CIPA Avila 2019: Documenting the past for a better future

Documenting the tangible and the intangible – qualitative and quantitative values in cultural heritage and a dialogue between humanities and STEM subjects

Prof. Dr. Mona Hess
University of Bamberg, Germany

Prof. Dr. Mona Hess, Chair for Digital Technologies in Heritage Technologies, University of Bamberg, Twitter: @Mona3Dimaging, @DigiHeritageBA, CIPA Avila September 2019.
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1. Documenting the tangible and the intangible
2. SF4CH and ICTs
3. Humanities and STEM subjects
4. Qualitative and quantitative values in CH
5. Conclusions

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Documentation of our tangible (and intangible) heritage

- Humanities, heritage conservation and monument preservation, museum studies are all disciplines with a calling for the protection of cultural assets; and they are now adopting innovative digitisation techniques

- Geomatics/ Optical imaging methodologies (active and passive)

- The digital 2D and 3D recording of our tangible heritage, movable and immovable, such as buildings and objects, is now as much a part of the preservation of historical monuments as the permanent monitoring of the condition of a building or artefact with intelligent sensor systems

Images: KDWT Project, University of Bamberg with LMU, Castle Arnstorf, Corpus of Baroque Ceiling Painting, Art historical examination and 3D documentation

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Digital Technologies in Heritage Conservation

• We are at the dawn of a new field and disciplines forming. They are called
  • “Digital Humanities”
  • “Digital Heritage”
  • “Digital Technologies in Heritage Conservation”.

• New professional profiles are becoming clearer and new educational opportunities for a cross-disciplinary formation are now available.
  • M.Sc. Digital Technologies in Heritage Conservation

Images: Teaching in the M.Sc. Digital Technologies in Heritage conservation at the University of Bamberg
3D Terrestrial laser scanning at the Islamic Museum (Bumiller Collection) in Bamberg
Heritage at risk: Europeana online topical exhibition


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EU Member States sign up to cooperate on digitising cultural heritage from 9 April 2019

- 26 European countries signed a Declaration of cooperation on advancing digitisation of cultural heritage.
- They will work more closely together to better use state-of-the-art digital technologies in addressing risks that Europe's rich cultural heritage is facing, enhancing its use and visibility, improving citizen engagement, and supporting spillovers in other sectors.
- Digitised cultural objects moreover unlock the potential for broader societal, cohesive and economic benefits of sectors such as tourism, education and creative sectors.

- The declaration has three pillars of action:
  1. A pan-European initiative for 3D digitisation of cultural heritage artefacts, monuments and sites;
  2. Re-use of digitised cultural resources to foster citizen engagement, innovative use and spill-overs in other sectors;
  3. Enhancing cross-sector and cross-border cooperation and capacity building in the sector of digitised cultural heritage.

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UNESCO/EU & digital

- UNESCO and EU promote a mission for the digitization, digital documentation and democratization and accessibility of digital data of heritage.


- Recently a novel reinforcement to the commitment for the digital preservation/production of digital heritage, caused by the recent fire at Notre Dame (2019) and refer to "Digital Cultural Heritage" task groups and H2020 projects.

- UNESCO/EU want to foster stewardship for our heritage by digital missions. -> Good times for ICT/ Digital Heritage

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• This is the age of Digital Transformation and Networked Information

• ICTs (Information and Communication Technologies) in a wider context are playing a bigger and bigger role in the relation of the importance of our cultural heritage to a diverse audience including tourism

• They can strengthen the stewardship of every single person for the heritage that surrounds us

Images: 3D imaging projects for museum objects at UCL
Top: Painting fragment from Knidos Turkey, Bottom left: Ivor Pridden (conservator, IT, 3D imaging specialist in one person) is imaging a cartonnage mummy mask from the Petrie Museum of Egyptian archaeology, Bottom right images: Mona Hess is imaging a war canoe from the Solomon Islands in the storage of the British Museum for later virtual reconstruction.

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Digital heritage a disruptive technology?

• But things are not as smooth as they appear!

• New technologies and their implications are still experienced as disruptive in the daily practice, where conventional (and often analogue) methods are often preferred.

• See for example: Christensen, C. M. Disruptive Innovation. The Encyclopedia of Human-Computer Interaction, 2nd Ed. 2013.

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„SF4CH“ is already here!
(Science Fiction for Cultural Heritage)


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The application of AR and VR are ubiquitous,

- AR and VR are ubiquitous in this context
- Greater role in the mediation of heritage
- Immersive: sense of space, movement and hopefully sound

Image: Mona Hess on the cover of the *uni.kat* publication of the University of Bamberg, Topic: Digitisation, Summer 2019

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SF4heritage

• Science Fiction for cultural heritage we have already implemented
  • 3D printing
  • Autonomous navigation, driving
  • Robotics
  • Pattern recognition and image analysis
  • AI, DL, NN…
  • Measurement tools in our mobile phones

• We are still waiting
  • For intuitive easy to use interfaces
  • Good AR in daily life
  • 4D printing

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Why digitize? From the age of mechanical reproduction – the Aura – to the age of digital reproduction


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Humanities simplified

- Quality of the critical argumentation
- Transparency of sources
- Material culture and related issues (e.g. immaterial cultural heritage)
- Creativity, unpredictable originality, uniqueness of the creative process

From the point of view of a STEM person

- Philosophical and speculative character of the academic discourse
- Doesn't aim to solve problems or prove anything.
- Research practice with little digitisation little cooperation
- Monographs / Only paper authors
For example ethnographic research

Sepik Yam Mask and curator of the Ethnographic Collection

Ephemeral installation of the Yam Festiva, Papua New Guinea
STEM

• Experiments, numbers, facts

• Verifiable evidence

• Validated by repetition of processes that ideally lead to the same results (reproducibility of research)

• Technological innovation and cooperation

STEM / engineering from the point of view of a humanities person

• Search for the solution before defining the question

• For an engineer, every problem has a solution.

