Promoter srl, Italy

In cooperation with

- The UNESCO Chair on Digital Cultural Heritage

Workshop
Tuesday 3rd December
09:30-17:45

SECreTOUR
Sustainable Creative Tourism

Time	Paper Title & Speaker
08:30-09:00	Registration
09:00-09:30	Saving Cultural Property in Armed Conflict: The Work of The Blue Shield *Peter Stone, UNESCO Chair in Cultural Property Protection & Peace at Newcastle University, Blue Shield International, The United Kingdom*
09:30-09:50	Cultural Tourism: Bridging Heritage & Places, Learning & Promoting Sustainable Practices *Antonella Fresa, Promoter srl, Italy*
09:50-10:30	EU Policy Framework *Giuliana De Francesco, Policy Officer, European Commission, DG Research & Innovation, Belgium*
10:30-11:00	Coffee Break (30 minutes)

Time	Paper Title & Speaker
11:00-11:15	A Charter for Sustainable Cultural Tourism: Co-creation of the Updated Edition *Manos Vougioukas, The European Cultural Tourism Network (ECTN), Belgium*
11:15:11:30	Tourism as a New Market in the Data Space for Cultural Heritage *Jolan Wuyts, Europeana Foundation, The Netherlands*
11:30-11:45	Preserving the Past, Shaping the Future: Cultural Heritage Tourism in Malta *Tony Cassar, Heritage Malta, Malta*
11:45-12:00	3D Big Data for Digitally Enhanced Cultural Tourism *Sander Münster, Time Machine, Austria*
12:00-12:15	Participative Interpretation using Interactive Digital Storytelling *Jonathan Barbara, Saint Martin's Institute of Higher Education, Malta*
12:15-13:00	All participants: Discussion & Brain Storming Session *Rapporteur: Carolina Islas Sedano, University of Turku, Finland*
13:00-14:00	Lunch Break (60 minutes)
14:00-14:15	Communicating (Digitally) the Natural & Cultural Heritage of Monte San Giorgio (Switzerland) *Lorenzo Cantoni, UNESCO Chair in ICT to develop & promote sustainable tourism in World Heritage Sites at the USI, Switzerland*
14:15-14:30	Every Contact Leaves a Trace: QR Codes & Bottom-up Tourism Intelligence- The Historic Graves Case Study *John Tierney, Eachtra Archaeological Projects, Ireland*
14:30-14:45	Interested or Just Curious? Irish Graveyards: From Community-led Heritage Projects to Community-led Tourism Experiences *Maurizio Toscano, Eachtra Archaeological Projects, Ireland*
14:45-15:00	The Evolving Concept of Authenticity in Heritage and Cultural Tourism *Anna Vichnevetskaia, Xi'an Jiaotong-Liverpool University, China*
15:00-15:15	Multidimensional Approach Fostering Sustainable Tourism Growth in Rural & Remote Regions *Evdoxia Eirini Lithoxoidou, Centre for Research and Technology Hellas, Greece*
15:15-15:30	Building an Enhanced Visitor Experience Though Cultural Memory: eFikardou *Elena Karittevli, Cyprus University of Technology, Cyprus*
15:30-16:00	Coffee Break (30 minutes)
16:00-16:15	Crafting Landscapes *Sharon Pisani, University of St Andrews, The United Kingdom*
16:15-16:30	Be-Cultour Project: A Co-creation Experience on Circular & Sustainable Tourism in Algarve Portugal *Daniela Toledano, University of Algarve, Portugal*
16:30-16:45	Barbora Route: Cultural Pilgrimage Tourism as a Catalyst for Sustainable Development in Central Slovakia *Darina Rojíková, Matej Bel University in Banská Bystrica, Slovakia*
16:45-17:00	Public Renaissance: Location-based Interpretation of Early Modern Urban Space *Fabrizio Nevola, University of Exeter, The United Kingdom*
17:15-17:45	All participants: Discussion & Brain Storming Session *Rapporteur: Manos Vougioukas, The European Cultural Tourism Network (ECTN), Belgium*
17:45-18:00	Closing Comments

Abstracts

Saving Cultural Property in Armed Conflict: The Work of The Blue Shield

Peter Stone
UNESCO Chair in Cultural Property Protection & Peace at Newcastle University, Blue Shield International, The United Kingdom

09:00:-09:30

In 1953 Luther Evans, Director General of UNESCO, addressed those drafting what was to become the 1954 Hague Convention on the Protection of Cultural Property in the Event of Armed Conflict, stressing that they had been brought together not only to draft the convention but also to create the "Red Cross for Cultural Property". Evans realised that cultural property protection (CPP) could not be delivered by the fledgling UNESCO but would need an independent, impartial, and neutral organisation. While the assembled experts renamed Evans' organisation the 'Blue and White Shield' after the formal emblem of the organisation it was not to be until 42 years later that the International Committee of the Blue Shield was actually established.

This presentation introduces the work of the international NGO, now simply referred to as 'The Blue Shield', which is committed to working in partnership with the heritage, uniformed, and humanitarian' sectors, encouraging them to see the relevance and importance of CPP to their disparate agendas. The Blue Shield stresses the intertwined nature and indivisibility of the protection of people and their cultural heritage and argues that cultural and natural heritage can be used as a vehicle for peace and reconciliation rather than simply as an excuse for conflict. Such work cannot be left until conflict breaks out but must become an integral facet of peacetime activity, concentrating on what unites, rather than what divides, us.

Cultural Tourism: Bridging Heritage & Places, Learning & Promoting Sustainable Practices

Antonella Fresa
Promoter srl, Italy

09:30-09:50

For people living in a territory, it is normal that the heritage and the places of that area are linked by history, by traditions, by geography, by the narrations of ancestors. However, nowadays, these liaisons risk being broken by forms of tourism that are looking at the destinations as mines to be exploited. The consequences are, among others, turistification, overtourism, gentrification, negative impacts on the natural landscapes.

When tourism is conceived as a tool to complement and diversify the income of the territories, a way of giving visibility and recognition to rural areas and their inhabitants, a means to promote the installation and the generation of services that are beneficial both for local communities and for visitors, then it can contribute to the respectful development of the areas.

Focusing on culture, nature, knowledge, and experiences, it would be possible to generate fair, creative and sustainable tourism approaches that meet together visitors and the heritage communities.

The SECreTour project, funded by the European Union under the Horizon Europe Programme, is a research and innovation action started on 1/3/2024. The project lasts 3 years, focusing on cultural tourism in the European peripheries, assessing different local contexts, needs and types of cultural heritage.

Specific goals are considered by the project while testing and experimenting new forms of tourism development, to promote alternative business models, to enable governance and citizen engagement not only for touristic-economic planning, but also for community building and cultural heritage management and protection.

A series of pilot cases have been chosen to represent a wide range of European territories, communities and heritage, including rural and agrarian landscapes, memory places of local identities, minorities, and conflictive dark heritage. Through these pilots, the project will experiment the adoption of new paradigms in local contexts, facilitating effective communication and cooperation, and activating co-creative problem-solving through interdisciplinary and trans-sectoral approaches.

A Charter for Sustainable Cultural Tourism: Co-creation of the Updated Edition

Manos Vougioukas
The European Cultural Tourism Network (ECTN), Belgium

11:00-11:15

The 'Charter for Sustainable Cultural Tourism' was first proposed in September 2014, at the 7th Conference of the European Cultural Tourism Network (ECTN) held in Volos, Thessalia Region, Greece. The 'Thessalia Charter' as it became known was updated in 2106 and in 2018, the latter being the ECTN contribution to the European Year of Cultural Heritage. A major updating is required after 10 years to incorporate all relevant initiatives, developments and synergies.

The purpose of this Charter is to bring together in a single, comprehensive and integrated document the main principles, features, findings, conclusions and recommendations on smart and sustainable cultural and heritage tourism development and promotion. It aims to build on all relevant previous initiatives, declarations, resolutions, opinions and charters, to exploit synergies and facilitate implementation by national, regional and local authorities. The overall aim is to encourage sustainable and responsible tourism policies and actions across Europe and beyond, through engaging culture and heritage with innovation, resilience and cohesion.

The ECTN Charter is a statement of principles on regional policies and strategies which guide the development, planning, management, operations and promotion of smart and sustainable cultural and heritage tourism in the European Union and beyond, for the benefit of tourist destinations, host communities, businesses, citizens and visitors.

The updating process, starting at the 17th ECTN Conference held in Dublin, Ireland, in October 2024, is based on co-creation involving key stakeholders, such as EU institutions, Europa Nostra, European Travel Commission, ICOMOS ICTC, NEMO, ICOM, NECSTouR, GSTC, WTACH, UN Tourism (formerly UNWTO) and UNESCO, as well as relevant academic and research institutes.

The updated edition aims to include, inter-alia, the following:

- EU Transition Pathway for Tourism.
- European Capital of Smart Tourism.
- Europa Nostra Europe Day Manifesto and Declarations.
- UN Tourism relevant conferences conclusions.
- Sustainable Development Goals.

Tourism as a New Market in the Data Space for Cultural Heritage

Jolan Wuyts
Europeana Foundation, The Netherlands

11:15-11:30

Europeana's increased efforts towards encouraging reuse of digital heritage in the data space for cultural heritage will lead it to try and penetrate new markets, namely the Media and Tourism markets. Both of these markets have their own set of opportunities and challenges. This talk aims to open up discussions around the challenges and opportunities for the tourism sector: are there needs in the Tourism sector that can be answered by digital heritage platforms? What activities, file formats, curated datasets, and engagement does the sector need? What specific actors within the sector are most useful to target? And what return on investment can be expected from fostering reuse in Tourism?

Preserving the Past, Shaping the Future: Cultural Heritage Tourism in Malta

Tony Cassar
Heritage Malta, Malta

11:30-11:45

Cultural heritage tourism in Malta provides a unique lens into the island's history, showcasing UNESCO World Heritage Sites, traditional architecture, and vibrant cultural events. The tourism sector here is evolving, with visitors increasingly seeking immersive experiences that connect them to Malta's diverse past. Malta's rich historical narratives, compact size, and high density of heritage sites make it a standout Mediterranean destination, significantly contributing to the national economy by bolstering GDP and providing employment in heritage-related sectors.

However, this growth brings challenges, including the need to balance preservation with tourism demands, manage infrastructure, and address congestion at key sites. A shift toward sustainable tourism practices is necessary to maintain both visitor satisfaction and community well-being.

Digital transformation plays a pivotal role in enhancing Malta's cultural tourism appeal. Initiatives like virtual tours, online ticketing, and interactive digital guides offer visitors engaging ways to explore Malta's heritage before arrival and enrich their experiences on the islands. These tools are particularly appealing to younger, tech-savvy travellers.

Expanding Malta's heritage tourism requires tapping into niche markets and promoting lesser-known sites to diversify its cultural offerings. Targeting specialized tourism, like dark tourism and military history, can attract specific audiences, while extending activities into shoulder seasons can address seasonal dips in tourism. To stay competitive, Malta must balance heritage preservation with tourism growth by embracing sustainable, immersive experiences and involving local communities, ensuring its heritage remains significant for future generations.

Participative Interpretation using Interactive Digital Storytelling

Jonathan Barbara
Saint Martin's Institute of Higher Education, Malta

12:00-12:15

The use of Interactive Digital Storytelling affords the provision of multiple perspectives for the interactor to engage with as they explore the subject matter presented (Koenitz, 2023). Such multiple perspectives could be different interpretations offered by various archaeologists for a given cultural heritage site, based on different schools of thought (Grima, 2001, 2003, 2005) or in comparison with their own experience excavating other contemporary sites (Malone, 2008). Curators regularly face the challenge of evaluating these perspectives, some belonging to the archaeologist performing the original discovery while others belonging to more recent interpretations, in order to present a mostly singular interpretation to accompany a site or artefact, with the more traditional perspective usually gaining more attention (Stroud, 2019). An Interactive Digital Narrative can bring this selective process to the visitor by presenting the different perspectives and allowing the interactor to make their own decision as to which interpretation to subscribe to. This is particularly applicable to Neolithic sites about which little to no documentary evidence is available to shed light on their purpose or use, such as the Neolithic Temples of Tarxien, Malta. A prototypical ideation tool that can help compare these perspectives has been designed and developed, allowing for the representation of the various perspectives, the evidence for these perspectives, and the sources for these evidences. Such a prototypical tool can help design interactive narratives that present and allow interactors- to explore and make their own interpretations based on these perspectives.

Communicating (digitally) the Natural & Cultural Heritage of Monte san Giorgio (Switzerland). Notes from the SECreTour project

Antonio Lenzo, Adine Gavazzi & Lorenzo Cantoni
Università della Svizzera italiana, Switzerland

14:00-14:15

Overlooking Lake Lugano and administratively split between Switzerland and Italy, Monte San Giorgio was inducted into the UNESCO World Heritage Site list in 2003, joining the Horizon EU SECreTOUR project as a pilot case in 2024.

Already well-known for its remarkable paleontological record relating to the Triassic period, more recent interdisciplinary research has cast light on the complexity of the site's natural, cultural and religious heritage, both tangible and intangible, suggesting a wealth of narratives to be recovered.

We will consider the role and affordances of digital storytelling in reaching a variety of audiences through multi-layered, multimedia narration.

Every Contact Leaves a Trace: QR Codes & Bottom-up Tourism Intelligence- The Historic Graves Case Study

John Tierney
Eachtra Archaeological Projects, Ireland

14:15-14:30

The Historic Graves pilot is part of the Horizon EU SECreTOUR project which commenced in April 2024. Using geolocated community surveys of historic graveyards published to www.historicgraves.com this pilot is researching sustainable cultural heritage approaches to developing creative and engaging tourism products.

A key tenet of the SECreTOUR approach is that tourism can be a tool used for the benefit of local communities. This talk examines how co-created local trails, built on top of the original community historic graveyard surveys can develop into a national tourism resource providing heritage information to residents and tourists alike whilst also gathering previously untapped tourism intelligence. Just as the community groups have co-ownership of the heritage survey datasets, they also become co-owners of the associated tourism intelligence.

The methodology being researched combines rich and deep geolocated genealogical datasets with simple, low-cost, parish level heritage trails which, using dynamic QR codes, gather anonymised tourism intelligence as well as providing a means for building potential conversations between visitors and the local communities. This talk will cover pilot research in West Waterford.

