

From the critical digital model to the master model

Enhancing authorial drawings with the third dimension

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The critical digital model and the graphical dimension

In the last few decades, the demand for digital 3D reconstructions of never built or no more existent architecture has extensively increased in both the academic and entertainment fields. Even though the objectives are very different, the methodologies are similar; the studies that try to define shared standards and guidelines in these fields are fostering scientific research (Kuroczyński et. al, 2016). Nevertheless, there are still several critical points regarding the methodologies used for historical digital reconstructions. Too often in the field of 3D reconstruction of cultural heritage the surface appearance (shading/texturing) is overlooked as opposed to the geometry/shape of the object of reconstruction, which is usually more documented and better communicated; however, it plays an equally important role in the dissemination and interpretation of the past.

The topic of this research has been inspired by the lack of focus on the traceability/objectivity of the surface appearance, the lack of attention to the problem of misinterpretations caused by the indiscriminate use of photorealistic and non-photorealistic shading styles, and the loss of information during the reconstruction process. In particular, the study proposes the idea of considering the model not only as a hypothetic "what if" represented with the visualization techniques of our time but also as a critical digital version of the two-dimensional reference drawings (Fig. 1., Fig. 2.).

The concept of "critical edition" comes from the "ecdotic" field. The critical edition of a book is the attempt to re-establishing the original form of an ancient book based on additional sources. Thus, the critical digital model (CDM) is the attempt to transfer this concept to the digital 3D reconstruction of never built or no more existing architectural heritage. The proposal is to consider the 3D model as a palimpsest of the ubiquitous geometrical/formal aspects conjugated with other more intangible aspects such as the aesthetic of the strokes, the graphical quality of the drawing, the cultural value of the use of colours and hatches, the quality of the spaces directly perceivable by the draw, the intrinsic cultural and historical value of all these and other aspects directly retrievable from the original drawings.

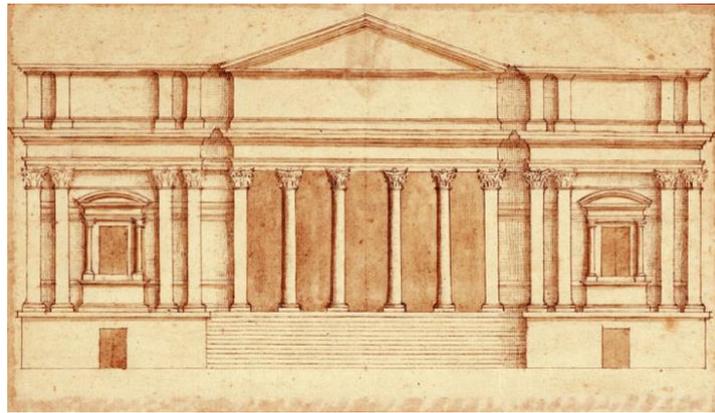
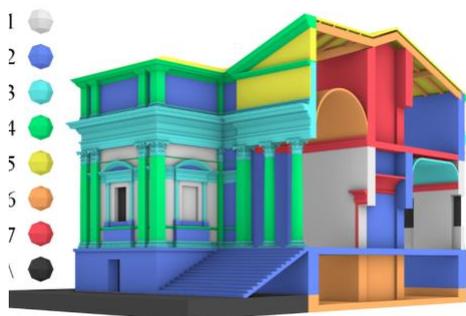


Fig. 1. Andrea Palladio, Villa Pisani, Bagnolo, RIBA collection, XVII/16 (Palladio, 1560)



a



b

Fig. 2. a) false colour shading to communicate the level of uncertainty of the CDM; b) 3D CDM shaded with procedural shading inspired by the original drawing.

The exploration of the third dimension often obfuscates the no less important graphical dimension intended as a language and as a medium to catch a glimpse of the culture and ability of the author in its time. These important aspects, typical of the representation subject, remain too often confined into the reference documentation and they are usually no longer visible in the final views of the model, this disconnection from the sources and the final views of the models often leads to misinterpretations, especially from laypersons who usually do not study in depth the textual reference documentation.

Future of the CDM

The CDM includes in its core concepts the aspirations to maximum objectivity and transparent documentation, already widely adopted in the academic field for scientific 3D reconstructions in general; nevertheless, it focuses particularly on the concepts of clear visual communication, and the continuity between model and sources, putting particular effort on the preservation of the original vision/style of the author.

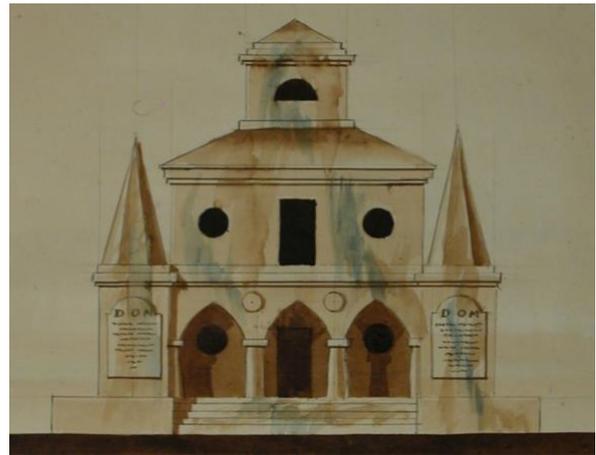
In the CDM, when an objective photorealistic texturing/shading of the model is not possible or not enough documented, the use of multiple non-photorealistic visualization strategies is encouraged, as an alternative to the photorealistic solution, or as an additional output visual style. Many NPR strategies can be used to embed additional information onto the model, such as the projection of the sources (drawing, sketches, paintings, etc.) directly on the surfaces of the model (Fig. 3 a,b), or the use of false colours to indicate particular characteristics of single elements (such as the level of

uncertainty or the type/age of the sources used, the period of construction of a particular element, etc.). A photorealistic shading/texturing, in order to be considered as a valid alternative for the CDM, must be visually communicated properly in order to avoid misconceptions, for example, pairing the photorealistic view with another false-colours view (Fig. 2. a) might be a good solution to give a direct and clear feedback on the uncertainty not only of the geometry but also of the textures.

The CDM could be a virtuous master model of reference for all those future works that will aspire to be not only scientifically valid (which would require providing good, clear and objective documentation) but also aspires to be properly visually communicated and to preserve the original graphic style of the original author.



a



b

Fig. 3. Mauro Guidi, *Sepolcro antico di figura quadrata con portico di due gradini*, Cesena Nuova, *Atlante 41, Carta 48* (Guidi, 1790); a) 3D CDM with sources projected as textures; b) Source by Guidi

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