Chapter 15

Parametric Modeling as a Tool of Analysis and Interpretation of Built Heritage: The Case Study of Complex Baroque Vaults

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ABSTRACT

In this chapter are developed some considerations about the heuristic potentialities of parametric digital modeling as a tool for analyzing and interpreting architectural heritage. Observed that the parametric thinking in architecture could be recognized almost from the origin, new parametric modeling software allows to verify the design criteria of the past. On the basis of previous studies on Baroque vaulted atria, this chapter develops, using parametric modeling tools, a real vocabulary of shapes and their possible combinations, suggested by the architectural literature of the time and the survey of about seventy atria in Turin. This method has been tested on the case study of the lunettes dome in the atrium of Palazzo Carignano.

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INTRODUCTION

Parametric digital modeling is today at the center of architectural designers and critics interests.

Increasing potentialities and developments of hardware and software allow to apply parametric methods in the whole design process. But the definition of Architettura Parametrica has an older origin: it was coined by Luigi Moretti in the Forties. Moreover, some examples of parametric thinking were found by several scholars almost since the origin of architectural history.

Previous researches on the complex unitary vaults in the Baroque atria of Turin (Spallone & Vitali, 2017) highlighted that, among over seventy vaulted atria of this kind, many presented recurrent shapes, but not identical. It seemed that, from a relatively reduced number of models, a lot of new shapes, with some variants and different combinations, derived. This was also observed by Augusto Cavallari Murat (Cavallari Murat, 1957), who spoke of a “formula” for interpreting these vaults. The research carried out in 2017 focused on the analysis, interpretation and parametric modeling of homogeneous classes of complex vaulted systems, in particular the so-called Planterian vaults (Vitali, 2017b).

The research presented in this chapter arises as a development of the previous ones: using as a knowledge base one of the most rigorous manual, both on geometric and constructive point of view, the Geometria pratica by Giovanni Curioni (Curioni, 1868), the authors propose and verify by parametric digital modeling a classification of shapes and their possible combinations.

An additional consideration must be made about the definition and description of the formal elements used for the construction of system of vaults. In this regard, within the form-making practices, shape-grammar studies represent a consolidated and systematic methodology that can open interesting research developments. In the case of the digital interpretation and re-construction of complex vault systems, it would be more appropriate to refer to continuous surfaces and their grammar and to a relations’ syntax that connect them.

These latter considerations, which are related to a grammatical and syntactic structure of vaults, not only had a remarkable influence on the parametric model’s construction, but they also offer a valid starting point for the definition of a repeatable methodology that could be used to study several complex vault systems; this aspect could also be one of the most prominent developments of the present research.

Finally, the authors develop a case study referred to built architecture.

While the researches of 2017 concerned the Planterian vaults, as we said above, today’s case study focuses on the Guarinian vault in the atrium of Palazzo Carignano, which could be considered as the first example of star-shaped vault, made by a lunettes vault on an oval plan.

BACKGROUND

The Parametric Thinking in the Architectural Heritage

The launch of Parametricist Manifesto, Parametricism as Style in 2008, by Patrik Schumacher, had a largely antagonistic response from critics, theorists, and scholars that aimed to demonstrate the presence of a “parametric thinking” in the architecture of the past.

Among the most interesting references precursors of the current developments in parametric architecture, there is the deep and complex theoretical contribution that Luigi Moretti expressed in the post-war period on the pages of the magazine “Space” which he founded in 1950 and was director.