Virtual Palaces, Digital Images – an Introduction

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This collection of essays deals with digital scale models of historical, courtly architecture from the medieval and early modern periods. Digital models of historical architecture, often called virtual models or CAD models to distinguish them from 'real' haptic models, are a relatively new medium of the digital age. Their use has started to become more widespread in the late 1980s. The digital or virtual architectural model in general is based on a complex, processed dataset and, therefore, a highly technological phenomenon, while the digital data at hand are almost invariably used to create digital images and their variants, such as films, panoramas or interactive representations. These up-to-date digital images often resemble, in style and content, older, analogically produced images. Their fundamental visual aspects may be described and studied with the methods of art history, of visual studies (Bildwissenschaften) and of the social sciences. Of course, other research approaches are conceivable as well but could not be discussed here.

There is a close and productive interrelation between 'real' historical palatial architectures, which is at the centre of our attention as objects of such virtual models in this volume, and the ideas that we have about them, which are circulating in diverse groups of discourse. When the images, for example in the case of digital models, gain comprehensive qualities and even start to depict spatial entities one may justifiably refer to the new digital images as virtual palaces.

Palaces or other princely architecture play an important role for the expression of national or regional identity; they offer condensed images of specific societies, analysed, for example by Norbert Elias, under the category of courtly society. Elias early on referred to architecture as an indicator of social structures ('Wohnverhältnisse als Anzeiger gesellschaftlicher Strukturen').[1] Palaces are, therefore, as important for the perception and the appropriation of the early modern period as the architecture of the great cathedrals is for the Middle Ages. A good deal of the historical and cultural impact of these palaces and residences is virtual even without any digital processing – in the sense, that we have to imagine long-lost situations and parts of the architecture as well as the every-day-life, the ceremonies and the other processes and events that once took place in and around them.[2] Often the building fabric of these palaces has undergone serious change over the centuries. Therefore, from a historical point of view we are always dealing with reconstructions.

In addition, the way we look at these monuments as part of our built heritage, the aspects we are interested in and the connotations we add to these remains of courtly and aristocratic culture deeply depend on a visual construction of history. The way these sites are represented to the public is often highly professional and complex. The architecture, the collections and exhibitions on display, the stories told, attest to the importance of our imagination when dealing with the palace-theme. There we find a broad range of interpretations and historical reconstructions, starting from different backgrounds and diverse political intentions together with a multitude of techniques and skills to visualize an intended message that is well worth investigating. Both virtuality and visuality have long played an important role in the presentation and reception of courtly architecture and palaces in particular.

As a result of specific technological innovations and medial traditions, digital models of historical architecture first materialised in the 1980s. They complemented older architectural reconstructions and images, in particular the haptic models made from wood or other such materials whose particular history may be traced back to the 14th century:[3] it is likely that they will increasingly replace them altogether. As soon as the digital or virtual model attempts to reconstruct a no longer existing architectural reality, it becomes the virtual alternative to a potential physical reconstruction.[4]

Nonetheless, unlike physical reconstructions, their virtual counterparts also play an increasingly important role as tools for the more scientific exploration of this type of architecture. In particular, as concerns the creation and communication of scholarly results, 'non-built' digital kinds of media, such as reconstruction drawings, maps, diagrams, photographs and film play an important part. Whether it concerns the reconstruction of a historical status quo, the explanation of diverse contexts of usage, the tracing of parent networks or communication with a range of clients, such research by necessity relies on virtual reconstructions as visual representations of diverse lost realities. Thus, our present-day notion and understanding of courtly architecture is greatly influenced by such digital images and, more specifically by virtual scale models.

The range of scale models of historical architecture has considerably expanded with digital techniques. Technology is increasingly used for the review of theoretical models, for the purpose of representation and for the documentation of research processes. In particular the digital integration of entire academic workflows, of databases, thematic maps, GIS techniques, CAD drawings and videos has a high potential for innovation.[5] While not all of these depictions may be described as images per se, images have gradually started to play a more central role.