Interested or Just Curious? Irish Graveyards: From Community-led Heritage Projects to Community-led Tourism Experiences

Maurizio Toscano
Eachtra Archaeological Projects, Ireland

14:30-14:45

This contribution explores the evolution of the Historic Graves project, a community-driven initiative that began over a decade ago. Initially founded by a small group of archaeologists working with two primary stakeholder groups—local Irish communities connected to graveyards by proximity and members of the Irish diaspora linked to graves by genealogical ties—the project sought to document and preserve the cultural heritage of historic graveyards in Ireland through digital technology. By empowering local communities to survey, map, and share information on gravestone inscriptions and cemetery histories, the Historic Graves project became a recognised genealogical and educational resource.

Over time, the project gradually developed into a significant tourism resource, creating a geolocated genealogical dataset that identifies ancestral origins across Ireland. This has encouraged diasporic tourists to visit specific places associated with their family histories, enhancing their connection to Irish heritage while fostering a deeper sense of place and identity for local community members.

In recent years, European-funded innovations actions transformed this resource into a more structured tourism product, with online destination microsites and onsite trails. Local community volunteers now play an active role, both in creating Points of Interest (POI) booklets and in guiding tourists, and in curating the content offered by the destination module, offering a participatory heritage experience.

A significant aspect of the project's success lies in its model of engagement, which resembles a narrowing pyramid form: a broad base of "curious" users exploring the surface of the content offered (being that the online platform or the printed booklets), a smaller segment of "interested" users, registering online or scanning QR codes to explore additional content, and a dedicated few who could become "true fans", who actively participate in heritage documentation and support. This model underscores the project's unique ability to engage and deepen connections with cultural heritage across various levels of interest and involvement.

The Evolving Concept of Authenticity in Heritage & Cultural Tourism

Anna Vichnevetskaia[1], Y. Wang[1], Y. Li[1], N. Webb[2]
[1]Xi'an Jiaotong-Liverpool University, Suzhou, China, [2]University of Liverpool, Liverpool, The United Kingdom

14:45-15:00

This study explores the impact of Extended Reality (XR) technologies on cultural heritage tourism, focusing on their capacity to enhance authenticity and visitor engagement. The notion of authenticity remains a contentious issue in heritage conservation and cultural tourism studies. Interpretations of what constitutes 'authentic' span a broad spectrum. At one end of this spectrum lies the view of authenticity being enshrined in the originality of an object. This perspective emphasizes the material originality of artefacts and sites, placing value on tangible, verifiable attributes. It aligns closely with conventional conservation practices that prioritize the preservation of physical integrity. In contrast, more recent constructivist and post-modernist approaches have shifted the focus to socially constructed and even entirely subjective experiences of authenticity. These interpretations recognize authenticity as a social or deeply personal phenomenon, acknowledging that perceptions of what is 'real' or 'genuine' can vary significantly among different observers or participants.

The introduction of digital technologies into this landscape has further complicated and expanded our understanding of authenticity. As tourism settings increasingly engage Augmented and Virtual Reality (AR/VR) applications, it is crucial to unravel how these digital innovations influence perceptions of authenticity and shape cultural experiences. This research addresses a significant gap in the literature by examining the complex interplay between XR technologies, evolving concepts of authenticity, and cultural tourism experiences. It looks at how XR can bridge traditional object-based authenticity with more contemporary, experiential interpretations, potentially enhancing both dimensions. Through a series of case studies, we demonstrate XR's unique ability to reveal hidden historical narratives,

reconstruct past environments, and facilitate interaction with inaccessible artefacts. These experiences help visitors connect to heritage sites on a deeper level while allowing us an expanded understanding of authenticity in the digital age. This research advances our understanding of how innovative technologies can create more authentic, meaningful, and engaging heritage experiences in an increasingly digital world.

Multidimensional Approach Fostering Sustainable Tourism Growth in Rural & Remote Regions

Evdoxia Eirini Lithoxoidou[1], Stelios Krinidis[1,2], Polyvios Raxis[3], Dimosthenis Ioannidis[1]& Dimitrios Tzovaras[1]
[1]Centre for Research and Technology Hellas, Greece, [2]Democritus University of Thrace, Greece, [3]Atlantis Research

15:00-15:15

The TOURAL project aims to revitalize rural and remote regions in Europe through sustainable and creative tourism development, emphasizing local community engagement, innovative business models, and new job opportunities. By prioritizing rural and remote areas, the project seeks to create a balanced approach between urban tourism hubs and underdeveloped rural communities. Through a multidimensional model, TOURAL will address diverse tourism niches—underwater cultural and nature heritage, cultural and creative tourism, cultural science tourism, and silver tourism (UCCST). This integrated approach aims to leverage a range of value-chains and collaborations with local stakeholders, fostering cross-border and macro-regional synergies.

TOURAL's framework emphasizes inclusivity and participation. Local communities and stakeholders will co-design policy pathways, collaboratively developing tourism offerings, services, and business models to foster the unique regional strengths. This participatory approach aims to ensure that tourism initiatives will resonate with community interests while promoting sustainable economic growth. The strategic dimension of TOURAL involves assessing barriers and sustainability, establishing action plans, and testing concepts through small-scale implementations that are validated with stakeholders' feedback.

Furthermore, TOURAL is emphasizing policy innovation, supporting updates to Smart Specialization Strategies (S3) using a bottom-up approach. Capacity building is central, with workshops and training sessions aimed at upskilling the local workforce, addressing community needs, and managing potential conflicts. In terms of business planning, the project envisions multi-destination, diversified tourism packages that will support the project's smart UCCST goals.

Finally, through its work in the business financing front, TOURAL will offer a one-stop-shop for partnerships, mentoring, and funding, creating a stable foundation for regional tourism value chains to flourish. This comprehensive approach plans to empower rural regions to become attractive, sustainable tourism destinations, unlocking new economic opportunities and enhancing the quality of life for local communities.

Building an Enhanced Visitor Experience Though Cultural Memory: eFikardou

Elena Karittevli
Cyprus University of Technology, Cyprus

15:15-15:30

This paper focusses on the case study of Fikardou Village (Cyprus), a UNESCO World Heritage Tentative List monument, highlighting its unique cultural value by referencing historical evidence identified during our research. Our contribution investigates Fikardou's cultural offerings by presenting and analysing the major outcomes of three H2020 EU-funded projects (TExTOUR, MNEMOSYNE, IMPACTOUR) that include Fikardou as a major component in their research programme. By elaborating on selected successful outputs such as policy interventions, new cultural tourism trends, advances in visitor management systems, and new business and/or governance models that arise from this specific case study, we argue for the advances that have been achieved in the cultural tourism sector in Cyprus, as exemplified through the experience of Fikardou Village as a developing cultural tourist destination exploring and embracing digital technology as a force multiplier in achieving its aims.

Crafting Landscapes

Llara Fuente Corripio[1] & Sharon Pisani[2]
[1]The University of Oviedo, Spain, [2]University of St Andrews, The United Kingdom

16:00-16:15

How can the integration of crafts and interpretative tourism enhance the understanding and preservation of cultural landscapes, fostering sustainable territorial development?

In recent decades, the concept of heritage has significantly expanded beyond monuments to include intangible elements, the surrounding environment, and the intrinsic connection of local communities. This broader perspective has given rise to the notion of cultural landscapes, defined by UNESCO as "combined works of nature and of man" expressing a long and intimate relationship between people and their environment. Along ide these shifts, the tertiarization of economies and a renewed interest in rural areas have positioned tourism as a pivotal tool for territorial development. Within this context, crafts hold untapped potential for fostering a holistic vision of culture. Crafts are dynamic processes embodying the knowledge, skills, and cultural expressions of communities. Deeply intertwined with their originating landscapes, they reflect the availability of natural resources, climatic conditions, and historical land-use practices. Preserving both crafts and landscapes is essential, as each sustains the other.

Landscapes, often central to tourism campaigns and a "pull factor" for travellers, are frequently shaped by centuries of human activity. However, the decline of practices such as farming or livestock keeping threatens to erase these landscapes and the knowledge they embody. Tourism initiatives cantered on craftsmanship provide immersive experiences, allowing visitors to engage with its creation and understand its significance. Interpretative tours focusing on the interplay between human activity and the environment address this issue, offering insights through rich storytelling that combines historical facts and anthropological narratives. By connecting visitors to local traditions and heritage, these tours create a holistic understanding of cultural landscapes. Additionally, technologies like VR and mobile apps recreate immersive environments, enabling tourists to appreciate the complex relationships between natural surroundings and cultural practices. This approach enriches visitor experiences while promoting sustainable tourism that preserves these essential landscapes.

Be-Cultour Project: A Co-creation Experience on Circular & Sustainable Tourism in Algarve, Portugal

Daniela Toledano[1], Paula Gomes da Silva[1,2], Desidério Batista[1,3] & Manuela Guerreiro[1,4]
[1]University of Algarve, Portugal, [2]Linking Landscape, Environment, Agriculture and Food (LEAF), Portugal, [3]Center for Art History and Artistic Research (CHAIA), Portugal, [4]Research Centre for Tourism, Sustainability and Well-being (CinTurs), Portugal

16:15-16:30

In 2021, the University of Algarve/Algarvensis Geopark was selected to join the Be.Cultour project community as a mirror innovation ecosystem. Be.Cultour project, which took place between 2021 and 2024, had as it main goal the transformation of cultural heritage, particularly in remote and economically depressed areas, into a catalyst for social and economic growth, through the implementation of innovative, circular, human-centred tourism. The consortium brought together a network of actors to co-create tools and solutions to enhance cultural heritage while empowering local communities to develop sustainable and innovative tourism solutions.

To achieved the objectives Be.Cultour created a community, consisting of 6 pilot heritage ecosystems and 16 mirror innovation ecosystems that worked in a peer learning system that included knowledge transfer, namely: methodologies, tools and practices.

The aim of this article is to report on the experience of Geopark Algarvensis as a mirror ecosystem throughout the duration of the project, especially through the peer learning events and the toolkit resources.

Algarvensis Geopark covers an area of 2428 km2, of which 1585 km2 are terrestrial and contain an important geological heritage, as well as natural and cultural heritage. A significant part of this territory, to the north, are unpopulated, economically impoverished rural areas with poor connections to the south coast.

The framework provided by the Be.Cultour project made it possible to systematise information and collect new data on potential natural and cultural resources for sustainable and circular tourism, to identify opportunities and stakeholders among local people, non-governmental organisations,

economic operators and local and regional authorities. It was also an opportunity to design a pilot project for circular tourism through sensory experience, with an ecopolicentric character, capable of revitalizing the villages, promoting the enhancement of natural and cultural heritage, the permanence of the local population and attracting new residents and economic activities.

Barbora route: Cultural Pilgrimage Tourism as a Catalyst for Sustainable Development in Central Slovakia

Darina Rojíková, Kamila Borseková & Alexandra Bitušíková
Matej Bel University in Banská Bystrica, Slovakia

16:30-16:45

The territory Central Slovakia was once among the wealthiest and most developed regions of the former Kingdom of Hungary and Europe, primarily due to its extensive mining activities. Historically rich in social, economic, and technological development, the region now faces challenges rooted in two primary issues: the insufficient development of rural areas, particularly in villages further from urban centres, and the unsustainable growth of urban tourism. Pilgrimage tourism appears to offer a promising approach to addressing both of these issues, especially considering the existence of the Barbora Cultural Pilgrimage Route. The Barbora route connects historically significant mining locations and showcases the region's tangible, intangible, and industrial heritage, including natural beauty and sites related to historical copper, gold, and silver mining in the mountains of what was then Upper Hungary.

This paper examines the Barbora Cultural Pilgrimage Route as a potential catalyst for the sustainable development of Central Slovakia. In addition to detailed information about the Barbora Route, the paper also compiles extensive statistical data on the municipalities along the route, including socio-economic and demographic profiles, as well as business statistics. This data offers a comprehensive view of the area's overall profile and potential, includes strengths and weaknesses. Through a comprehensive overview of the Barbora Route, this paper explores its potential to stimulate balanced regional development and sustainable tourism model across Central Slovakia.

Paper Sessions

Time	Paper Title & Speaker
08:30-09:00	Registration
09:00-09:30	Saving Cultural Property in Armed Conflict: The Work of The Blue Shield *Peter Stone, UNESCO Chair in Cultural Property Protection & Peace at Newcastle University, Blue Shield International, The United Kingdom*
	Relocation
09:35-09:45	On the Digitisation & Fabrication Process of Three-Dimensional Items Manufactured in an Academic Educational Context Using 3D Scanning & 3D Printing Techniques *Antreas Kantaros, University of West Attica, Greece*
09:45-10:00	PaPeS: The Interdisciplinary Research Project on Painted reliquary Shrines in Belgium *Jeroen Reyniers, The Royal Institute for Cultural Heritage, Belgium*
10:00-10:10	Expert Knowledge Digitization: Safeguarding Construction Techniques as Intangible Heritage *Olga Rosignoli, Politecnico di Milano, Italy*
10:10-10:25	Technologies for Circular Renovations in Cultural Heritage Preservation with the DeCO2 Project *Giulia Viero, Institute for European Energy and Climate Policy, The Netherlands*
10:25-10:30	*Q&A Session: Physical & Digital Reproduction*
10:30-11:00	Coffee Break (30 minutes)
11:00-11:10	Assessing Wind and Fire Hazards in World Heritage Cities Using Digital Methods — A Case Study of Gu Rong Alley Historical District in Quanzhou City *Haoxi Chen, Taipei National University of the Arts, Taiwan*
11:10-11:20	An Analytical Framework for Knowledge Transfer in Saudi Arabia's Traditional Arts: The Apprenticeship Model *Ruba Abu Hasna, The Royal Institute of Traditional Arts, Saudi Arabia*
11:20-11:25	*Q&A Protection, Conservation & Preservation of Cultural Heritage*
11:25-11:35	Digital Reconstruction in the Neolithic Hypogeum *Jonathan Barbara*
11:35-11:45	Preserving History: The Wooden Shield Hand *Abdelmoniem Mohammed, Fayoum University, Egypt*
11:45-11:55	Digital Documentation of a Wooden Coffing Covered with a Layer of Black Resin & Coloured Materials from Egypt *Abdelmoniem Mohammed, Fayoum University, Egypt*
11:55-12:05	Visualizing Surface Details in a 3-Dimensional World *Moshe Caine, Hadassah Academic College Jerusalem, Israel*
12:05-12:15	Promoting Research & Innovation for Cultural Heritage in Cyprus through the CONNECTING Infrastructure Project *Argyro Argyrou, Cyprus University of Technology, Cuprus*
12:15-12:30	From Preservation to Engagement: Digital Strategies for Cultural Heritage Institutions *Béatrice Gauvain, Universität Basel, Switzerland*
12:30-12:45	Application of 3D Laser Scanning for Digital Monitoring of Historical Walls *Wun-Bin Yang, China University of Technology, Taiwan*

