Chapter 24
On Visual Computing for Architectural Heritage

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ABSTRACT

Aim of the chapter is to present a critical discourse on the use of visual computing for the study of historic architecture. From the analysis of the experiences in other scientific fields and of current researches in the architectural one, the paper highlights how visual computing has become an important approach in built heritage study and how it could favor new lines, in particular according to the non-linear spatial narratives of the 3D models. They are useful to analyze and describe the buildings and provide an aggregative core for the heterogeneous bulk of information related to historic buildings (drawings, texts, images, data, metadata, etc.). In this way visual architectural modeling and database modeling correlate together, and the whole system gives rise to complex informative models – manipulable, navigable and interactive –, helpful for the understanding, knowledge, preservation, communication and enhancement of architectural heritage.

INTRODUCTION

The constant growth of digital technologies for surveying, modeling, and visualization of architectural heritage – in particular thanks to low cost applications – made them an inescapable part of the everyday practice of professionals and academics. In the early experiences, the digital representation had the simple purpose of visualizing the results of a research; now we have reached the awareness that digital simulation can be a completing aspect of the research process.

Historical buildings present peculiar characteristics compared to other kind of cultural heritage: It is a complex system of spaces, volumes, materials, surfaces, constructive aspects, actual and past functions, etc. The whole is the result of a continuous historical process of modification and transformation: In fact architecture can be interpreted as a "hand-made", where its characteristics are witnesses of constructive cultures and of events occurred during the life of the building.

Not secondary are "context" issues: We cannot consider an architectural heritage in isolation from what surrounds it, because it is an inescapable part of the historicized landscape.

In addition, archival and bibliographic studies are ineludible in the study of architecture and they implement issues of data organization and cataloguing, of information computing, of relationships between data, information, and digital models. In many ways, they configure a complex system of large amounts of cultural, historical, spatial, numerical, topographical, morphological, topological data, etc. – on the edge of Big Data –. In fact in architectural studying we have surveying data (for example point clouds); 2D and 3D interpretative models; graphics; images; text documents; photographs; comparative, metrological, proportional, historical analysis; studies on the degradation, structures, materials; historical project documents; etc. Moreover, it is necessary the study of other works of the same architect/s, artisans and, workforces, and the analysis of buildings referable to the same period and to the same architectural culture. In general, the architecture embodies a complex system given by the synthesis of society, culture, history, economy and technology.

The analysis of an architectural heritage is a knowledge process, and visual computing favors the interrelated and interactive set of actions of remote sensing, modeling, rendering, and document's correlation and visualization.

The 3D model cannot be reduced to the outcomes of a series of automatic processes from measurement to rendering (even technologically refined), but it has to be the result of an historical-critical knowledge process of architectural data interpretation. It is a critical problem not only of reconstruction, but also of understanding and description. It is a simulation not only of the spatial and perceptive qualities, but also of the actuality, historicity, aura, genius loci, and cultural values of architectural heritage.

Thus the digital model has to be an informative scientific and interpretative tool: Necessary it is a complex media model that allows new visual computing for communication and knowledge (Brusaporci, 2015).

Briefly, the study of visual computing for architectural heritage essentially can be summarized in the issues implemented by the two models in the game, and by the mutual relations between these two "worlds": The digital 3D model, per se the bearer of spatial, metrical, and material information; the database model that collects and / or refers to the complex, heterogeneous and vast heap of data, related to the historical building and to its context.

BACKGROUND

Visual Computing in Arts and Humanities

Visual computing is an analysis technique based on the visual representation of data. It favors the study of large amount of data, and of complex systems of heterogeneous data (textual, visual, audio, etc.). Those data can derive from various kinds or phenomena, also from non-visual ones. Visual computing consists in the representation of three-dimensional digital environments, where there is a complex interaction of an elevated number of agents simulating different kinds of data and information. The images of data provide information and through the manipulation of the images, we can observe, interact with, compute and control the data and the information, and create new knowledge (Card et al. 1999).

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