At this point, it seems opportune to introduce the peculiarities, constituent processes and scenarios of the reception, and advancement of the recent visual medium of the digital architectural model in its relationship to in-depth, theoretical research. Several disciplines, such as art history, visual studies, or sociology of knowledge may be considered, since they develop historical as well

as systematic research objectives and analyse phenomena in contexts that go well beyond the representation of isolated cases.

Such a *modus operandi* gives rise to questions about the qualities, possibilities and limitations of different techniques and strategies of virtual reconstruction. The use of digital models brings new perspectives for the sciences as well as for the medial presentation of research results. However, what is the state of the art in building digital models of historical palaces? How deliberately do researchers, model-builders, and recipients use the new techniques and the dazzling possibilities of diverse modes and styles? What does the virtual picture of these palaces look like? Do these images conform to a particular style and does this style follow examples developed by other media?

Even though we are used to overpowering visual impact from the film, advertising and gaming industry,[6] the scholarly and lay audience's skills of evaluating or analysing 3D-media have not grown in tandem. Therefore, a gap exists between the growing role and professionalization of the visual reconstruction of the historical and of the theoretical background. Although media theory is dealing with this issue, users from historical fields of research have not yet addressed much of its scientific influence.

Those historical buildings, whose digital models have been chosen as objects of investigation in this volume fall mainly in the areas of the research of art history, building research (Bauforschung), medieval archaeology and cultural studies. It is important to emphasize this fact, since at this moment studies and surveys of earlier, pre-medieval cultures do not only provide the majority of digital reconstructions, but also reflect on and publish research about the new medium most assiduously.[7] The essay by Sander Münster in this collection, for example, illustrates this circumstance very clearly. A number of analytical positions that strive for an interdisciplinary character in this volume are also relevant to this publication.[8]

Within the scope of the more recent architectural history the digital scale model as a new genre of both data and image creation has long been rather neglected from a theoretical perspective. With the exception of the presentation of single projects, for example those put into a wider context in Heike Messemer's essay in this volume, the proceedings 'Der Modelle Tugend', compiled by Marcus Frings (Darmstadt, 2001), deserve a special mention.[9] Although by digital standards, much time has passed since 2001, we must urgently turn to the historical and theoretical aspects of the new digital visual medium – including the areas of medieval and early modern art history. In particular, the approaches employed by visual studies (Bildwissenschaften), which are deeply ingrained in German-language art history, may develop further in this field.

The essays published in this volume, originally were contributions to a workshop entitled 'Lost Palaces and their Afterlife – Virtual Reconstruction between Science and Media', which took place at the Ludwig-Maximilians-Universität in Munich, 13 to 14 April 2012. This event formed the

second part of a series of conferences on 'Virtual Palaces', organised by PALATIUM, an international scholarly network funded by the ESF and dedicated research on 'Court Residences as Places of Exchange in Late Medieval and Early Modern Europe (1400-1700)'. In 2011, the first workshop in Leuven in 2011 dealt with modes of recording and surveying existing palaces, preserved interiors or ruins and explored issues of maintenance as well as the development of digital techniques in this field.[10]

Organized jointly by the Institute for Art History at the Ludwig-Maximilians-Universität München (Stephan Hoppe) and by the Institute of Archaeology, Cultural Heritage and Art History at the Otto-Friedrich-Universität Bamberg (Stefan Breitling), the workshop in Munich focused on the virtual reconstruction of lost palaces and its theoretical impact. Digital architectural models and virtual reconstructions have long been integrated into the day-to-day academic work at both institutions: they are used for teaching as well as constitute a tool for research and an object of research.