12:45-12:55	A Digital Edition for the Book of Records of the Metropolitan See of Philippopolis: Approaches & Tools *Dimitar Iliev, Sofia University St. Kliment Ohridski, Bulgaria*
12:55-13:00	*Q&A Session: Cultural Heritage Documentation and Restoration*
13:00-14:00	Lunch Break (60 minutes)
14:00-14:10	The Lost Brutalist Narratives: Re-creating Modernist Architectural Meaning Through Augmented Reality *Maria Sotomayor, University of Cologne, Germany*
14:10-14:20	Interactive & Immersive City Exploration through Augmented Reality *Christian Weber, University of Basel, Switzerland*
14:20-14:30	Developing a Virtual Museum Experience of the Takht-i-Bahi World Heritage Site *Muhammad Tufail, The Hong Kong Polytechnic University, Hong Kong*
14:30-14:40	Development of Samarkand Afrasiab Palace Mural XR Content Based on Silk Road GPT *Jin-ho Park, Korea University, South Korea*
14:50-15:00	Development of Samarkand Afrasiab Palace Mural XR Content *Jin-ho Park, Korea University, South Korea*
15:00-15:10	VR prototype for Cultural Heritage Presentation: Old Bosnian Town of Dubrovnik and Kopošići Stećak Necropolis *Zlatan Filipovic American University of Sharjah, The United Arab Emirates*
15:10-15:20	Intangible Cultural Heritage, Digital Reconstructions & Augmented Reality: Using Motion Capture to Add Immaterial Context to AR–simulation of a Historical Event (the Assassination of Julius Caesar) *Gunnar Liestøl, University of Oslo, Norway*
15:20-15:30	Galiverso: A Virtual Immersion in Galician Heritage *Fátima María García Doval, Universidades y Formación Profesional. Xunta de Galicia, Spain*
15:30-16:00	Coffee Break (30 minutes)
16:00-16:10	Comparison of Different Deep Neural Networks Models in the Cultural Heritage Domain *Teodor Boyadzhiev, Bulgarian Academy of Sciences, Bulgaria*
16:10-16:25	Reflecting on the Concept of Similarity in Digital Cultural Heritage Domains *Carolina Islas Sedano, University of Turku, Finland*
16:25-16:30	*Q&A Session: AI in Cultural Heritage*
16:30-16:40	Enhancing Cultural Heritage with Ontology-Driven Data Integration *Maria Iosif, Catalink Ltd, Cyprus*
16:40-16:50	Mapping of National & Sectorial Repositories Handling 3D Data *Sander Münster, Friedrich Schiller Universität Jena, Germany,*
16:50-17:00	The Convergence of Tangible and Intangible Heritage in Augmented and Virtual Reality Platforms *Delas Santano. Sunway University, Malaysia*
17:00-17:10	Digital Technologies Transforming Learning & Education in the Museum Context: A Visual Map for Visitor Experience in Heritage *Fotis Kitsios, University of Macedonia, Greece*
17:10-17:20	Q&A Session: AI in Cultural Heritage
17:25-17:45	All participants: Discussion & Brain Storming Session
17:45-18:00	Closing Comments

Abstracts

Session: Reproduction Physical and Digital

On the Digitisation & Fabrication Process of Three-Dimensional Items Manufactured in an Academic Educational Context Using 3D Scanning & 3D Printing Techniques

Antreas Kantaros[1], Evangelos Soulis[1], Konstantinos Brachos[1]Theodore Ganetsos[1], Maja Delibašić[2] & Balsa Gobovic[2]
[1]University of West Attica, Greece, [2]Mediterranean University Podgorica, Montenegro

09:35-09:45

This paper explores the digitization and fabrication processes of pre-existing three-dimensional objects within an academic context by employing advanced 3D scanning and 3D printing techniques. Two specific items, created by undergraduate students at the Mediterranean University of Podgorica, Montenegro were digitized and replicated. The first item, a wooden and glass memorabilia logo of the IT Faculty and the second, a miniature wooden chair from the Faculty of Visual Arts served as case studies for this work. A portable handheld 3D scanner employing structured light emission technology was used to capture detailed scans of the aforementioned objects. The resulting digital models were then fabricated using FFF and SLA 3D printing techniques. This study discusses the technical challenges encountered during 3D scanning and 3D printing, including the use of chalk spray to enhance the scan accuracy of transparent and reflective surfaces. The findings demonstrate the potential of integrating 3D scanning and printing in educational projects and providing students with hands on experience in modern fabrication methods while contributing to the preservation and accessibility of cultural heritage artefacts.


PaReS. The Interdisciplinary Research Project on Painted Reliquary Shrines in Belgium

Jeroen Reyniers[1], Arnaud Schenkel[2], Henry-Louis Guillaume[2], Valentine Henderiks[2], Koen Janssens[3] & Lowie Vercruysse[3]
[1]Royal Institute for Cultural Heritage, Belgium, [2]Université libre de Bruxelles, Belgium, [3]University of Antwerp, Belgium

09:45-10:00

In May 2023, the project PaReS - Painted Relic Shrines in Situ (https://pares.kikirpa.be) has started. It is a collaboration between the Royal Institute for Cultural Heritage (KIK-IRPA), the Université libre de Bruxelles and the University of Antwerp in Belgium. This project focuses on fragile wooden painted reliquaries still to be found in Belgian churches and dating from before 1566. These churches are often permanently closed and what hinders the accessibility and appreciation of the objects. With the project, we are trying to bring these hidden gems back into the spotlight by digitally unlocking them and studying them with material-technical research.

An important element within the project is the 3D digital recordings of the reliquaries. This method is versatile and offers great potential in terms of documentation and (art-historical) research. Not only does this make it easier to study the object digitally from a distance, it also avoids the many manipulations of the object (in the future) (protection of cultural heritage).

Moreover, it constitutes an important time capsule that can be used as a benchmark in time and used in the future to evaluate the objects' conservation condition. The study is not only interesting for merely documenting the existing structure. By using polarisation filters, certain details and structures come to light that are not visible to the naked eye. Within the project, we have managed to work out a methodology for fast processing of the footage. The new footage will also be used for a tourism exclusion from 2026.

The lecture discusses on the methodology, the context and the useful contribution in function of the study and preservation of less accessible but valuable cultural heritage.

Expert Knowledge Digitization: Safeguarding Construction Techniques as Intangible Heritage

Olga Rosignoli
Politecnico di Milano, Italy

10:00-10:10

To safeguard and valorise cultural heritage, translating expert knowledge into accessible formats is essential; in the built environment field, accurate knowledge about construction techniques and crafts allows the correct conservation and functioning of buildings. In this context Historic Building Information Modelling (HBIM) systems offer a powerful platform to integrate this type of knowledge, transforming it from isolated or obscure information into more accessible digital resources. In this work, expertise recovered from published materials of specialists in architecture, conservation, and historical analysis significantly enriches HBIM content, presenting and preserving information crucial to the sustainable management of the assets.

Technologies for Circular Renovations in Cultural Heritage Preservation within the DeCO2 Project

Filippos Anagnostopoulos[1], Giulia Viero[1], Joan Romero[2], Andrea Jany[3], Eleni Kolovou[4] & Anastasios Karameros[4]
[1]Institute for European Energy and Climate Policy, The Netherlands, [2]Valencia Institute of Building, Spain, [3]University of Graz, Austria, [4]PricewaterhouseCoopers Business Solutions SA, Greece

10:10-10:25

This paper explores the integration of Building Information Modelling and Digital Twin technologies within a circular renovation ecosystem, focusing on the DeCO2 project's demonstration site in Castellón, Spain. The paper presents efforts to disrupt the conventional linear material life cycle in the construction sector through the establishment of sustainable and innovative practices and local ecosystems to bridge the gap design-to-market, in the renovation of cultural heritage buildings, by leveraging advanced tools such as Digital Twins and robotic fabrication and other advanced within regulatory sandboxes. The paper discusses how the DeCO2 project aims to enhance the preservation, restoration, and long-term management of cultural heritage sites while addressing modern challenges of retrofits for circularity targeting construction and demolition waste including regulatory barriers.

Session: Protection, Conservation and Preservation of Cultural Heritage

Assessing Wind and Fire Hazards in World Heritage Cities Using Digital Methods — A Case Study of Gu Rong Alley Historical District in Quanzhou City

Haoxi Chen[1], Chunhan Chien[2], Wenlin Liu[3] & Alex Yaning Yen[4]
[1]Taipei National University of the Arts, Taiwan, [2]China University of Technology, Taiwan, [3]Tamkang University, Taiwan, [4]University of Science and Technology of China, Taiwan

11:00-11:10

Historic districts are often preserved as carriers of urban history. The historic districts of Quanzhou generally feature wooden or brick-wood structures. Given the narrow existing fire separation distances, changes in the spatial layout of historic districts can alter the wind environment, which in turn has a significant impact on fire spread. Therefore, the objective of this study is to investigate the factors influencing fire spread in historic districts and their correlations, and to propose improvement suggestions for these factors.

This study employs the methods of literature review, field surveys, and simulation analysis. First, the contradictions and mitigation conditions in current fire prevention regulations for historic districts are explored through literature review. Then, Gu Rong Alley is selected as a case study, and simulation data from before and after the 2018 improvements are compared with real-world data collected in the winter and summer of 2024. It was found that after the improvements, wind speeds increased in some outdoor areas, with wind speeds reaching 3.75 m/s, which could increase the likelihood of fire spread. Additionally, some areas had wind speeds below 0.94 m/s, which may indicate potential zones for smoke accumulation during a fire.

The study draws two conclusions regarding Gu Rong Alley: Spatial improvements in Gu Rong Alley have accelerated wind speeds in some areas and Improvement suggestions for fire spread prevention and control based on the wind environment.

An Analytical Framework for Knowledge Transfer in Saudi Arabia's Traditional Arts: The Apprenticeship Model

Ruba Abu Hasna
Royal Institute of Traditional Arts, Saudi Arabia

11:10-11:20

The preservation of traditional arts is vital for safeguarding cultural heritage, particularly in rapidly modernizing societies like Saudi Arabia. Traditional crafts are at risk of disappearing as younger generations shift towards modern professions. UNESCO (2003) emphasizes that safeguarding intangible cultural heritage, including traditional crafts, relies heavily on effective knowledge transfer mechanisms like apprenticeships, as apprenticeship pro-grams facilitate the transfer of skills between master artisans and apprentices. This study explores various global apprenticeship models to evaluate their adaptability to the Saudi context through a comparative analysis of key components, such as model structure, educational frameworks, government involvement, and the balance between theoretical and practical training. This study aims to propose a tailored apprenticeship model for Saudi Arabia by aligning traditional knowledge transfer mechanisms with contemporary market needs with the goal to enhance the sustainability and relevance of Saudi Arabia's rich traditional arts heritage, ensuring their preservation for future generations.

Session: Cultural Heritage Documentation and Restoration

Digital Reconstruction in the Neolithic Hypogeum

Jonathan Barbara
Saint Martin's Institute of Higher Education, Malta

11:25-11:35

The use of digital replicas of heritage sites allows for reconstructive archaeology helping to visualize what spaces looked like in the past. Building upon previous research in virtual representation of a Neolithic hypogeum and based on tool mark analysis, this paper reports on a digital reconstruction of walls and corridors to help archaeologists visualize and feel what the space could have offered in terms of structure and layout. A further contribution is the visualization of a geological study that identified fault lines running along the complex. Evaluation is qualitative in terms of feedback from one of the senior curators of the site and authors of the tool mark study.

Preserving History: The Wooden Shield Hand

Abdelmoniem Mohammed
Fayoum University, Egypt

11:35-11:45

The purpose of this paper is to document the documentation, examination, analysis, and restoration process of a wooden shield hand at the National Military Museum. The restoration process began with the careful documentation of the shield hand, including its dimensions, materials, and any visible damage or deterioration. This documentation was imperative for gaining a thorough understanding of the shield hand's condition and identifying potential areas of concern. Additionally, photographic documentation was carried out before, during, and after the restoration process. This allowed for a comprehensive visual record of the shield hand's transformation and provided valuable documentation for future reference. Furthermore, AutoCAD was utilized for detailed documentation and measurements of the shield hand. Diagnosing the manifestations of damage in the wooden shield hand and identifying their causes was a crucial step in the restoration process. This was achieved through meticulous examination and analysis of the shield hand, considering factors such as environmental conditions, handling practices, and previous restoration attempts. Species identification of the wooden shield hand was also conducted, as it is a crucial step in the diagnostic process. Species identification is important not only for understanding the physical and mechanical properties of the wooden object but also for gathering historical information about ancient trade.

Digital Documentation of a Wooden Coffin Covered with a Layer of Black Resin & Coloured Materials from Egypt

Abdelmoniem Mohammed
Fayoum University, Egypt

11:45-11:55

This paper focuses on different documentation methods of a wooden coffin covered with a layer of black resin and colored materials using a different technique to provide necessary information for suitable future conservation works. the coffin covered with a layer of black resin and colored materials from outside, and the coffin suffered from many separations and cracking on the base, and some parts were completed in the previous restoration, such as the use of linen and sponge in the strengthening and support. The lid was broken, as well as missing parts of this lid, resulting from bad storage inside the storerooms of the Dahshur archaeological area.