• Special features for the research community: Contributions with more than 10 authors
Understanding the role of the interdisciplinary

• We need (digitization) methods that enable experts to communicate humanities research issues at the interface to STEM (Science, Technology, Engineering and Mathematics) subjects and vice versa.

Figure from Bentkowska-Kafel, A.; Moitinho de Almeida, V.; MacDonald, L. W.; del Hoyo Melendez, J.; Mathys, A. Beyond Photography. An Interdisciplinary Exploratory Case Study in the Recording and Examination of Roman Silver Coins. In Digital Techniques for Documenting and Preserving Cultural Heritage; Bentkowska-Kafel, A., MacDonald, L. W., Eds.; ARC Humanities Press: Plymouth, 2017.

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Twitter: @Mona3DImaging, @DigiHeritageBA, CIPA Avila September 2019.
Geodatabase for Auxiliary Sciences in History, University of Bamberg

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Interdisciplinary Educational programs

- Digital data, electronic tools and calculation methods permeate academic disciplines
- Interdisciplinarity in education with skills from STEM and Humanities
Conclusions

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Qualitative vs quantitative research

The underlying qualities of and principles in humanities and heritage using qualitative research are not easily congruent with the principles of digitisation and measurement.

- Is often difficult to be expressed numerically
- Methods such as in ethnographic observations of rites, collection of oral history

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Project Jewish Cemeteries in Franconia/Bavaria, Cemetery Laudenbach, 2019, M.Hess
### Values for Digital Cultural Heritage and Genius Loci/ tangible vs intangible

<table>
<thead>
<tr>
<th>Tangible Heritage</th>
<th>Intangible Heritage</th>
<th>Immersive Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Spatial and three-dimensional</td>
<td></td>
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<tr>
<td>• Locative</td>
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<td>• Topographical</td>
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<td>• Morphological</td>
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<td>• Visual</td>
<td></td>
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<tr>
<td>• Scientific</td>
<td></td>
<td></td>
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<tr>
<td>• Restitutional/ Reconstructional</td>
<td>• Auditive/ Aural/ (Sound)</td>
<td>• Spatial Feeling / Immersive</td>
</tr>
<tr>
<td>• Typological, Urbanistic</td>
<td>• Haptic/ Tactile</td>
<td>• Locational dynamical: Sense of movement</td>
</tr>
</tbody>
</table>

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Mediation between the requirements of heritage experts and engineering surveying methods can be reached by interdisciplinary communication and a joint discourse.

- Mutual understanding through vocabularies, glossaries, lots of talking to overcome the semantics that might be different.
- Knowledge exchange rather than one-directional knowledge transfer.
  - But you all do this already of course.

The UCL Petrie Museum of Egyptian Art, Website with Timeline and Narrative by 3D Objects

Interdisciplinarity as mediation process

- Communicate research concerns in the humanities at the interface with STEM subjects and vice versa
- Discuss requirements and results
- Patience and dialogue
- Bridging the gap between disciplines

- Complementary existence
- Convergence through interdisciplinary research
- Multimodal studies and research

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A dialogue between Humanities and Technologies for Digital Heritage

Client brief

Client budget

Prof. Dr. Mona Hess, Chair for Digital Technologies in Heritage Technologies, University of Bamberg,
Twitter: @Mona3Dimaging, @DigiHeritageBA, CIPA Avila September 2019.
Centre for Heritage Conservation Studies and Technologies

Kompetenzzentrum für Denkmalwissenschaften und Denkmaltechnologien

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Aims and objectives of KDWT

- Culture-technology transfer
- Digital long-term documentation
- Digital object acquisition and analysis
- Historical work techniques

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KDWT contributions to this conference

- KDWT (Kompetenzzentrum Denkmalwissenschaften und Denkmaltechnologien) = Centre for heritgae conservation and technologies

- Contributions
  - 3D INSPECTION OF THE RESTORATION AND CONSERVATION OF STAINED GLASS WINDOWS USING HIGH RESOLUTION STRUCTURED LIGHT SCANNING, Rahrig, Max; Torge, Manfred (2 Sept. TS6 - Restoration, Rehabilitation and Conservation of CH)
  - INFRARED THERMAL IMAGING AS A NON-DESTRUCTIVE INVESTIGATION METHOD FOR BUILDING ARCHAEOLOGICAL PURPOSES, Luib, Anna (5 Sept. TS7 - Monitoring and Conservation of Heritage)
  - P10 - THE OCTAGON OF THE NIDAROS CATHEDRAL IN TRONDHEIM: CONSTRUCTIVE, HISTORICAL AND TECHNICAL STUDIES ABOUT ITS RESTORATION PROCEDURES UNTIL THE 19TH CENTURY Menargues Rajadell, Angel (3 Sept. Poster Session 1)

- Contributions of collaborators
  - EXPLOITING 3D MULTISPECTRAL TEXTURE FOR A BETTER FEATURE IDENTIFICATION FOR CULTURAL HERITAGE. Mathys, Aurore; Jadinon, Rémy; Hallot, P. (2 Sept. TS2 - Heritage 3D Documentation and Modeling I)

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