As a main result of the conference, it has become clear that by now digital reconstructions have turned into a complex medium of historical reconstruction not to be disregarded by researchers in art history and architectural history. The quality and range of the models and projects presented are impressive, as is the diversity of the approaches employed by the models'-builders. The scholarly impact of digital models has to be planned very carefully: therefore the theoretical basis and its parameters need to be queried for each single case study. In particular, the following issues are crucial contributions to the debate: What is the best way to provide the spectator with a convincing and intriguing picture of past eras? Or should they be allowed to reach their own conclusions by a method that provides them with the necessary information and leads them to the right questions? Equally important are queries regarding data maintenance, regarding access to the database through supporting systems and regarding the accessibility of a digital model to later change.

The first essay in this volume aims to give an introductory historical survey, charting the early stages of the use of digital architectural models in art history since the 1980s. This chapter was added to the conference presentations since it provides a systematic gateway to the general topic. It is based on Heike Messemer's doctoral research on the subject of the genesis and typology of digital models of historical architecture during the post-classical period. Such an overview of early types, uses and target groups of digital models in the context of sacred and courtly architecture attests to its importance and originality in the history of art.

The contribution by Michael Rykl likewise approaches the subject of digital architectural models of medieval castles from a historical vantage point. By using Czech examples, he demonstrates how the experience made in traditional reconstructions of castles and élite dwellings in the field of building archaeology could be transferred to the visual conception of digital images.

In the third essay, Sander Münster and Thomas Köhler discuss diverse virtual reconstruction projects and aim for a synthesis by way of sociological analysis. The contribution raises the issue of the academic audience of virtual architectural models. Statistics based on an in-depth analysis of literary sources including websites and e-publications on current projects underpin their research. In Italy and Spain, for instance, e-publications discussing virtual models of palace architecture document a substantial part of research, whereas most of the northern European countries continue with traditional publications in the field of history. North of the Alps, e-publications concerned with virtual modelling remain largely for a matter for computing specialists and aim for completely different target groups.

The following chapter composed by the architects Dominik Lengyel and Catherine Toulouse explores the formal and visual conditions for building of scientific digital reconstructions. One of the main issues that determine the scientific model as both a database and a digital image is the issue of how to handle sharpness and uncertainty of historical evidence and how to display it in the digital reconstruction. Depending on the concentration of archaeological or historical knowledge, every model includes parts defined by diverse levels of historical and architectural sharpness. The thoughtfully prepared and communicated principles, forming the basis of the high-end Pergamon model, allow the audience to take part in the archaeological discussion on the reconstruction of this famous place. This example made it particularly obvious that there is no 'pure' model making. Since the style of the large digital Pergamon model is strongly influenced by Neoclassicism, it not only provides scientific data but also information on the traditions of classical archaeology and architectural theory.

The colourful sketches and visualizations of the Cambodian residential metropolis of Angkor Thom by Tom Chandler and Martin Polkinghorne on the contrary attempt to show the rich tapestry of daily life and thereby represent the wider cultural context. The study presents a very interesting way of dealing with uncertainty by revealing the sources and the reconstruction process for every detail. It offers divers solutions for the reconstruction of highly uncertain parts, so that one may follow the implications of a range of assumptions. The cartoon-like drawings help the viewer to understand them as a reconstruction in progress and to reserve their judgement. Digital technology makes it possible to provide simultaneous access to all of these layers and thus to create an interactive communicative basis.

The essay by Marc Grellert and Franziska Haas demonstrates the value of digital models when employed as knowledge transfer strategy for lost building structures by using new digital models as well as haptic models of 17th century Dresden and her castle (Residenzschloss). The main result of the work so far, includes a rapid prototyping plaster print of the castle and its spacious environs as well as a virtual tour through the streets, courtyards and selected interiors of the former residential palace in 1678. In addition, the Dresden example demonstrates the potential of the rapid prototyping models for research and as possible strategies when dealing with 'gaps' in the available information.