Photographic documentation, Technical photography (TP), 2D illustrations, and 3D modules were made to document the coffin. Photographic documentation was used to document the current state of the coffin and document aspects of damage, and the images were used in two-dimensional and three-dimensional documentation. j-sesh program was used for Documenting hieroglyphic texts. Technical images were acquired by using a modified digital camera for documentation and determine the area of the previous restoration, Adobe Illustrator was used to highlighting the decoration of the black resin layer on the base of the coffin from outside. Agisoft PhotoScan program was used for photogrammetric documentation to make a 3D model of images

Visualizing Surface Details in a 3-Dimensional World

Moshe Caine[1], Sharon Tager[2] & Doron Altaratz[1]
[1]Hadassah Academic College Jerusalem, Israel, [2]Israel Museum Jerusalem, Israel

11:55-12:05

This paper focuses on the challenges and advancements in capturing and imaging delicate surface details and texture information in three-dimensional cultural heritage objects using volumetric imaging. The complexity of documenting 3D artefacts arises from preserving their integrity while ensuring detailed and accurate visualization. Techniques such as Photogrammetry, 3D scanning, LiDAR, NeRF, and Gaussian splatting are discussed for their roles in capturing full 3D scenes or simulating space. These methods help overcome the limitations of interacting with fragile heritage objects by providing non-invasive solutions. Each technique's purpose, presentation platform, and cost influence its application. While a significant emphasis is placed here on the importance of choosing the right techniques for the task, the paper also highlights the advantages inherent in the combination of various imaging techniques, in cases where just a single one is limited. All these and more involve close collaboration between the imaging and the heritage specialists, essential in understanding the needs and limitations of each other

Promoting Research & Innovation for Cultural Heritage in Cyprus through the CONNECTING Infrastructure Project

Argyro Argyrou, Athos Agapiou, Elias Gravanis, Stylianos Hadjipetrou, Giorgos L. Kafataris, Nicholas Kyriakides, Phaedon Kyriakidis, Vasiliki Lysandrou, Kyriacos M. Michaelides, Apostolos Papakonstantinou, Dimitrios Skarlatos, Marinos Vlachos & Renos Votsis
Cyprus University of Technology, Cyprus

12:05-12:15

The "Research and Innovation Knowledge Centre for Engineering in Heritage" project, in short CONNECTING, aims to establish a knowledge centre equipped with advanced sensors and platforms such as Vertical Take-off and Landing (VTOL) drones, cameras, LiDAR systems, laser scanners, and various other sensors to support research on cultural heritage sites and monuments, both on land and underwater. The knowledge centre will be a hub for supporting local research in Cyprus dealing with cultural heritage. The project brings together a multidisciplinary team involving experts from geomatics, civil engineers, Information, Communication and Technology (ICT)experts, archaeologists, and heritage managers. This collaborative effort will enable selecting appropriate methods, techniques, and tools to support heritage sites, management, and preservation. The project will also develop a cloud Data Centre to store and share evidence, results, services, and products. This paper serves as an introduction to the scope and objectives of the project while outlining the infrastructure expected to be acquired and hosted at the Cyprus University of Technology premises.

From Preservation to Engagement: Digital Strategies for Cultural Heritage Institutions

Béatrice Gauvain & Christian Weber
Universität Basel, Switzerland

12:15-12:30

The digital revolution has profoundly influenced cultural heritage institutions, reshaping how collections are preserved, accessed, and engaged with by global audiences. This paper delves into the pivotal role of digital strategies in cultural heritage, advocating for their implementation as catalysts for transformation from passive preservation to dynamic community engagement. By examining successful case studies and addressing challenges and opportunities, this study underscores the benefits of strategic digital integration. Key themes include enhancing accessibility, fostering inclusivity, and promoting sustainability within cultural heritage organizations. Emphasizing the alignment with institutional values and the International Council of Museums' principles, the paper offers practical insights and recommendations for developing and implementing effective digital strategies. Ultimately, it argues that embracing the digital realm is essential for cultural heritage institutions to adapt, thrive, and meaningfully connect with diverse audiences in the contemporary landscape.

Application of 3D Laser Scanning for Digital Monitoring of Historical Walls

Wun-Bin Yang & Ya-Ning Yen
China University of Technology, Taiwan

12:30-12:45

ICOMOS has announced the theme for the International Day for Monuments and Sites on April 18, 2024, as "Disasters & Conflicts Through the Lens of the Venice Charter". This aims to re-evaluate the Venice Charter in the context of current challenges, particularly Article 16 which states, ""In all works of preservation, restoration or excavation, there should always be precise documentation in the form of analytical and critical reports...

The 2023 ICOMOS General Assembly noted that the digital realm has become crucial for global information sharing and social connections. It also acknowledged new virtual methods for creating, documenting, exhibiting, and experiencing heritage, recognizing the importance of digital technologies in cultural heritage preservation.

This study uses the wall of the Taipei Guest House, a national monument in Taiwan, as an example. During the underground passage construction near the wall, 3D laser scanning and monitoring systems were employed to digitally preserve and monitor the wall before, during, and after construction. The results show that throughout the construction process, the wall's monitoring values remained within safe limits. This underscores the importance of protective measures and monitoring before construction begins. By utilizing digital recording and maintenance, the goal of sustainability can be achieved.

A Digital Edition for the Book of Records of the Metropolitan See of Philippopolis: Approaches & Tools

Dimitar Iliev & Kristiyan Simeonov
Sofia University St. Kliment Ohridski, Bulgaria

12:45-12:55

The paper describes the work on the digital edition of the Codex of records of the Metropolitan See of Philippopolis (Plovdiv) for the period 1794-1856. The Greek text of the handwritten codex is read and transcribed, translated into Bulgarian, provided with a commentary and then annotated in XML. For the purposes of the annotation, we use our custom-built lightweight annotation tool. A digital publication platform based on our own AIAX front-end tool is used to visualize the annotated text.

Session: Cross Realities for Cultural Heritage (AR/XR/VR/ Virtual Worlds)

The Lost Brutalist Narratives: Re-creating Modernist Architectural Meaning Through Augmented Reality

Maria Sotomayor Chicote & Øyvind Eide
University of Cologne, Germany

14:00-14:10

The architectural history of the University of Cologne offers a unique in-sight into Brutalism and its cultural significance. However, the cultural and historical narratives embedded in the architectural landscape and concrete buildings of the campus are difficult to recognize because their architectural expressiveness and the interconnections between the different buildings have been obfuscated by later changes and poor maintenance.

This paper examines how the application of Augmented Reality (AR) and Virtual Reality (VR) technologies, through the Virtual Campus project of the University of Cologne, helps to emphasize their historical and architectural value, by enhancing the accessibility and engagement of these historical narratives.

The integration of geospatial information, 3D modelling and semantic web technologies to create AR historical tours is analysed. In addition, the use of CIDOC-CRM and its extensions, especially CRMact, is also presented as a way to ensure the integration and reusability of data. This contributes to the sustainable development of the digital infrastructure of the University of Cologne and, more generally, digital cultural heritage.

Interactive & Immersive City Exploration through Augmented Reality

Christian Weber, Béatrice Gauvain, Marian Clemens Manz &, Peter Fornaro
University of Basel, Switzerland

14:10-14:20

Zyytgeflüster Basel is an innovative augmented reality project designed to revolutionize city exploration by immersing users in the historical and cultural heritage of Basel. By overlaying real-time historical and cultural in-formation onto the physical environment, the project aims to create an en-gaging and interactive user experience. This paper outlines the project's development process, details the proposed technological implementation, and discusses the planned scientific evaluation to assess its impact on user engagement and appreciation of heritage. The ultimate goal is to provide a dynamic and accessible way to experience Basel's rich history, thereby enhancing both educational and tourism experiences.

Developing a Virtual Museum Experience of the Takht-i-Bahi World Heritage Site

Muhammad Tufail[1], Jinho Park[2] & Deukyoum Cheon[3]
[1]The Hong Kong Polytechnic University, Hong Kong, [2]Korea University, South Korea, [3]Chonnam National University, South Korea

14:20-14:30

Takht-i-Bahi is a globally significant world heritage site because of its artistic representation of Greco-Buddhism. In addition to its cultural and historical significance, the site is at risk of extinction due to human-induced threats, including negligence, unsustainable tourism practices, and natural disasters such as earth-quakes, floods, and landslides. We decided to digitally document the site and develop its extended reality (XR) content, enabling digital reconstruction and dissemination. This would allow for an accurate representation and experience of the site in a three-dimensional virtual environment, as well as expanding its global audience. We first digitally captured the entire site and then used virtual reality (VR) in conjunction with XR content creation to turn it into a museum's immersive content experience. We used a drone camera to digitally record the entire site, then combined VR and XR content creation to transform the Takht-i-Bahi heritage site's digital data into an immersive virtual museum content experience. We hope that this will enable potential visitors to actively engage in a VR environment, allowing them to fully immerse themselves in a realistic experience of time and space travel, with the visual representation accurately portraying real-world scenarios of the Takht-i-Bahi heritage site. By incorporating XR content creation, the virtual museum will effectively overcome the typical challenges faced during physical visits, and the site's immersive content experience can lead to sustainable outcomes, such as reducing the number of tourists visiting the physical site and increasing its cultural and historical value on a global scale.

Development of Samarkand Afrasiab Palace Mural XR Content Based on Silk Road GPT

Jin-ho Park[1], Hyoung Ki Ahn[1], Young-hoon Cha[2], Sang Kye Park[3], Gi Hong Kim[4] & Muhammad Tufail[5]
[1]Korea University, South Korea, [2]Seasion, South Korea, [3]AI Media, South Korea, [4]Korea National University of Heritage, South Korea, [5]The Hong Kong Polytechnic University, Hong Kong

14:30-14:40

The Silk Road was a crossroads of civilization, connecting the East and West in ancient times. Numerous historical sites and records related to the Silk Road remain to this day. Silk Road GPT aims to create a dedicated GPT model for the Silk Road by building a vast database of such historical data. Based on this, it will be applied to the Afrasiab Palace murals in Samarkand, Uzbekistan, a UNESCO World Cultural Heritage site. Utilizing the Samarkand Afrasiab GPT, various content related to the Afrasiab murals, such as VR, AR, and XR, can be effectively produced.

Development of Samarkand Afrasiab Palace Mural XR Content

Jin-ho Park[1], Gi Hong Kim[2], Sang Kye Park[3] & Muhammad Tufail[4]
[1]Korea University, South Korea, [2]Korea National University of Heritage, South Korea, [3]Korea National University of Heritage, South Korea, [4]The Hong Kong Polytechnic University, Hong Kong

14:50-15:00

Recent advancements in digital technology have led to an increase in digital con-tent utilizing cutting-edge technology for museum artefact exhibitions, with ongoing efforts to enhance visitor experiences. As part of an ODA (Official Development Assistance) project, the Korean Cultural Heritage Administration has collaborated with the Ministry of Culture of Uzbekistan, focusing on the 'Afrasiab Palace Mural,' a Silk Road mural discovered in 1965 at the Afrasiab archaeological site in Samarkand, Uzbekistan. This mural depicts a Korean diplomatic mission from the Korean Peninsula in the 7th century, which has garnered continuous social interest and has even been included in South Korean high school text-books. Since 2009, various digital restorations and content developments related to the Afrasiab mural have been ongoing, with continuous production of digital content. This paper analyses the evolution of digital content related to the Afrasiab mural over the past 14 years (2009-2023). Through this analysis, it aims to address the shortcomings in exhibition content and proposes artificial convergence digital content that combines virtual production and AI-powered digital humans utilizing the latest technologies to enhance visitors' exhibition experiences. By presenting the potential for strengthened interaction through artificial con-vergence technology and improving immersion, this study aims to suggest the direction for next-generation digital content in the future.


VR prototype for Cultural Heritage Presentation: Old Bosnian Town of Dubrovnik and Kopošići Stećak Necropolis

Zlatan Filipovic
American University of Sharjah, The United Arab Emirates

15:00-15:10

The Virtual Center for Cultural Heritage Presentation focuses on showcasing artefacts from the Old Bosnian Town of Dubrovnik (Sarajevo Canton, Ilijaš and the Kopošići Stećak necropolis, utilizing modern Head-Mounted Display (HMD) technology. This virtual reality platform offers visitors a unique experience of exploring and studying this significant historical site (a National Monument of Bosnia and Herzegovina). The digital reconstruction of the necropolis allows users to investigate details of each Stećak and accompanying artefacts, while also enabling them to navigate the space in real time. The Virtual Center provides educational content that highlights the cultural significance of the Stećak, their history, and symbolism. Realistic graphics, narrative elements, and sound further enrich the overall experience. This innovative approach allows a wide audience, regardless of physical distance, to interactively experience and study the cultural heritage of this National Monument.

Intangible Cultural Heritage, Digital Reconstructions & Augmented Reality: Using Motion Capture to Add Immaterial Context to AR–simulation of a Historical Event (the Assassination of Julius Caesar)

Gunnar Liestøl[1], Šarūnas Ledas[2], Tor Østmoe[1] & Jack Edwardwick[1]
[1]University of Oslo, Norway, [2]Tag of Joy, Lithuania

15:10-15:20

Digital recording and documentation of existing intangible cultural heritage are well explored and conducted. The intangible of the bygone and ancient, on the other hand, tends to be more often ignored. There are good reasons for this discrepancy: the urgency of capturing what is soon to be extinct, as opposed to the relative lack of knowledge regarding cultural practices of the past, both historic and archaic. The intangible cultural heritage of the distant past always involves some element of human action. Hence, in the research and development presented here we experiment with the use of Motion Capture as a valuable digital technique for the reconstruction of a historical event in ancient Rome: the assassination of Julius Caesar in Pompey's Curia. Drawing on written sources and archaeological evidence we describe the design of the indirect augmented reality simulation with attention to Motion Capture for animation of human behaviour and movement, graphical resolution, verbal selection, and genre adaptation. We also report on the feedback from testing and evaluation with visitors on location.


Galiverso: A Virtual Immersion in Galician Heritage

Fátima María García Doval[1], Maria Concepcion Fernandez Munin[1] & Miguel Angel Cajigal Vera[2]
[1]Universidades y Formación Profesional. Xunta de Galicia, Spain, [2]Fundación Cidade da Cultura, Spain

15:20-15:30

Galiverso is an initiative of the Xunta de Galicia that uses immersive technologies to show Galician tangible and intangible heritage in an engaging interactive way. Its development is based on the exploration of the possibilities of different digital and 3D technologies from the perspective of accessible culture. It is an ongoing project with a multitude of different experiences grouped in exhibitions. Its iterative approach has allowed, over the 20 months of its existence, to develop a unique style of presenting heritage both to local public and tourists, valued as a good practice in the heritage dissemination

Session: Artificial Intelligence and Cultural Heritage

Comparison of Different Deep Neural Networks Models in the Cultural Heritage Domain

Teodor Boyadzhiev[1], Gabriele Lagani[2], Luca Ciampi[2], Giuseppe Amato[2] & Krassimira Ivanova[1]
[1]Institute of Mathematics and Informatics, Bulgarian Academy of Sciences, Bulgaria, [2]Consiglio Nazionale delle Ricerche, Pisa, Italy

16:00-16:10

The integration of computer vision and deep learning is an essential part of documenting and preserving cultural heritage, as well as improving visitor experiences. In recent years, two deep learning paradigms have been established in the field of computer vision: convolutional neural networks and transformer architectures. The present study aims to make a comparative analysis of some representatives of these two techniques of their ability to transfer knowledge from generic dataset, such as ImageNet, to cultural heritage specific tasks. The results of testing examples of the architectures VGG, ResNet, DenseNet, Visual Transformer, Swin Transformer, and PoolFormer, showed that DenseNet is the best in terms of efficiency-computability ratio.

