

EDITORIAL. VIRTUAL MODELS AND SCIENTIFIC VALUE

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Abstract

This number of SCIRES-IT is a special issue on *Virtual Models and Scientific Value*, which summarises significant outcomes from the international meeting and conference series on “3D models in the history of art, architecture and archaeology”. Key topics include the documentation and analysis of architecture with digital means, processes of and tools for the semi-automatic analysis of e.g. point cloud representations, practices of modelling and the use of virtual models for answering innovative research questions in architectural history. Collaboration and exchange platforms for digitally native projects, which aim at preserving and fostering their scientific quality, are a further focus.

Keywords

SCIRES-IT, Editorial, SCientific REsearch and Information Technology, Open Access Journal, Virtual Model, Built Heritage, Architectural History

3D-Models, digital documentations, virtual or 3D-printed reconstructions and interpreted point clouds are since some time omnipresent in architectural history and building archeology. Backed by the London Charter for the computer-based visualisation of cultural heritage (Denard 2009), there are a lot of efforts to integrate information about human processes of understanding and interpretation of data objects and information about semi-automated interpretation processes into a scientifically valid computer model.

These data, which describe scientific base and scholarly background of a virtual reconstruction or of results given in a 3D-based representation, should be incorporated into the model itself. By doing so the model achieves scientific value.

The present special issue of SCIRES-IT - SCientific REsearch and Information Technology Journal, addresses the topic *Virtual Models and Scientific Value* in its various aspects.

These include models as interactive and epistemic tools, the documentation and analysis of architecture with digital means and processes of and tools for the semi-automatic analysis of e.g. point cloud representations, which is an ongoing and growing field of research (De Luca 2015).

Papers are concerned with practices of modelling and the use of virtual models for

answering innovative research questions in architectural history. Collaboration and exchange platforms for digitally native projects, which aim at preserving and fostering their scientific quality, are a further focus.

This issue of SCIRES-IT aims to bring together major exponents in the field, to discuss emerging standards and to disseminate shared best practices, which enable us to fully exploit the potential and the scientific value of digital architectural history.

The issue summarises significant outcomes from the international meeting and conference series on *3D models in the history of art, architecture and archaeology*.

The series comprises the meeting, organized by Sabine Frommel at the École Pratique des Hautes Études, PSL in Paris (November 2015), the meeting, organized by Livio de Luca at the Laboratoire MAP, CNRS in Marseille (June 2016), the conference, organized by Marco Gaiani at the Università di Bologna (September 2016), the conference, organized by Emanuela Ferretti at the Università degli Studi di Firenze and the Biblioteca Leonardiana in Vinci (October 2017) and the conference, organized by Hermann Schlimme at the Technische Universität Berlin (November 2018).

Papers deal with the current use of 3D models in interactive exhibition design and as knowledge transfer tools.

In their paper *Visualizing Leonardo and Michelangelo through digital humanities, reconstruction and interaction design*, Emanuela Ferretti and Davide Turrini analyse and share the approach and the research process for three-dimensional modelling and other advanced digital techniques designed to enhance appreciation of cultural heritage in exhibition contexts.

In her paper *Digital 2D and 3D Visualisations as iconic epistemological Models*, Mieke Pfarr-Harfst investigates the role of digital 2D and 3D visualisations in the scientific discourse. Models have become more and more a scientific tool during the research process and could be defined as spatial and object-related iconic epistemological models and media.

Digital tools and platforms for 3D models are a further focus. Innovative tools for creating 3D models are the topic of the paper *Bridging the Gap. Digital Models of Historic Roof Structures for Enhanced Interdisciplinary Research*. In their paper Markus Pöchtrager, Gudrun Styhler-Aydın, Georg Hochreiner, Taşkın Özkan, Marina Döring-Williams and Norbert Pfeifer describe the development of a highly automated tool for analysing point clouds of historic timber roof structures. In their examples the authors generate digital 3D geometric and structural models directly out of laser scan data.

In the paper *baureka.online - Research Repository, Catalogue and Archive for Architectural History and Building Archaeology*, Anke Naujokat, Tobias Glitsch, Felix Martin and Hermann Schlimme present a planned digital repository and exchange platform for 3D research data from Building Archaeology, which is especially aimed at preserving and fostering the scientific quality and