The specialized discipline of building archaeology (Bauforschung) has a rich tradition of model making. Linked to the field of conservation, it is both descriptive and analytic, since this kind of models tries to show fragmentary evidence in its spatial context and thus to explain complex architectural situations. In addition to the Czech examples given by Michael Rykl, the chapter written by Olaf Wagener, Christian Seitz and Sven Havemann and the one composed by Stefan Breitling, Martin Buba and Jan Fuhrmann show additional examples of and distinctive approaches to making historical building fabric readable. Therefore, virtual models are a useful tool for non-destructive archaeological research as well as for defining the historical impact and cultural wealth of architectural remains and sites. Here, we also find digital modelling used as an interactive tool for scientific research. With the availability of airborne landscape scans, also the scenic context of architecture may be modelled. This innovative technique leads to the analysis of historical views from and to castles or to the reconstruction of the reach of medieval firearms on the basis of the charted impact of missiles. It also serves as an appropriate kind of research tool to locate and geo-reference historical evidence as well as displaced or lost objects in architectural and landscape models.

Virtual reconstructions can be understood and implemented as spaces of specialized knowledge. As sets of data they may contain single pieces of information such as construction data, source extracts, surveys and documentation embedded in a multidimensional context. Visually presented space is thus enriched by a range of meta-information and thereby acts as a metaphor for the spatially-organized 'interface', which refers to an essential scientific framework. Wherever rich literary sources are available, the digital model may adapt to diverse realities described rather than keep the same focus throughout.

Ever since the start of a research project on the 16th-century inventory of the 5th Duque of Bragança, D. Teodósio I, drawn up for the palace of Vila Viçosa in Portugal, the spatial dimension has played a central role. While the palace has repeatedly undergone structural changes up to the present day, the documentation under investigation in combination with an interpretation of the building existing today, one may virtually rebuild its architecture as an unique approach to the history of this ducal house. The essay by Ana Catarina G. Lopes reports on how the research team develops their project, for example the registration of all the metric and geometric information as well as architectural and topographical surveys, including photogrammetry. The architectural model is fundamental for the acquisition of a tool that allows for the testing and for the clarification of the types, forms, functions and geometries of this building complex, while also permitting to launch interpretations related to the artistic domain and functional programme. Finally, it ought to help with the evaluation of the possible impact of subsequent construction phases.

For certain kinds of scientific usage the image as the result of research is less interesting than the principles, on which the reconstruction is based, such as the overlaying historical evidence, historical plans, analogies and the probability of a plan. The visualization of Rubens's Palace projects for the 17th-century Antwerp Nieuwstadt by Piet Lombaerde and Marc Muylle is

based on such principles. This radical approach to the creative use of diverse and experimental digital models for architectural research is of great value for educational use. To place Italian-style palaces virtually in the northern city and to compare their plans and architectural features to the neighbouring buildings from different periods clarifies the reasons for a regional building traditions and helps with its evaluation. If students study the history of architecture in this way, they practise their skills in architectural drawing as well as in 3D-construction while also getting a deeper insight in the constrictions set by climate and geomorphology and in the principles of historic architecture and town planning at the same time.

The interactive open-source internet-based project by Alexandra Gago da Câmara, Helena Murteira and Paulo Rodrigues regarding the reconstruction of pre-earthquake Lisbon is based on the painstaking collection of every detail known about the almost entirely devastated older town. Therefore, the virtual model helps at the same time to cope with the shock brought by catastrophe and to fill the gaps in the memorial culture of a community.

The close link between research and model-making allows for the prudent organization and management of larger reconstruction projects such as the Dresden Zwinger project presented by Peter Heinrich Jahn, Markus Wacker and Dirk Welich. The model making actually provides deep insights in the historical and topographical situation of past times, but also into the skills and methods of the builders of this past. In this way, the building of a model turns into a process parallel to the complex planning of a masterpiece of 18th-century architecture.