Reflecting on the Concept of Similarity in Digital Cultural Heritage Domains

Carolina Islas Sedano[1], Antero JÃ¤rvi[1], Luca Zeilioli[1], Chris Vastenhoud[2]
[1]University of Turku, Finland, [2]Musées Royaux d'Art et d'Histoire

16:10-16:25

In this paper we reflect on the current research of the similarity concept in digital cultural heritage artifacts when utilizing AI or ML tools. While much work is present in this area, there is not a systematic approach to guide researchers and practitioners in the understanding on how to tackle problems that rely on similarity in complex applications. We present this research as a position paper where we explore how the concept of similarity is presented in the literature, and we discuss a preliminary approach as a guidance to address similarity when utilizing AI or ML tools. We argue that similarity is a central and fundamental concept and it is often not designed thoroughly, instead it is implicitly defined by the chosen data, algorithms and validation methods. Without a careful reflection on how similarity will be used, we do not reach the potential of AI and ML tools, in the domain of digital cultural heritage, at its fullest.

Session: Ontologies, Standards and Guidelines for Cultural Heritage

Enhancing Cultural Heritage with Ontology-Driven Data Integration

Maria Iosif, Stelios Kontogiannis, Pavlos Kosmides & Konstantinos Avgerinakis
Catalink Ltd, Cyprus

16:30-16:40

The EU commission-funded MuseIT project aims to improve cultural heritage experiences by promoting social inclusion, democracy, and equality. Integrating ontologies with real-time sensory data to generate immersive and tailored user experiences is an important aspect of the project that is being explored. The results ensure accessible and engaging experiences for a range of end users by connecting cultural heritage assets with emotional and physiological inputs. This paper describes in high level the methodology employed from the ontology creation till the utilization of data within the knowledge graph.

Mapping of National & Sectorial Repositories Handling 3D Data

Sander Münster[1], Fiona Mowat[2] & Marco Medici[3]
[1]Friedrich Schiller Universität Jena, Germany, [2]Europeana Foundation, The Netherlands, [3]Inception, Italy

16:40-16:50

In recent years, many public infrastructures for storing, aggregating and viewing collections of 3D heritage models have been developed across Europe. The European Data Space for Cultural Heritage is proposed to aggregate heritage content from different these collections and, in particular, to increase the number of 3D data available in Europeana. However, there is a need to understand the current state of these repositories to effectively leverage them. As a prerequisite, this article

a) reviews published studies on users, objects and requirements related to 3D digital heritage repositories. To gain an up-to-date picture of existing repositories and their collections, we conducted

b) a desk survey of repositories already mapped and

c) an online survey to map additional collections. In total, 75 repositories from all over Europe and beyond were surveyed, holding a total of 26,000 3D assets. Our findings highlight the challenges and opportunities in aggregating 3D heritage data at a pan-European level and

d) recommendations for the further development of the European Cultural Heritage Data Space.

The Convergence of Tangible and Intangible Heritage in Augmented and Virtual Reality Platforms

Delas Santano[1], Human Esmaeili[2] & Harold Thwaites[3]
[1]Sunway University, Malaysia, [2]University of Staffordshire, The United Kingdom, [3]University College Dublin, Ireland

16:50-17:00

This research paper showcases a detailed digitization of tangible and intangible heritage for Augmented Reality (AR) and Virtual Reality (VR) purposes, covering various aspects ranging from culture to visual elements. This includes several intangible areas such as beliefs and stories as well as tangible aspects like lifestyle, art, and craft. The main objective of this research project is to provide an update on the current state of digitization of heritage with regards to technological advances with specific focus on the Mah Meri People and their art and culture. The paper expands on the steps taken during the documentation and digitization process that include methods, approaches, limitations, and proposed solutions. These processes include audiovisual documentation, spherical panorama capturing, 3D digitization and photogrammetry, and AR/VR content presentation combined with exhibition.

Digital Technologies Transforming Learning & Education in the Museum Context: A Visual Map for Visitor Experience in Heritage

Fotis Kitsios[1], Vassiliki Kamariotou[2] & Maria Kamariotou[1]
[1]University of Macedonia, Greece, [2]Aristotle University of Thessaloniki, Greece

17:00-17:10

More and more, cultural organizations are focusing on the benefits of technological innovation, especially in the education sector, which is getting more and more complicated and demanding. Previous research on the use of technology in cultural heritage has extensively reviewed the unique attributes of ICT and its capacity to sustain individual visitors, primarily during their physical visit to a cultural or historical site. Still, the role of ICT in changes to the tourist experience isn't well-known, so observing these changes in the visitor experience through the use of ICT is a clear opportunity for research. Professionals in the heritage sector have benefited from this shift, which has enabled them to transform museums in a more innovative and visitor-focused manner. The paper investigates all of the potential dimensions for increasing learning in a digital museum. The purpose of this article is to create a mind map that presents the relationships between dimensions in an ap-pealing and procedural visualization for improving visitors' learning experiences in digital museums. The proposed framework is supported by literature and examples adopted by various digital museums across the world. The mind map aids cultural consultants in comprehension and gaining additional insights from the suggested primary drivers of improving visitors' learning experiences in museums.

Ghostly Interactions in the Neolithic Hypogeum

Jonathan Barbara, Jeremy Grech, Silvio McGurk & Charles Theuma
Saint Martin's Institute of Higher Education, Malta

17:10-17:15

Challenges to accessibility of prehistoric sites is not only limited to physical ac-cess to the site itself but also access to information about the site, such as knowledge about its excavation. Providing a voice-driven interface to excavation reports of a Neolithic hypogeum in Malta, and the recreation of the archaeologist in charge of its excavation through the use of Artificial Intelligence is the main aim of the project reported in this short paper. Situating the virtual visitor’s voice as they ask questions to the archaeologist’s persona within the underground complex through the use of contextualized reverberations further adds to the immersive experience as they travel back in time to explore the hypogeum. The paper reports on design decisions made for this ongoing project which we are happy to share with the community for early dissemination and feedback.

Schedule Wednesday 4th December 2024

Workshop 3: CoVHer Multiplier Event on Hypothetical 3D Reconstructions & Documentation in Cultural Heritage

Wednesday 4th December 09:00-16:00

CoVHer stands for "Computer-based Visualization of Architectural Cultural Heritage" and is an Erasmus Plus Project (2021-1-IT02-KA220-HED-000031190, CoVHer Project), started in February 2021 and ending in January 2025.

The use of 3D models for the virtual reconstruction of past architectures, whether unbuilt or lost, has become widespread among both scientific and amateur communities. Despite this growth, the field still lacks standardized practices for processing and evaluating these virtual reconstructions.

Key gaps include the absence of a shared glossary for specific terms, including a shared classification of digital representation methods and 3D modelling techniques, as well as a scholarly approved, ready-to-use methodology for computer-aided hypothetical 3D reconstruction and documentation.

This Multiplier Event will address several unresolved issues in the field, particularly:

- Documentation of uncertainty in hypothetical reconstructions
- Publication of 3D models as scientific products
- Quality assurance and assessment of 3D models
- Accessibility and reusability of results

In this Multiplier Event, we aim to delve deeper into these critical points by presenting and discussing some results developed in the context of the CoVHer project. Specifically, we will illustrate the CoVHer MOOC course that will be published in January 2025; we will present the methodology to assess and visualize the uncertainty of hypothetical virtual reconstructions, as well as CoVHer developed to share 3D models as open scientific research outputs. Among the aims of this Event we will explore the potential of creating a digital archive of 3D models of virtual reconstructions, such as the CoVHer 3D Repository, and we will aim to promote the use of a shared terminology and methodology for the documentation of the reconstruction process and the assessment and quantification of the uncertainty in virtual hypothetical reconstructions.

You are invited to discuss ongoing or past European projects and international initiatives related to these topics, and the issues raised by the European Union concerning the preservation and sharing of European cultural heritage. Join us to contribute to and discuss about the advancement of standards and methodologies in the field of 3D virtual reconstruction of architectural heritage.

The Erasmus+ CoVHer Project

Workshop Organisers

Fabrizio Ivan Apollonio, Federico Fallavollita, Riccardo Foschi
- Alma Mater Studiorum – Università di Bologna, Italy

Igor Piotr Bajena, Piotr Kuroczyński
- Hochschule Mainz – University of Applied Sciences, Germany

Workshop
Wednesday 4th December
09:00-13:00

CoVHer Computer based Visualisation of Architectural Cultural Heritage

Acknowledgement
CoVHer has received funding from European Commission, Erasmus+, KA2 – Capacity building in the Field of Higher Education Project Number: 2021-1-IT02-KA220-HED-000031190

Abstracts

Time	Paper Title & Speaker
09:00-09:10	Introduction about the topics *Fabrizio Apollonio, Alma Mater Studiorum – Università di Bologna, Italy* *Piotr Kuroczyński, Hochschule Mainz – University of Applied Sciences, Germany*
09:10-09:30	Empowering Digital Heritage: CoVHer MOOC on 3D Reconstruction of Lost and Unbuilt Architectural Heritage *Federico Fallavollita, Alma Mater Studiorum – Università di Bologna, Italy*
09:30-09:50	Hands-On: The Uncertainty Assessment *Riccardo Foschi, Alma Mater Studiorum – Università di Bologna, Italy*
09:50-10:10	The Visualisation of Uncertainty in Virtual Reconstructions as a Dynamic Tool for Discussing about the Prehistoric Past *Evdoxia Tzerpou, Universitat Autònoma de Barcelona, Spain*
10:10-10:30	Virtual Reconstructions in the Age of Generative AI *Sander Münster, Friedrich-Schiller-Universität Jena, Germany*
10:30-11:00	Coffee Break (30 minutes)
11:00-11:20	Hands-On: The 3D Repository *Igor Piotr Bajena, Hochschule Mainz – University of Applied Sciences, Germany*
11:20-11:40	Abbreviated Workflows for 3D Reconstructions in Art and Architectural History *Fabrizio Nevola, & Luca Brunke University of Exeter, The United Kingdom*
11:40-13:00	*CoVHer Discussion on 3D Digital Cultural Heritage in Higher Education*
13:00-14:00	Lunch Break (60 minutes)
14:00-15:30	*All Conference Participants: Discussion & Brain Storming Session* *Rapporteur: TBC.*
15:30-16:00	Closing Comments

Abstracts

Empowering Digital Heritage: CoVHer MOOC on 3D Reconstruction of Lost & Unbuilt Architectural Heritage

Federico Fallavollita & Riccardo Foschi
Alma Mater Studiorum – Università di Bologna, Italy

09:10-09:30

The CoVHer MOOC of the Computer-based Visualization of Architectural Cultural Heritage Ersamus + Project (https://covher.eu), grounded in research, provided comprehensive training on digitally reconstructing architectural cultural heritage (CH) that has been lost or was never built. Aimed at students, scholars, and the public, this course sought to enhance digital skills and deepen understanding of scientifically accurate virtual reconstructions, bridging research with accessible learning.

The course was structured into several modules, each focusing on key aspects of 3D modelling and digital visualization. Topics included an introduction to hypothetical reconstructions, the scientific foundations of model creation, and best practices for constructing accurate and accessible 3D models. Through a combination of lectures, quizzes, and assignments, participants learned about different modelling techniques, historical source documentation, and the importance of communicating uncertainty within digital representations.

One of the course's unique aspects was its emphasis on interoperability and accessibility, providing guidelines for publishing models on digital platforms and ensuring they met scientific standards. In its final weeks, the MOOC covered documentation, sharing, and reuse of 3D models, including insights on augmented and virtual reality applications for these reconstructions.

Through the CoVHer MOOC, a research-driven initiative, participants gained a solid foundation in creating, evaluating, and understanding the role of 3D models in preserving and communicating cultural heritage. The course presented the research findings in a clear and accessible way, underscoring the importance of digital skills in this field and enhancing public appreciation of lost or unrealized European architectural heritage.

The Visualisation of Uncertainty in Virtual Reconstructions as a Dynamic Tool for Discussing about the Prehistoric Past

Evdoxia Tzerpou[1], Juan Antonio Barceló[1], Fabrizio Ivan Apollonio[2]
[1]Universitat Autònoma de Barcelona, Spain, [2]Alma Mater Studiorum - University of Bologna, Italy

09:50-10:10

During the last decades the three-dimensional models and the hypothetical virtual reconstructions of architectural and archaeological cultural heritage have created a whole new field in digital heritage studies. The following presentation will focus on virtual reconstructions in the field of prehistoric archaeology, where the temporal distance is of a few millennia, attempting to add new perspectives to the visualization of uncertainty. The necessity of shared standards and methodology has also arisen in this field to ensure the legibility, transparency and reusability of the hypothetical reconstructions and of the scale(s) of uncertainty applied to each case study.

Based on the theoretical framework proposed in this presentation, the process of virtual reconstruction is perceived as an interpretative exercise itself and different levels of development can be created based on the different levels of detail represented as well as on the data available in every moment. New data, new sources, new hypotheses, as well as re-evaluations of the previous ones, will constantly arise, transforming our ideas and hypothetical reconstructions. However, not all the components of a reconstruction have the same validity, due both to the plurality and variety of sources and to the different perceptions that reflect on a reconstruction the beliefs of its author.

Consequently, it is fundamental to visualize the degree of uncertainty that a hypothetical virtual reconstruction has. Different approaches and scientific proposals have been made during the last decades, both in the field of architecture and of archaeology, to visualize the uncertainty in a comprehensive and transparent way. In this presentation there will be a synthetic review of the work conducted so far in this field, focusing on virtual reconstructions of archaeological case studies, and, also, going a step forward proposing and adding other elements/aspects that should be taken into

consideration when visualizing uncertainty in prehistoric case studies. For example, the emphasis will be shifted from the idea of a scale of uncertainty that can be re-used on different case studies without modifications to the definition and systematization of the concepts that should appear on a scale of uncertainty, allowing and providing, in this way, the necessary flexibility to adapt to the specific characteristics of each case study. This issue is way more complicated when our reconstructions aspire to visualize not only buildings/structures, but also objects, people, social interaction and activities that may occurred at the area under study. However, this leap should be made in order to transform our reconstructions from passive contemplations to a dynamic tool for communicating our hypotheses about the past.

Virtual Reconstructions in the Age of Generative AI

Sander Münster
Friedrich-Schiller-Universität Jena, Germany

10:10-10:30

Virtual reconstruction of past architectures are still a very complex and research and labour intense approach. In our work we assess to which extent virtual reconstructions could be created according to principles of the critical digital 3D model via technical pipelines and generative AI tools.

From a formal point of view, the reproducibility and objectivity of virtual reconstructions created by pipelines can be closer to scientific principles than ever before. They can be fully documented and uncertainty can be quantified in terms of probabilities and deviations between validator and proposer. However, the issues raised are of a deferent nature and include, for example, biased training data, parameter sets and numbers, and explainability.

