

# Reconstructive Architectural and Urban Digital Modelling

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## INTRODUCTION

The digital reconstruction of contemporary architectural and urban complexes which were demolished, transformed or have been only theatrically conceived, remaining ‘on paper’, is now a tool of considerable heuristic value, allowing to preserve, interpret and create new images of cultural heritages that no longer exist in their original shape or never reached a material construction.

This chapter reviews methods and techniques of digital reconstruction, through an overview of the international theoretical statements, and then the author explores the potentials of three-dimensional reconstruction and the prerogatives of animation in the interaction with three-dimensional data.

The examination of several international case studies, and also some experiences personally conducted highlights the different strategies used for the preservation of the memory of such heritage.

## BACKGROUND

The theme of the digital reconstruction of architectural and urban complexes is currently the subject of interest for many scholars and a field of convergence of different disciplinary viewpoints ranging from history of architecture, urban studies and environmental psychology.

This chapter privileges the point of view that takes as the central moment of the reconstruction the creation of interpretative digital models of a series of knowledge assumed through interdisciplinary researches. The relationship between architectural and urban dimensions is thought

seamless: the architectural complex, object of study, must be related to the urban context in which it was designed or it spent a special time in its life or it could live today, and the reciprocal transformations must be carefully recorded. In this way the object itself takes on an urban meaning. There could be several aims of reconstruction that, in this research ambit, goes beyond the mere iconographic documentation, to provide scientifically plausible readings of the analysed phenomena.

Several reconstruction techniques are inspired by Pagnano, Docci and Albisinni’s theories and methodologies of graphical analysis, applied to the design drawing as well to realize buildings, thanks to which the drawing can be identified with the model of understanding (Pagnano, 1975; Docci, 2009; Albisinni, 2011).

The scholars, adopting this method, re-draw and, or, re-model the space and use the graphic model as scientists reproducing artificially a certain phenomenon in the laboratory.

Reconstructive 3D modeling allows reviving an architecture and its relationships with the context, whether it is partly, or totally, lost, or hidden in the body of a building heavily altered, or, finally, it is going to be irreversibly transformed.

Representation and communication concern the knowledge data and their interpretation, resulting from the documentation phases. The digital models are the most useful database for collecting and synthesizing these analyses.

The modeling is therefore a cognitive strategy in which the idea of similarity, in comparison with the reality, plays a decisive role, a strategy that is utilized in different ways depending on which kind of model it is going to carry out (Gaiani, 2004)

There are several stages in the 3D reconstruction of a built complex. These include the gathering of the source information, the interpretation of this information, the comparison with contemporaneous examples, the development of 2D blueprints and/or 3D geometric (or parametric) models of the building and its context, the texture mapping, the addition of lights and, finally, the rendering.

Transforming several drawings into a digital model is a process which changes one model into another and deserves some attention. It is, as a matter of fact, not a simple variation without alteration of contents, but, on the contrary, it modifies, from time to time, “the wealth of the model, its expressive potentiality. In fact, the transmutations of the models are moved by the interpretative intent of the scholar, and they converge, therefore, toward an abstract model... that we can identify in the project idea” (Migliari, 2004).

The creation of a 3D digital model offers, as a result, infinite possibilities of observation and survey: from the objective visualization of a cylindrical projection, orthographic or isometric, to that subjective of a conical projection, perspective (Spallone, 2007). The model thus becomes an essential tool to check and control the validity of reconstructive hypotheses and the congruence between the building elements.

Moreover 3D computer models allow more enhanced and controlled interaction between users and models; they are able to cover the whole range of possible models in a single system of representation (Maldonado, 2005).

*Conceived as real maquettes, which live in a virtual space perfectly corresponding to the real one, so much to offer all the four dimensions, the models carried out by means of computer are then observed through a screen..., with capacities to vary the point of view in order to simulate the mobility and the transformability in the time and in the appearance. (Gaiani, 2004)*

In the operational strategy that ascertains the models attributes, a central moment is the

definition of the ratio between representation/visualization scale and modeling details. Since all the models are simplifications and schematizations of the reality, there is always a difference between the real and the details that are included in the model.

*Even a very detailed graphic reconstruction, of an architectural product, aimed at giving the viewer a stimulating image of reality, will always necessarily be the result of a synthesis... A synthesis always implies the exploitation of specific aspects to the detriment of others and consequently a data loss. (Galifi, Moretti, & Aoyagi, 2002)*

The increasingly enhancements of digital technologies also in the ambit of renderings, in many reconstructions, appear in the ability to produce high-level photorealistic imagery: digital processed images seem to be photographs of a real object, represented as if it had just been built. In this case, photorealism become sometimes hyper-realism overcoming the limits of truth likeness.

It is the reason why the author prefers the conceptual 3D models to which materials like clay are applied to the opaque surfaces, and glass to the transparent ones, for simulating physical plastic models. This latter kind of render allows to appreciate the shape generation, the geometric relationships between the building and its context, the perception of the interior and exterior spaces. When the model becomes part of an animated sequence, only some stop-images could be rendered by soft realistic imagery.

In any case the author shares with Ogleby the idea that “what is lacking presently is both an ontology for visual literacy in the area of virtual heritage, and some method of adding to the viewer’s understanding through the supply of supporting information” (Ogleby, 2007).

The ability to access the fourth dimension, through the construction of a sequence of images, constitutes a specific prerogative of the digital representation, which goes beyond the static constraint imposed by the conventional

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