The essays of this volume make evident the strong relations between the new digital models and more traditional forms of visualizations, such as isometric drawings or analogue models. While the digital architectural scale model is still a new medium there is neither a consensus about its theoretical foundations nor much awareness of the outcome at present. The models presented here differ much more from one another than a first glimpse on the visual results may suggest. Every model has its own specific starting point as a project, its own medial conception and its own techniques to deal with issues of space, types, content and visuality. The controversy about what is 'permissible' in scientific digital modelling, emphasizes the need to set clear parameters and paradigms that determine a digital model. The seemingly incomparable variety of approaches to the use of digital models as a tool for research shows clearly that we are only starting out in this field. Furthermore, it is obvious that every digital reconstruction and its renderings have their own style. Therefore, not only the technical possibilities and restrictions distinguish digital models. It also becomes possible to understand the intellectual background and the idea of what exactly constitutes history subscribed to by the contractors involved. The images these models create and the knowledge they transmit are deeply rooted in long-term cultural debates. In the end, such visualization of a great variety of aspects may well be one of the main qualities provided by the medium. Obviously, the digital reconstruction is flexible enough to be adaptable to different purposes and approaches and is able to build up a rich model of the past. In this sense, even now virtual models present very interesting objects for future scholarly research.

Unfortunately, most current projects do not have an answer to the question of what to do with the enormous collections of data that are necessary for making the reconstructions.[11] Future projects must evaluate the scientific achievements gained even by the architectural investigation of well-known historical data. A crucial issue at stake regarding further scientific exploitation relates to how these collections of data might be used as a pool of knowledge for research on residences and how expensive digital models might be extended or changed later on. As a result, the imaginary worlds created and manipulated by the extensive use of digital reconstructions, computer networks, external knowledge bases and internet references as well as the development of interactive games and internet tools therefore need to be supported by scientific discourse. Museums and archives for these immaterial cultural goods are thus an essential requirement.

In conclusion it remains for us to point out that the international standards in building digital models of lost palaces are rising steadily. Most researchers in this field use virtual reconstructions to doublecheck their theses. Digital projects exist on most palaces of main national and international importance. The future will bring additional tools aimed at interactivity and data exchange. We are curious where this technology will take us. In any case to see so many models and to read about their building process seems very promising. Either way, the digital model building leads to a new debate about the virtuality of our perception of palaces and residences of medieval and pre-modern times and thereby about our way of reconstructing and understanding history. Moreover, there is the potential of helping us in sharing our imagination and knowledge. As long as it may be ensured that researchers and scholars gain access to collections of reconstructions to the data and to the underlying evidence virtual reconstructions via digital models may quickly become interactive pools of knowledge serving science and the media.

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[1] Elias, Norbert, *Die höfische Gesellschaft. Untersuchungen zur Soziologie des Königtums und der höfischen Aristokratie mit einer Einleitung Soziologie und Geschichtswissenschaft* (Neuwied, 1969). Several re-editions.

[2] In that sense, methodologically inspiring: Kerscher, Gottfried, *Kopfräume: Eine kleine Zeitreise durch virtuelle Räume* (Kiel, 2000). Cf. Handzel, Josef, Schichta, Gabriele and Schmid, Christina, 'Raumordnungen – Raumfunktionen und Ausstattungsmuster auf Adelssitzen im 14. bis 16. Jahrhundert', in *Raumstrukturen und Raumausstattung auf Burgen in Mittelalter und Früher Neuzeit*, ed. Christina Schmid, Gabriele Schichta, Thomas Kühtreiber and Kornelia Holzner-Tobisch (Heidelberg, 2015), pp. 15-66 with further bibliography.

[3] On the history of architectural scale models see: Lepik, Andres, *Das Architekturmodell in Italien 1335–1550* (Worms, 1994); Millon, Henry A. (ed.), *The triumph of the baroque. Architecture in Europe 1600–1750* (New York, 1999); Frommel, Sabine (ed.), *Les maquettes d'architecture* (Paris, 2015).

[4] For the discussion see Lengyel, Dominik and Toulouse, Catherine (ed.), *Projecting spaces. 9th international eaea conference 2009. Conference on Architectural Visualisation* (Dresden, 2011) and the initiative

'Digitale Rekonstruktion' at the Fachgebiet Informations- und Kommunikationstechnologie in der Architektur at the TU Darmstadt.