A key issue is the truth of the content generated by the generative AI. As the proposer and validator architectures are still very similar to the process of traditional virtual reconstructions – as reconstructing and validating a 3D hypothesis – generative AI raises questions about the nature of scientific 3D reconstructions: While there is no doubt that the results are hypothetical and lack object specificity, the extent to which the results (such as inferring patterns from large examples to propose a single case) are a valid intellectual deduction and thus a scientific result is questionable.

What does this mean for the issues raised in the workshop? Regarding the documentation of uncertainty in hypothetical reconstructions, this could be well quantified and codified. Also, a grounding in sources can be formalised – limitations in this case are mainly due to the lack of explainability of AI results. Publication of 3D models as scientific products and accessibility and reusability of results: The current step is to separate the data (historical sources) and the modelling process (modelling pipelines): both could be reproduced and measured. Quality assurance and evaluation of 3D models is the big issue, especially for more speculative techniques.

Abbreviated Workflows for 3D Reconstructions in Art & Architectural History

Fabrizio Nevola & Luca Brunke
University of Exeter, The United Kingdom

11:20-11:40

Over the past five years the Florence4D team have contributed to the debate around standards for research-based 3D models of lost or modified buildings from the past, and the art and material culture they contained (e.g. Nevola et al. in Getty Research Journal, 2022). Common ground is emerging in approaches to research-based or serious 3D models and the structured underpinning datasets that are an essential part of documenting uncertainty in reconstructions. However, such approaches are time intensive and are not always possible, even where a scientific output is a required end product. Visualisations/reconstructions are increasingly used as part of the ways in which museum and gallery curators communicate issues of historical context to visitors at permanent and temporary exhibitions, raising a question as to how these might better conform to our desired standards for scientific quality and reusability in art and architectural history.

This talk uses as a case sample a series of ongoing reconstructions produced by members of the Florence4D team for major exhibitions and related publications on Renaissance artists, where visualisations form part of a complex research-based argumentation proposed by curators. The question of uncertainty that is so central to how a visualisation responds to absences in the surviving evidence does not have equal valence for different constituencies of the research and curatorial

teams, causing us to question: whose uncertainty? So then for example, in an altarpiece reconstruction, the curatorial team will be most concerned with ordering the surviving (and lost) panels correctly, while perhaps for the 3D modeller the main challenge is around proposing the reconstruction of the carpentry frame. Moving to a more complex full-scale building model – as we know – the challenges multiply as various parts of the modelling process frequently shed light on areas often overlooked in traditional analysis, while the placement of objects or the experiential representation of movement or light raise further series of variables. In the case example in question this led us to adopt a light 3D modelling approach where we limited the output requirements in order to avoid having to model all aspects of the building through the selection of optimal camera angles within the modelling environment that met the curatorial brief.

While time constraints on these reconstructions mean that a full implementation of research-based/serious 3D standards may not be possible, a simplified version of the workflow can ensure a level of methodological rigour that is often lacking in such visualisations. Such an approach in turn invites us to return to the workflow to consider how input data (including scholarly interpretations of that data) can be gathered and stored while attending primarily to the output visualisation. Systematic gathering and storage of the input data, combined with the curatorial analysis text would allow for possible future processes (including through use of AI chatbot assistants) to retrospectively reconnect underpinning data to the models.

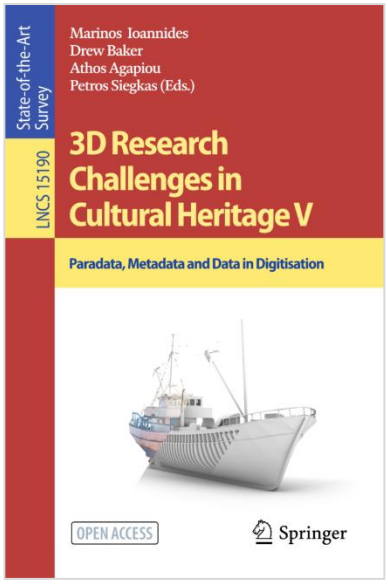
Publications

3D Research Challenges in Cultural Heritage V
Paradata, Metadata and Data in Digitisation

Editors
Marinos Ioannides, Drew Baker, Athos Agapiou & Petros Siegkas
Publisher
Springer (Forthcoming 2024)

Paradata is now widely seen, along with Metadata and geometrical data, as part of the trinity that indicates high-quality 3D digital resources, enriching 3D assets, creating knowledge and promoting reusability. However, the Digital Cultural Heritage community still lacks a definitive description and differentiation of Paradata and Metadata, and their benefits to stakeholders, owners, the multidisciplinary DCH community, digital scholarship, and compliance with the European Commission Recommendation for the collection of 3D-digitised cultural heritage assets.

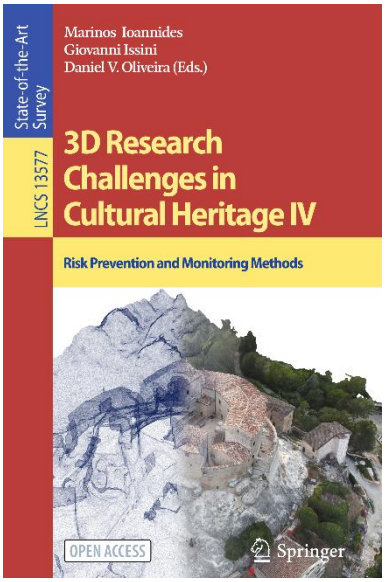
This publication draws from the spectrum of Digital Cultural Heritage practice professionals to share their experiences of using and working with Paradata seeking to lay down a common understanding of Paradata as a first step towards a community-built set of standards and expectations for its application to 3D documentation and the creation of knowledge.



3D Research Challenges in Cultural Heritage IV
Risk Prevention and Monitoring Methods

Editors
Marinos Ioannides, Giovanni Issini & Daniel V. Oliveira
Publisher
Springer (Forthcoming 2025)

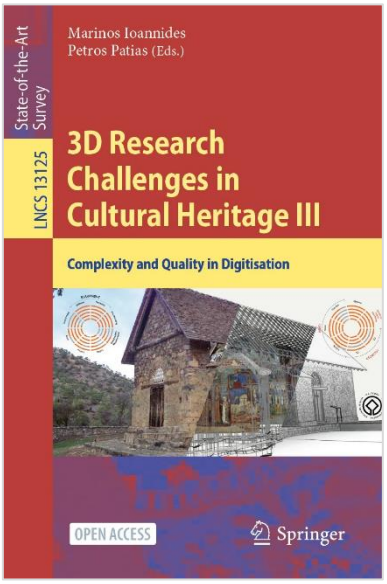
This book will illustrate the advances and challenges in digital data acquisition/documentation of tangible objects and the modelling of acquired massive data sets into accurate 2D/3D architectural drawings/models through Heritage Building Information Modelling (HBIM), and parametric/freeform surfaces. Additionally, it will address the processes of semantic annotation of digital models and the application of linked data approaches to embedding vital data (original construction materials, conditions, structural analysis, books, research reports, storytelling, etc.) and enrich the model with ancillary records/models/data that inform the modern multidisciplinary team required to assess and protect heritage at risk.



3D Research Challenges in Cultural Heritage III

Complexity and Quality in Digitisation

Editors
Marinos Ioannides & Petros Patias
Publisher
Springer (2023)



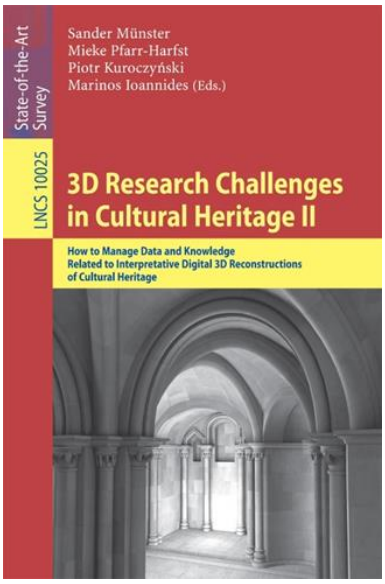
This open access book presents a collection of papers focusing on current 3D research challenges in the domain of digital cultural heritage. 3D technologies find considerable use within the field of cultural heritage at the beginning of the 21st century, for example in the areas of data acquisition, modelling, archiving in local repositories, harvesting in digital libraries and their long-term preservation.

This volume puts emphasis on a number of challenges facing 3D research in the 2D/3D digitization of tangible objects and their transformation to digital/virtual/memory twins; the interplay of geometry, semantics and the recovery and management of knowledge in digital cultural heritage; the handling of 3D data via the Cloud on the Internet and mobile devices; the presentation of cultural heritage content in 3D to the general public; and the 3D reproduction of cultural heritage objects from virtual to real.

3D Research Challenges in Cultural Heritage II

How to Manage Data and Knowledge Related to Interpretative Digital 3D Reconstructions of Cultural Heritage

Editors
Sander Münster, Mieke Pfarr-Harfst, Piotr Kuroczyński, Marinos Ioannides
Publisher
Springer (2016)

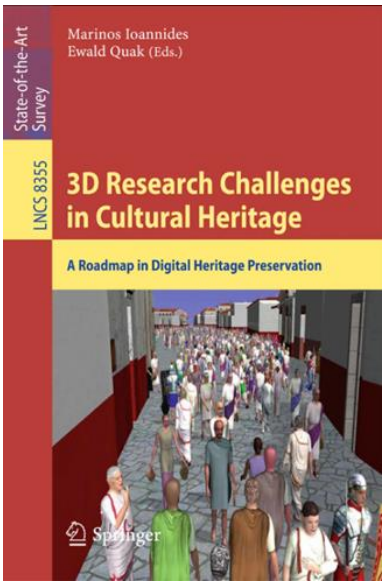


This book reflects a current state of the art and future perspectives of Digital Heritage focusing on interpretative reconstruction and bridging practical and theoretical perspectives, strategies and approaches. Comprehensive key challenges are related to knowledge transfer and management and data handling within an interpretative digital reconstruction of Cultural Heritage including aspects of digital object creation, sustainability, accessibility, documentation, presentation, preservation and more general scientific compatibility. The three parts of the book provide an overview of a scope of usage scenarios, a current state of infrastructures as digital libraries, information repositories for an interpretative reconstruction of Cultural Heritage; highlight strategies, practices and principles currently used to ensure compatibility, reusability and sustainability of data objects and related knowledge within a 3D reconstruction work process on a work basis; and show innovative concepts for the exchange, publishing and management of 3D objects, knowledge about data, workflows and semantic structures.

3D Research Challenges in Cultural Heritage:
A Roadmap in Digital Heritage Preservation

Editors
Marinos Ioannides & Ewald Quak
Publisher
Springer Berlin, Heidelberg (2014)

This book contains selected contributions from some of the most renowned researchers in the field of Digital Heritage and 3D representation of the Past, based in large part on invited presentations from the workshop "Computational Geometry and Ontologies for Cultural Heritage 3D Digital Libraries: What are the future alternatives for Europeana?" which was held in conjunction with the International Conference on Cultural Heritage EuroMed2012 (www.euromed2012.eu) on the island of Cyprus in October 2012. This was the official event of the Cyprus Presidency of the Council of the European Union on Progress in Cultural Heritage Preservation. The aim of this book is to provide an insight to ongoing research and future directions in this novel, continuously very promising and multi-disciplinary evolving field, which lies at the intersection of digital heritage, engineering, computer science, mathematics, material science, architecture, civil engineering and archaeology.

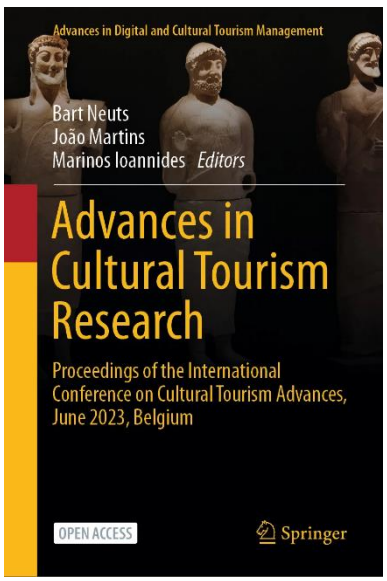


Advances in Cultural Tourism Research
Proceedings of the International Conference on Cultural Tourism Advances, June 2023, Belgium

Editors
Bart Neuts, João Martins & Marinos Ioannides
Publisher
Springer (2024)

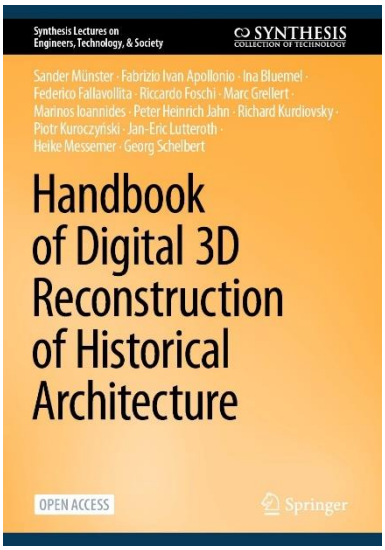
This open access book pertains to the "International Conference on Cultural Tourism Advances," held on June 27 and 28, 2023, at KU Leuven, Belgium. It focuses on advancing understanding of the sustainable development potential of cultural tourism by examining successful policy interventions, emerging cultural tourism trends, advancements in visitor management systems, new business and governance models, and the opportunities arising from ICT in the twenty-first century.

This book presents recent key advances and their significant outcomes in the domain of European Cultural Tourism including the latest state-of-the-art in research on cultural tourism in Europe and beyond, the potential for responsible, circular, and human-centred regional development and innovative data methodologies and digital tools reshaping the landscape of cultural tourism



Handbook of Digital 3D Reconstruction of Historical Architecture

Authors
Sander Münster, Fabrizio Ivan Apollonio, Ina Bluemel, Federico Fallavollita, Riccardo Foschi, Marc Grellert, Marinos Ioannides, Peter Heinrich Jahn, Richard Kurdiovsky, Piotr Kuroczyński, Jan-Eric Lutteroth, Heike Messemer & Georg Schelbert
Publisher
Springer (2024)



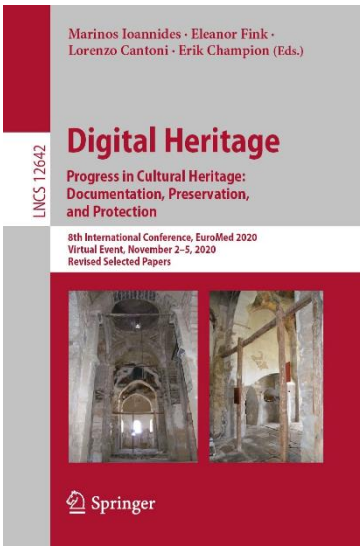
This open access book is a handbook for students, experts and interested parties who want to learn more about digital 3D reconstruction of historical architecture. The book provides answers to the core questions of the subject: What is a digital 3D model or a digital 3D reconstruction? How are they created and what are they used for? Practical instructions, condensed knowledge, explanations of technical terms and references to example projects, literature and further references provide information of varying density and thus enable an individual introduction to the subject.