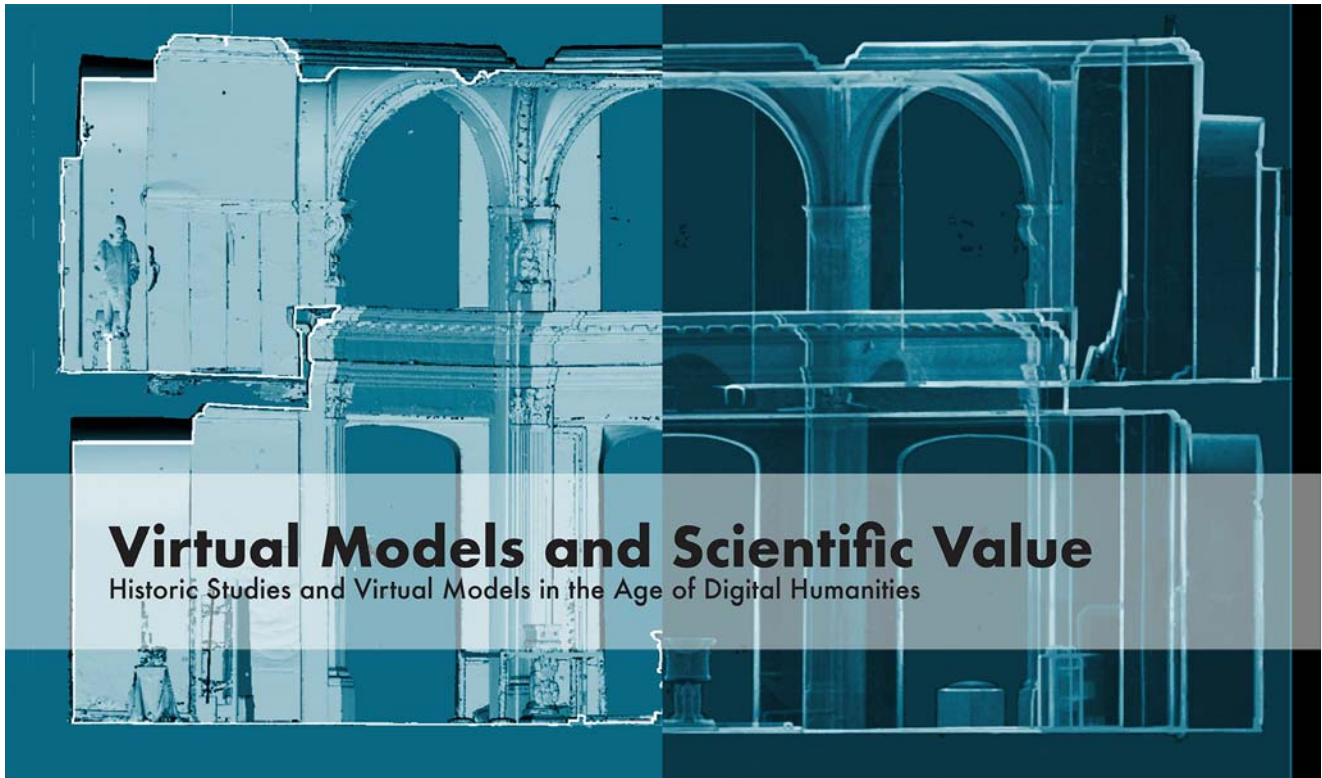
the overarching valorisation of scientific building documentation.

Through case studies a group of papers shows specific uses of 3D models for tackling scientific research questions. In their paper *Some reconstruction hypotheses of Leonardo's project for the tiburio of the Milan cathedral by using 3D digital models*, Sabine Frommel, Fabrizio Ivan Apollonio, Marco Gaiani and Gianna Bertacchi use 3D modelling techniques in order to systematically reenact different possible interpretative solutions of the two sheets of the *Codex Atlanticus*, which Leonardo da Vinci dedicated to the *tiburio*-project.

Pier Paolo Diotallevi then uses these hypothetical 3D reconstruction models of Leonardo's *tiburio* for evaluating their structural behaviour through Finite Elements Method. He describes the approach and discusses the results in his paper *On Leonardo's project for the tiburio of Milan cathedral: some consideration on static behaviour*.

In their paper *The Nubian village of Balle: Social and spatial structure explained using a virtual model*, Hermann Schlimme, Bernadeta Schäfer, Olga Zenker and Constanze Bieber investigate the correspondence between spatial and social structure in a vernacular village in Egypt over several generations of inhabitants. They use a CAD-based model, which integrates the ethnological, social and architectural research data.

The architectural detail is the topic of the paper *Digital documentation of construction details in the architecture of Michelangelo and Giuliano da Sangallo - two case studies*. Julian Bauch and Gunnar Schulz-Lehnfeld describe how to choose appropriate 3D scan documentation methods for architectural detail and evaluate the potential of the U3D format for the presentation of results.



Virtual Models and Scientific Value

Historic Studies and Virtual Models in the Age of Digital Humanities

2015 - École Pratique des Hautes Études, PSL in Paris

2016 - Laboratoire MAP, CNRS in Marseille

2016 - Università di Bologna

2017 - Università degli Studi di Firenze and the Biblioteca Leonardiana in Vinci

2018 - Technische Universität Berlin

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Denard, H. (ed.) (7 February 2009). *The London Charter for the computer-based visualisation of cultural heritage*. Retrieved from <http://www.londoncharter.org>.

De Luca, L. (2015). What do Thirty-One Columns say about a 'Theoretical' Thirty-Second? *Journal on Computing and Cultural Heritage*, 1(2015), DOI: <https://doi.org/10.1145/2700425>.