[5] Cf. the research project 'Virtuelle Rekonstruktionen in transnationalen Forschungsumgebungen – Das Portal: Schlösser und Parkanlagen im ehemaligen Ostpreußen' at the Herder Institute Marburg. Cf. Kuroczyński, Piotr, 'Digital Reconstruction and Virtual Research Environments – A matter of documentation standards', in *Access and Understanding – Networking in the Digital Era, Proceedings of the annual conference of CIDOC, Dresden, 06.09.-11.09.2014,* at www.cidoc2014.de/images/sampledata/cidoc/papers/L-1_Kuroczynski_paper.pdf (accessed on 11.02.2015).

[6] Bonner, Marc, 'Construction As A Condition To Win – Depiction Of Early Modern Architecture And Urban Landscapes In Strategy And Economic Simulation Games', in *Early Modernity and Video Games*, ed. Tobias Winnerling and Florian Kerschbaumer (Cambridge, 2014), pp. 91-104.

[7] Q.v. as a selection of the more important works from the field of archaeology: Reilly, Paul, Rahtz, Paul, *Archaeology and the information age. A global perspective* (London e.a., 1992); Forte, Maurizio and Siliotti, Alberto (eds.), *Virtual archaeology. Re-creating ancient worlds* (New York, 1997); Frischer, Bernard and Dakouri-Hild, Anastasia (eds.), *Beyond illustration. 2d and 3d digital technologies as tools for discovery in archaeology* (Oxford, 2008); Barceló, Juan A., Forte, Maurizio, and Sanders, Donald H. (eds.), *Virtual Reality in Archaeology* (Oxford, 2000).

[8] Novitski, B. J., *Rendering real and imagined buildings. The art of computer modeling from the Palace of Kublai Khan to Le Corbusier's Villas* (Gloucester, Massachusetts, 1998); Niccolucci, Franco (ed.), *Virtual archaeology. (Proceedings of the VAST Euroconference, Arezzo 24-25 November 2000)* (Oxford, 2002); Favro, Diane, 'In the eyes of the beholder: Virtual Reality re-creations and academia', in *Imaging ancient Rome. Documentation, visualization, imagination. (Proceedings of the Third Williams Symposium on Classical Architecture, 20.-23. Mai 2004 in Rome)*, ed. Lothar Haselberger (Portsmouth, 2006), pp. 321-334; Grellert, Marc, *Immaterielle Zeugnisse. Synagogen in Deutschland. Potentiale digitaler Technologien für das Erinnern zerstörter Architektur* (Bielefeld, 2007); Heine, Katja, Rheidt, Klaus, Henze, Frank and Riedel, Alexandra (eds.), *Erfassen, Modellieren, Visualisieren. Von Handaufmass bis High Tech III. 3D in der historischen Bauforschung (Interdisziplinäres Kolloquium vom 24.-27. Februar 2010, Brandenburgische Technische Universität Cottbus)* (Darmstadt/Mainz, 2011); Bentkowska-Kafel, Anna, Denard, Hugh and Baker, Drew (eds.), *Paradata and transparency in virtual heritage*, (Farnham/Burlington, 2012).

[9] From the field of art history: Frings, Marcus (ed.), *Der Modelle Tugend. CAD und die neuen Räume der Kunstgeschichte (Visual intelligence. Kulturtechniken der Sichtbarkeit, vol. 2)* (Weimar, 2001).

[10] Martens, Pieter (ed.) with the assistance of Heike Messemer, *Virtual Palaces, Part I. Digitizing and Modelling Palaces* (Leuven, 2016) (= PALATIUM *e*-Publications, vol. 2).

[11] Cf. Koller, David, 'Research challenges for digital archives of 3D cultural heritage models', *Journal on Computing and Cultural Heritage (JOCCH),* 2 (2010), pp. 1-17.