The book was created within the research network "Digital 3D Reconstruction as Tools for Research in Architectural History," which was funded by the German Research Foundation (DFG) from 2018 to 2023. The authors combined their expertise in the fields of art and architectural history, architecture, university teaching and media informatics.

Digital Heritage. Progress in Cultural Heritage: Documentation, Preservation, and Protection

8th International Conference, EuroMed 2020, Virtual Event, November 2–5, 2020, Revised Selected Papers

Editors
Marinos Ioannides, Eleanor Fink, Lorenzo Cantoni & Erik Champion
Publisher
Springer Nature Switzerland AG (2021)



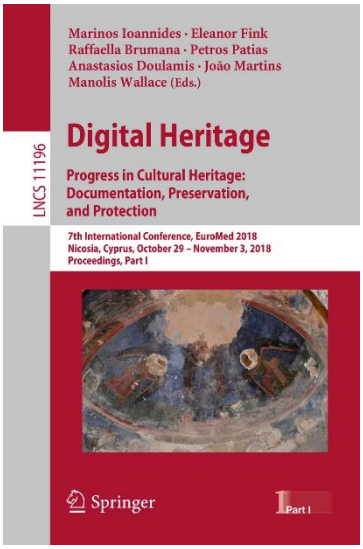
This book constitutes the refereed post-conference proceedings of the 8th International Conference on Digital Heritage, EuroMed 2020.

The 37 revised project papers and 30 revised short papers presented were carefully reviewed and selected from 326 submissions. The papers are on topics such as digital data acquisition technologies in CH/2D and 3D data capture methodologies and data processing; remote sensing for archaeology and cultural heritage management and monitoring; interactive environments and applications; reproduction techniques and rapid prototyping in CH; e-Libraries and e-Archives in cultural heritage; virtual museum applications (e-Museums and e-Exhibitions); visualisation techniques (desktop, virtual and augmented reality); storytelling and authoring tools; tools for education; 2D and 3D GIS in cultural heritage; and on-site and remotely sensed data collection.

Digital Heritage. Progress in Cultural Heritage: Documentation, Preservation, and Protection

7th International Conference, EuroMed 2018, Nicosia, Cyprus, October 29–November 3, 2018, Proceedings, Part I

Editors
Marinos Ioannides, Eleanor Fink, Raffaella Brumana, Petros Patias, Anastasios Doulamis, João Martins & Manolis Wallace
Publisher
Springer Nature Switzerland AG (2018)



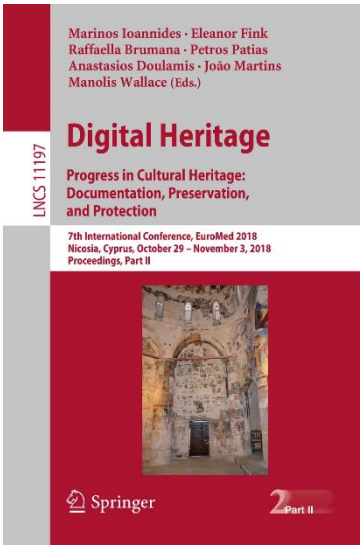
This two-volume set LNCS 11196 and LNCS 11197 constitutes the refereed proceedings of the 7th International Conference on Digital Heritage, EuroMed 2018, held in Nicosia, Cyprus, in October/November 2018.

The 21 full papers, 47 project papers, and 29 short papers presented were carefully reviewed and selected from 537 submissions. The papers are organized in topical sections on 3D Digitalization, Reconstruction, Modelling, and HBIM; Innovative Technologies in Digital Cultural Heritage; Digital Cultural Heritage –Smart Technologies; The New Era of Museums and Exhibitions; Digital Cultural Heritage Infrastructure; Non Destructive Techniques in Cultural Heritage Conservation; E-Humanities; Reconstructing the Past; Visualization, VR and AR Methods and Applications; Digital Applications for Materials Preservation in Cultural Heritage; and Digital Cultural Heritage Learning and Experiences.

Digital Heritage. Progress in Cultural Heritage: Documentation, Preservation, and Protection

7th International Conference, EuroMed 2018, Nicosia, Cyprus, October 29–November 3, 2018, Proceedings, Part II

Editors
Marinos Ioannides, Eleanor Fink, Raffaella Brumana, Petros Patias, Anastasios Doulamis, João Martins & Manolis Wallace
Publisher
Springer Nature Switzerland AG (2018)



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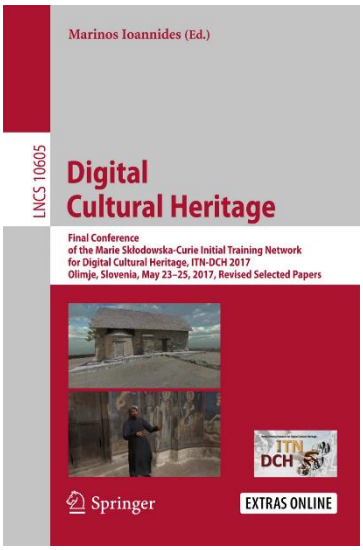
Digital Cultural Heritage

Final Conference of the Marie Skłodowska-Curie Initial Training Network for Digital Cultural Heritage, ITN-DCH 2017, Olimje, Slovenia, May 23–25, 2017, Revised Selected Papers

Editor
Marinos Ioannides
Publisher
Springer (2018)



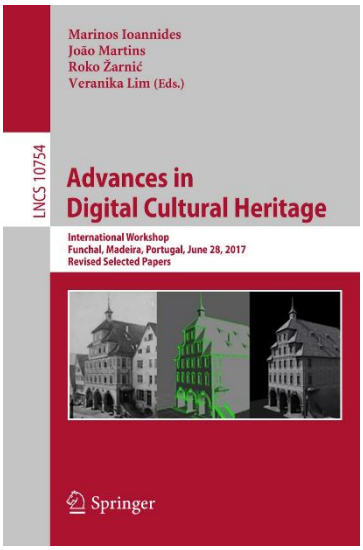
This book constitutes the refereed post-conference proceedings of the Final Conference of the Marie Skłodowska-Curie Initial Training Network for Digital Cultural Heritage, held in Olimje, Slovenia, in May 2017.

The 29 revised full papers included in this volume were carefully reviewed and selected from 198 submissions. They focus on interdisciplinary and multi-disciplinary research concerning cutting edge cultural heritage informatics, -physics, -chemistry and -engineering and the use of technology for the representation, documentation, archiving, protection, preservation and communication of cultural heritage knowledge.

Advances in Digital Cultural Heritage

International Workshop, Funchal, Madeira, Portugal, June 28, 2017, Revised Selected Papers

Editors
Marinos Ioannides, João Martins, Roko Žarnić & Veranika Lim
Publisher
Springer (2018)



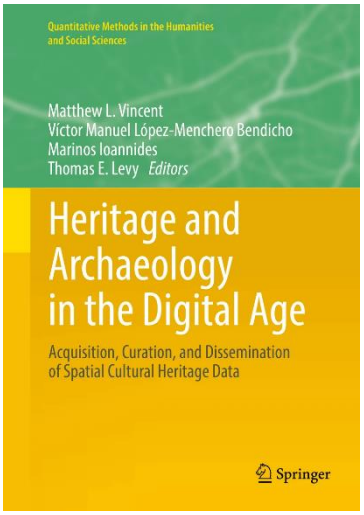
This book constitutes the papers of the International Workshop on Analysis in Digital Cultural Heritage 2017, held in Funchal, Madeira, Portugal, in June 2017. The 16 full and 19 poster papers were carefully reviewed and selected from 93 submissions.

The main objective of the Workshop was to present recent developments and applications of IT technologies for Cultural Heritage preservation, namely: Demonstration of the advantages of new generation of equipment for mapping, digital survey and documentation of heritage assets and sites; Presentation of technologies for digitalization, optimal documentation and information sharing on Cultural Heritage; Tools and procedures for social interaction enhancing, fostering awareness and participation; Rising of the knowledge level in domain of IT applications for Cultural Heritage preservation; Use of virtual reality for better understanding and learning on Cultural Heritage.

Heritage and Archaeology in the Digital Age

Acquisition, Curation, and Dissemination of Spatial Cultural Heritage Data

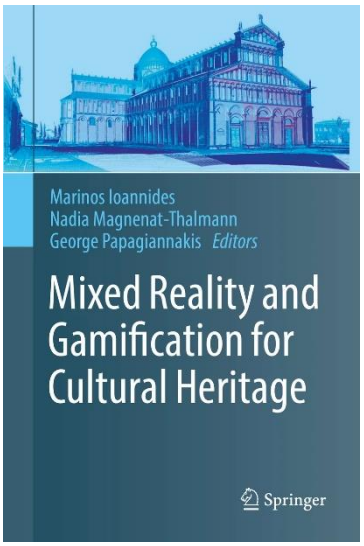
Editors
Matthew L. Vincent, Víctor Manuel López-Menchero Bendicho, Marinos Ioannides & Thomas E. Levy
Publisher
Springer (2017)



This book examines how computer-based programs can be used to acquire 'big' digital cultural heritage data, curate, and disseminate it over the Internet and in 3D visualization platforms with the ultimate goal of creating long-lasting "digital heritage repositories.' The organization of the book reflects the essence of new technologies applied to cultural heritage and archaeology. Each of these stages bring their own challenges and considerations that need to be dealt with. The authors in each section present case studies and overviews of how each of these aspects might be dealt with. While technology is rapidly changing, the principles laid out in these chapters should serve as a guide for many years to come. The influence of the digital world on archaeology and cultural heritage will continue to shape these disciplines as advances in these technologies facilitate new lines of research.

Mixed Reality and Gamification for Cultural Heritage

Editors
Marinos Ioannides, Nadia Magnenat-Thalmann & George Papagiannakis
Publisher
Springer (2018)



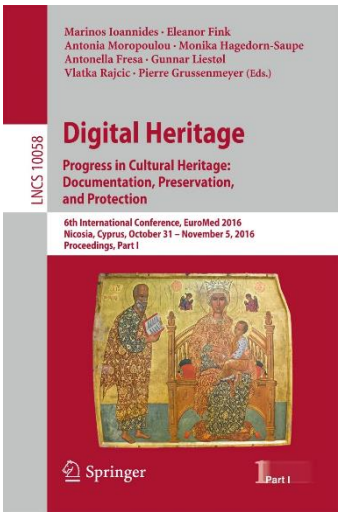
This volume on virtual and augmented reality (VR/AR) and gamification for cultural heritage offers an insightful introduction to the theories, development, recent applications and trends of the enabling technologies for mixed reality and gamified interaction in cultural heritage and creative industries in general. It has two main goals: serving as an introductory textbook to train beginning and experienced researchers in the field of interactive digital cultural heritage, and offering a novel platform for researchers in and across the culturally-related disciplines.

This book is intended for all heritage professionals, researchers, lecturers and students who wish to explore the latest mixed reality and gamification technologies in the context of cultural heritage and creative industries. It pursues a pedagogic approach based on trainings, conferences, workshops and summer schools that the ITN-DCH fellows have been following in order to learn how to design next-generation virtual heritage applications, systems and services.

Digital Heritage. Progress in Cultural Heritage: Documentation, Preservation, and Protection

6th International Conference, EuroMed 2016, Nicosia, Cyprus, October 31 – November 5, 2016, Proceedings, Part I

Editors
Marinos Ioannides, Eleanor Fink, Antonia Moropoulou, Monika Hagedorn-Saupe, Antonella Fresa, Gunnar Liestøl, Vlatka Rajcic & Pierre Grussenmeyer
Publisher
Springer (2016)



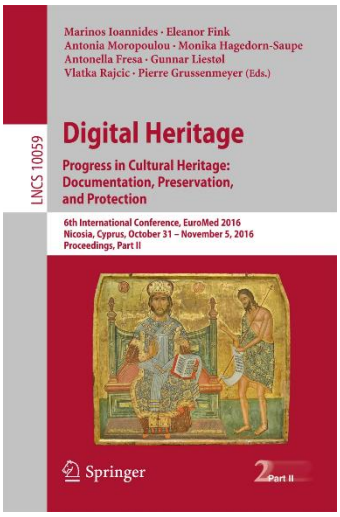
This 2-volume set LNCS 10058 & 10059 constitutes the refereed proceedings of the 6th International Conference on Digital Heritage, EuroMed 2016

The papers are organized in sections on Cultural Heritage topics: 3D Reconstruction & Modelling; Heritage Building Information Models; Innovative Methods on Risk Assessment, Monitoring and Protection of Cultural Heritage; Intangible Cultural Heritage Documentation; Digital Applications for Materials' Preservation & Conservation; Non-Destructive Conservation Techniques; Visualisation, VR/ AR Methods & Applications; The New Era of Museums & Exhibitions: Digital Engagement & Dissemination; Digital Cultural Heritage in Education, Learning & Training; Data Acquisition, Process & Management in Cultural Heritage; Data, Metadata, Semantics & Ontologies; Novel Approaches to Landscapes in Cultural Heritage; Digital Applications for Material Preservation & Conservation; Serious Games for Cultural Heritage.

Digital Heritage. Progress in Cultural Heritage: Documentation, Preservation, and Protection

6th International Conference, EuroMed 2016, Nicosia, Cyprus, October 31 – November 5, 2016, Proceedings, Part II

Editors
Marinos Ioannides, Eleanor Fink, Antonia Moropoulou, Monika Hagedorn-Saupe, Antonella Fresa, Gunnar Liestøl, Vlatka Rajcic & Pierre Grussenmeyer
Publisher
Springer (2016)



This 2-volume set LNCS 10058 & 10059 constitutes the refereed proceedings of the 6th International Conference on Digital Heritage, EuroMed 2016

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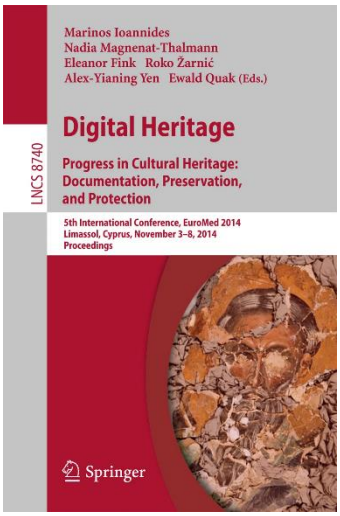
Digital Heritage. Progress in Cultural Heritage: Documentation, Preservation, and Protection

5th International Conference, EuroMed 2014, Limassol, Cyprus, November 3-8, 2014, Proceedings

Editors
Marinos Ioannides, Nadia Magnenat-Thalmann, Eleanor Fink, Roko Žarnić, Alex-Yianing Yen & Ewald Quak
Publisher
Springer (2014)



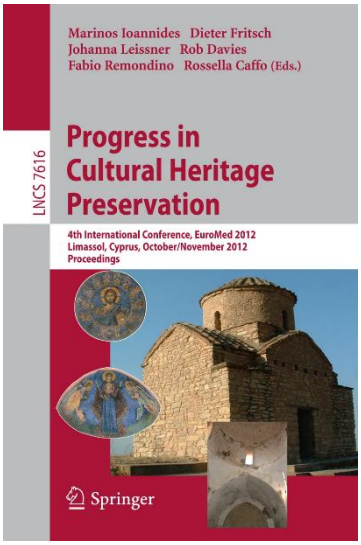
This book constitutes the refereed proceedings of the 5th International Conference on Digital Heritage, EuroMed 2014, held in Limassol, Cyprus, in November 2014.

