Chapter 19
Computational Design and Built Environments:
The Quest for an Alternative Role of the Digital in Architecture

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ABSTRACT

Drawing has always been the most powerful instrument for the conceptualization, interpretation and representation of spaces and forms. Today, the computer screen complements the eye-brain telescope with an additional lens that increases the ability to understand, visualize and ultimately design the built environment. Computational design is dramatically shifting not only established drawing and modeling practices, but also – and perhaps most importantly – design thinking processes in the very conception and morphogenesis of forms and of their complex relationships in space. Specifically parametric modeling allows to understand geometry and manipulate shapes in dynamic, articulated and yet intuitive ways, opening up unprecedented design opportunities but also diminishing the importance of the design process for the sake of formal complexity. This chapters offers some insights on the incredible design opportunities offered by new computational instruments, as well as highlighting circumstances in which the act of 'modeling' takes over the 'design.'

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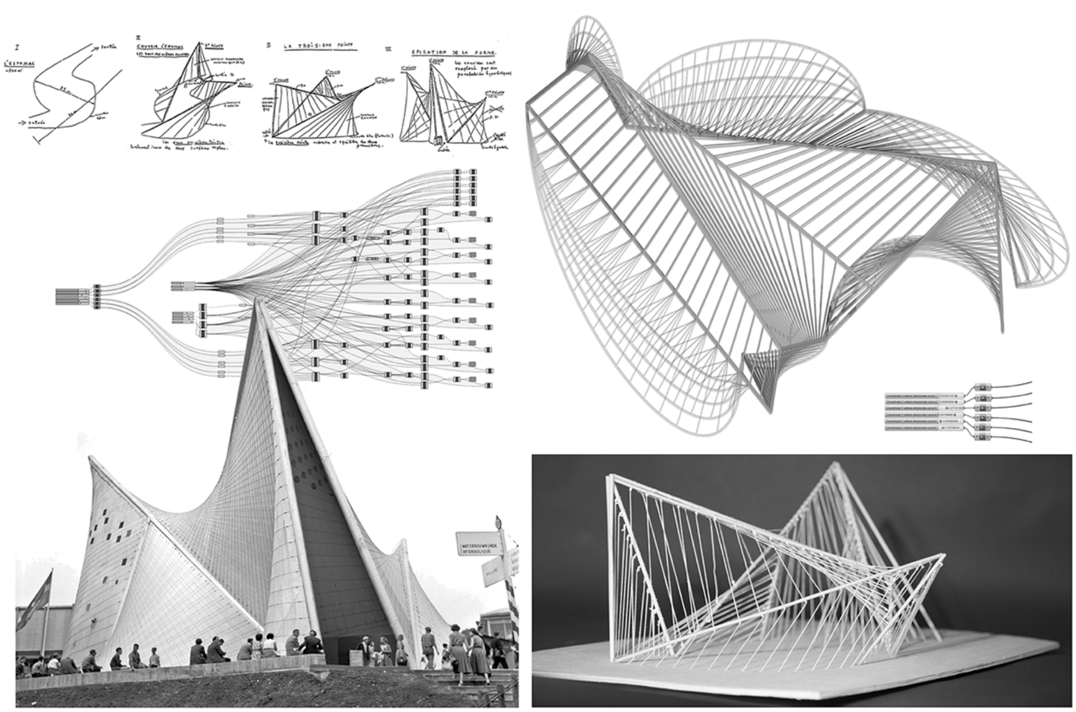
INTRODUCTION

Drawing can be considered as the "logical instrument" that humans have always used for trying to understand and envision their surrounding reality (de Rubertis, 1994). Another "logical instrument" geometry articulates precisely the rules of drawing, acting as a fundamental support of scientific representation (Migliari, 2000). In this field the digital revolution has fostered the development of rigorous representation methods. The syntactic and purely mathematical alphabet of the computer is now able to create synthetic elements and morphological patterns, eventually providing models of an either existing or envisioned physical environment. Computational design indeed has a tremendous intrinsic power of formal modeling, with potentially infinite spatial possibilities and configurations. For quite some time this ability was in the hands of skillful programmers who were able to manipulate scripts and algorithms for 3D modeling. Over the last few years though, parametric software have evolved in such a way that mastering coding is not a necessary prerequisite anymore. In fact, relatively intuitive visual interfaces of parametric software such as Rhinoceros Grasshopper, Catia Digital Project or Autodesk Dynamo make clear to the designer not only the geometrical proprieties of forms, but also the relationships between them to create complex compositions. These environments also facilitate and make easier the use of scripts to integrate their modeling limitations. Today's open source and sharing culture in fact pushes towards that direction, allowing to borrow codes from the web and manipulating them for specific design needs. Basic coding skills so become sufficient for designers to embrace the potentials of computational design.

The digital language of parametric modeling can be thus expressed by a visual interface translating software procedural logic that would otherwise be formulated through strings of codes that are usually

Figure 1. Models of Le Corbusier's Philips Pavilion
(Student's work, University of Perugia)



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