The 84 full and 51 short papers presented were carefully reviewed and selected from 438 submissions. They focus on the interdisciplinary and multi-disciplinary research concerning cutting edge cultural heritage informatics, -physics, chemistry and engineering and the use of technology for the representation, documentation, archiving, protection, preservation and communication of Cultural Heritage knowledge.

Progress in Cultural Heritage Preservation

4th International Conference, EuroMed 2012, Lemessos, Cyprus, October 29 -- November 3, 2012, Proceedings

Editors
Marinos Ioannides, Dieter Fritsch, Johanna Leissner, Rob Davies, Fabio Remondino & Rossella Caffo
Publisher
Springer Berlin, Heidelberg (2012)



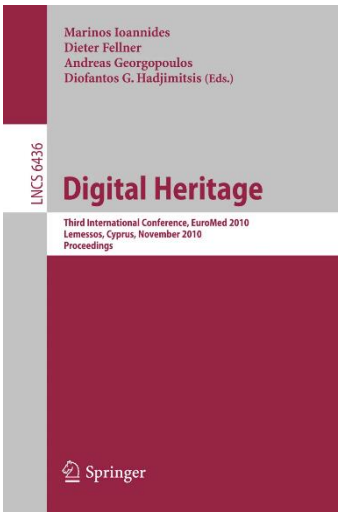
This book constitutes the refereed proceedings of the 4th International Conference on Progress in Cultural Heritage Preservation, EuroMed 2012

The papers are organized in sections on Cultural Heritage topics: digital acquisition technologies & processing, data capture methodologies, GIS in cultural heritage, VR in archaeology & historical research, standards, metadata, ontologies & semantic processing, data management, archiving & presentation of heritage content, ICT assistance in monitoring & restoration, innovative topics related to the current & future implementation, use, development & exploitation, innovative technologies to asses, monitor & adapt to climate change, on-site & remotely sensed data collection, reproduction techniques & rapid prototyping in cultural heritage, damage assessment, diagnoses & monitoring for the preventive conservation & maintenance of CH, information management systems in CH, European research networks in the field of CH, non-destructive diagnosis technologies for the safe conversation & traceability of cultural assets.

Digital Heritage

Third International Euro-Mediterranean Conference, EuroMed 2010, Lemessos, Cyprus, November 8-13, 2010. Proceedings

Editors
Marinos Ioannides, Dieter Fellner, Andreas Georgopoulos & Diofantos G. Hadjimitsis
Publisher
Springer Berlin, Heidelberg (2010)



This volume comprises the proceedings of the Third International Euro-Mediterranean Conference (EuroMed 2010) on the historical island of Cyprus. The focal point of this conference was digital heritage, which all of us involved in the documentation of cultural heritage continually strive to implement. The excellent selection of papers published in the proceedings reflects in the best possible way the benefits of exploiting modern technological advances for the restoration, preservation and e-documentation of any kind of cultural heritage. Above all, we should always bear in mind that what we do now may be used by people in another century to repair, rebuild or conserve the buildings, monuments, artefacts and landscapes that seem important. Recent events like earthquakes, tsunamis, volcanic eruptions, fires and insurrections show that we can never be too prepared for damage to, and loss of, the physical and, non-tangible elements of our past and, in general, our cultural heritage. To reach this ambitious goal, the topics covered included experiences in the use of innovative recording technologies and methods, and how to take best advantage of the results obtained to build up new instruments and improved methodologies for documenting in multimedia formats, archiving in digital libraries and managing a cultural heritage. Technological advances are very often reported in detail in specialized fora. This volume of proceedings establishes bridges of communication and channels of co-operation between the various disciplines involved in cultural heritage preservation.

Projects and Chairs

UNESCO Chair on Digital Cultural Heritage at the Cyprus University of Technology

https://digitalheritagelab.eu

The main objectives UNESCO Chair on Digital Cultural Heritage at the Department of Electrical Engineering, Computer Engineering and Informatics at the Cyprus University of Technology over the next years are to:

- Carry out a wide-reaching program of awareness raising and knowledge-sharing programs on the role of Digital Cultural Heritage (DCH) in the Eastern Mediterranean region and beyond, utilizing conferences and events, web and social media channels, academic exchanges and all possible media publicity vehicles.
- Introduce model DCH curricula ('Cultural Informatics') at vocational, undergraduate and postgraduate levels and extend course availability, teaching and study facilities to students internationally through state-of-the-art e-Learning.
- Define, extend and carry out a program of research in digital heritage which will further UNESCO's cultural heritage agenda in the region and to impact its key objectives.
- Extend to communities across the region usable and affordable systems for telling the stories of their own heritage and expressing their identity online, in a context of inter-communal cooperation.

Erasmus+ ExhiBIT

https://exhibit-project.com

ExhiBIT: *Co-curating in the Phygital Museum and the creation of alternative and transcultural 'voices' towards developing inclusive and sustainable museums* is an Erasmus+ Project which introduces the significance of co-curatorship through hybrid or "phygital" strategies (blending together physical experiences with digital practices). It aims for a wider visitor engagement in museum spaces in the multicultural societies of the post-pandemic era.

ExhiBIT's overarching objectives aim to:

- Address digital transformation in society by enhancing digital readiness, resilience and capacity both among CCI professionals and adult citizens;
- Promote innovative, life-long learning practices in local centres and other spaces in order to enhance public participation around cultural heritage in a transversal approach;
- Tackle social misrepresentation and foster the promotion of multiculturalism, diversity and inclusion within Galleries, Libraries, Archives and other Museum spaces (the GLAM sector).

Horizon Europe ANCHISE

https://www.anchise.eu

ANCHISE stands for 'Applying New solutions for Cultural Heritage protection by Innovative, Scientific, social and economic Engagement'.

ANCHISE aims to build a global and comprehensive answer to meet the challenges of effective protection of cultural heritage in Europe, for both antiquities and modern cultural goods, in order to provide sustainable and replicable solutions. Its assumption is that addressing this topic implies a bottom-up process, which will build a global and comprehensive approach at every stage of the analysis.

Crossing the methodology of networking that has proved its efficiency in the H2020 NETCHER project with the innovative results of new technologies developments (H2020 PREVISION, H2020 MAGNETO), ANCHISE will create an operational set of tools applicable for European contexts and replicable in other situations abroad.

Digital Europe Eureka3D

https://eureka3d.eu/

The EUreka3D project addresses the growing need of enabling the digital transformation of the Cultural Heritage (CH) sector. Museums, galleries, libraries, archives and archaeological sites need to review and modernise their internal processes from digital capture to end-user access and re-use. They need to re-train their personnel to cope with the new digital responsibilities and roles; to review their infrastructure capacity, in particular with regard to the ability to process 3D contents; to generate a novel holistic documentation of the digital objects. The existing services of the Europeana platform is a good starting point to support sharing and re-use, but an integration with more advanced, powerful and safe services is needed to answer to the demand of small institutions.

EUreka3D has the following five main objectives:

- To design and assess a range of new services and tools for CH digital transformation.
- To provide new contents in Europeana.
- To contribute to the capacity building of European CHIs.
- To outreach the widest community of CHIs, with particular regard to small institutions.
- To guarantee the highest quality of results, in terms of project's outcomes and in relation to the compliance with Europeana and the future Data Space for Cultural Heritage.

Erasmus+ ARTEST

https://artest-project.eu

The project aims at rethinking education in humanities in Mongolia in line with European standards, research and practices to catch up with the latest trends of the labour market by adopting digital methods of research and education.

EUreka3D has the following five main objectives:

- to develop innovative education methodology that combines methods of humanities, digital humanities and STEM;
- to equip HEIs' teachers with innovative European methods and facilitate their professional growth;
- to develop and launch multi-disciplinary Master degree programme with international student exchange opportunities;
- to create Digital Lab (virtual platform) for international small-scale projects aimed at preserving and promoting cultural heritage;
- to promote innovations in humanities reinforced by STEM methods and tools via collaboration with the labour market and joint small-scale projects of the Digital Lab.

HORIZON HERITALISE

https://heritalise.eu/

HERITALISE mission is to research and develop advanced digitisation techniques and solutions for documenting and representing diverse CH assets, giving a full comprehension of the diverse CH features, visible and non-visible. In addition, AI-powered tools including Machine Learning (ML) will be developed for improved and optimised data post-processing and integration based on standard and expanded methodologies. All this will be connected through a knowledge graph environment that allows the individual aspects known about the CH object to be related and retrievable. As with Wikipedia, by following links it will be possible to learn more about a particular object, what research has been done, and what results have been derived from it.

DIGITAL EUreka3D-XR

https://eureka3d-xr.eu/

The aim of EUreka3D-XR is to expand 3D and XR scenarios in the European common data space for cultural heritage. EUreka3D-XR builds upon the three pillars constructed by EUreka3D to create new experiences in extended reality integrated with the European Data Space for Cultural Heritage

COST MAIA

https://www.cost.eu/actions/CA23141/

Managing Artificial Intelligence in Archaeology (MAIA). The advent of Artificial Intelligence (AI) applications within archaeology has brought incredible opportunities but also significant challenges. Only a few years ago, Machine Learning algorithms and Neural Networks were concepts unknown to archaeologists; now, AI has been applied to many archaeological fields, from the detection of archaeological sites, the recognition and reassembling of archaeological pottery, the mining of text from historical documents and epigraphs, the study of human remains, the identification of murals and graffiti, and even robotics. AI has great potential to create a better comprehension of shared archaeological heritage. However, a more profound understanding of which archaeological research questions could be addressed, the availability and creation of the data upon which this research relies, the ethical, epistemological and hermeneutical side of the challenges that AI poses, and the lack of sustainable access to the necessary resources to undertake this work now deserve more in-depth discussion and exploration. The MAIA COST Action will create a community of archaeologists, digital archaeologists and computer scientists who will work together to develop a shared understanding of AI applications in archaeology. This will include meetings and workshops bringing together researchers who wish to create or use digital collections and training data. Key to this will be training opportunities in the field for documenting archaeological resources optimised for AI research and Short Term Scientific Missions, where researchers can work across borders to understand how to create comparative and training data.

Research Infrastructures

CLARIN - European Research Infrastructure for Language Resources and Technology - Cyprus

https://www.clarin.eu

CLARIN stands for "Common Language Resources and Technology Infrastructure". It is a research infrastructure that was initiated from the vision that all digital language resources and tools from all over Europe and beyond are accessible through a single sign-on online environment for the support of researchers in the humanities and social sciences.

In 2012 CLARIN ERIC was established and took up the mission to create and maintain an infrastructure to support the sharing, use and sustainability of language data and tools for research in the humanities and social sciences. Currently CLARIN provides easy and sustainable access to digital language data (in written, spoken, or multimodal form) for scholars in the social sciences and humanities, and beyond. CLARIN also offers advanced tools to discover, explore, exploit, annotate, analyse or combine such data sets, wherever they are located. This is enabled through a networked federation of centres: language data repositories, service centres and knowledge centres, with single sign-on access for all members of the academic community in all participating countries. Tools and data from different centres are interoperable, so that data collections can be combined and tools from different sources can be chained to perform complex operations to support researchers in their work.

DARIAH-CY

https://www.dariah.eu

DARIAH Cyprus is the Cypriot Digital Research Infrastructure for the Arts and Humanities, which aligns its activities with those of the central European Digital Research Infrastructure for the Arts and Humanities DARIAH-EU (www.dariah.eu), to which Cyprus is a member state. DARIAH-EU is one of the 12 largest research infrastructures of the European Research Infrastructure Consortia (ERIC) which aims to promote and support Arts and Humanities sector on a research level. As member of this European research network, Digital Heritage Research Laboratory, dedicated to the research on the specific areas of digitization, archiving and promotion of tangible and intangible Cultural Heritage, as well as to the modelling of knowledge, actively contributes to the infrastructure of DARIAH-EU, and highlights Arts and Humanities through Culture.

International Organisations

PHOTOCONSORTIUM

https://www.photoconsortium.net/

International association spin-off of Europeana Photography project, a thematic aggregator about early photography that digitised and made accessible online nearly half a million historic photographs. Within the legacy of Europeana Photography, Photoconsortium is also the curator of the travelling exhibition *All Our Yesterdays*.

CARARE Association

https://www.carare.eu

CARARE aims to advance professional practice and foster appreciation of the digital archaeological and architectural heritage through the promotion for public benefit of digitisation, connection. Enhancement, and use of digital content nationally and internationally. It supports the creation, connection, enhancement and use of digital archaeological and architectural heritage resources, for work, research, learning and for enjoyment

Michael Culture Association

https://michael-culture.eu

Michael Culture Association (MCA) is a trans-sectoral and trans-domain European network, gathering more than 200 public and private organisations from all over Europe and beyond, for the preservation, the promotion and the valorisation of heritage and digital cultural contents, and its communities. MCA provides knowledge, tools and services for cultural institutions and the general public, to support the role of cultural heritage as a pillar of inclusive and sustainable European societies.

Europa Nostra

https://www.europanostra.org

Europa Nostra was founded on 29 November 1963 in Paris. For over 50 years, we have celebrated, protected and lobbied for cultural heritage. Europa Nostra is today recognised as the most representative heritage organisation in Europe with members from over 40 countries.

Marie Curie Alumni Association - Cyprus Chapter

https://www.mariecuriealumni.eu/groups/cyprus-chapter

The group has been created to bring closer all the Marie Curie fellows and Alumni that live in the geographical area of Cyprus under a common goal, to enhance the image of the MCAA within the Cypriot territory.

In Cooperation With

EUROMED

10th International Conference on Digital Heritage

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