Chapter 4
The Post-Parametric Attitude in the Digital Materialization of Architecture:
Beyond the Automation in Representation towards the Emerging Digital Fabrication

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ABSTRACT

The purpose of this essay is to outline a particular evolution path of digital achievements and improvements in architecture. The author depicts the historical emergence of the digital in architecture presenting a sequence of world-renowned and pioneering researches focusing the dissertation on the materiality feature of the digital designs. The author paraphrases several scientific papers and books using the designer's words to support his story telling. In this way, this chapter proposes not only an illustration of several researches that go beyond the boundaries of computational thought. The author argues his standpoint that is the awareness of materiality as the substantial feature of architecture. The digital tools and any further related improvement of powerful parametric logics for design require the physical objecthood of fabrication to really enrich architecture. The chapter does not illustrate an own research project; it neither aims to establish a digital workflow for the digital fabrication of architecture. Rather it aims to highlight the fallacy of digital productions (in the meaning of simplistic virtual representation), pointing out the material instance as the address of the advancing of the digital as a method. The increasing availability of technical equipment kits should not be confused with the potential of the computation for architecture. According to these premises, it is necessary to start to examine some of the cornerstones of the last century to support the validation of digital fabrication and robotics as a powerful research field.

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THE INITIAL DEVELOPMENT OF DIGITAL TOOLS: THE RELENTLESS IMPLEMENTATION OF CAD SOFTWARE AS DESIGN LOGIC

In the last three decades Information Technology has forcefully entered into our design habits. Nowadays, the computational power of computers has increased substantially, to the extent that they have become unavoidable resources. Their overwhelming spread permeates architectural debate so much that nowadays-architectural design is inconceivable without the use of computers.

The year 1963 is taken symbolically as the starting date of the digital turn in architecture. In fact, in January of that year Ivan Sutherland presented the first edition of Sketchpad during his PhD dissertation at the MIT Lincoln Laboratory. The program handled input data in a clever way and it pioneered the use of objects and instances in computing. This groundbreaking software application represents the catalysing breakthrough in the development of computer graphics and thus it can be considered as the ancestor of modern Computer Aided Architectural Design (CAAD) programs. It was not only a simple electronic evolution of the drafting table that makes it easy to draw repetitive or highly accurate drawings. Indeed, it was the first man-machine graphical communication system: "The system contains input, output and computation programs which enable it to interpret information drawn directly on a computer screen" (Sutherland, 1963, p. 2). The user directly designed on the computer display employing the devised light pen. Theretofore, in most cases the communication between man and computers had been limited by the need to reduce the statement to written strings that could be typed on a keyboard. A 2D drawing made by Sketchpad was entirely different from the trail of graphite left on a piece of paper. Furthermore, it was not only a light that appeared on the screen. Through the language of the light pen the user set geometrical, topological and structural conditions and the program processed the input data to build up a drawn output. The software, developed for the Lincoln TX-2 computer, disclosed an innovative way to directly represent on the screen collections of straight lines or to set constraints or even to copy drawings and their properties. Thus, Sketchpad was the first virtual environment that held information and data about the drawing.

During the following decades, computing power improved astonishingly and the CAAD software permeated the architectural field. Initially, CAAD software represented a new and more efficient way to draw architecture – a computerization of the usual practice. Architects could easily reproduce, within the infinite vector space of software, their own drawings by taking advantage of pre-set geometrical and mathematical functions. Furthermore, they could easily edit or copy their compositions on the computer. On the other hand, in parallel with this rapid technical advancement, scientific research delved into the epistemological roots of the digital tools. The era of automated drawings brought with itself an odd failure: it was not able to exploit the potential of the computer as a design method and it halted the digitization of drawings. The enlightening work of Alexander (1963) marked the need for rationality in order to achieve a solution to the increasing complexity of the digital design problem. Digitalization is a cultural achievement resulting from centuries of human engagement with logic. For this reason the computer is a fascinating instrument, one that motivates the designer to exploit the human potential for associative thinking in order to discover new organizing principles. So, virtual shapes and computer-aided representations are not the innovation of digital architecture. Instead of that, the embedded data and information is the keystone of the digital revolution. Architects who are able to manage their data stream and who implement their non-linear relation play the computer out solely as a design tool.

This historical account is well articulated by books, periodicals and by newly designed projects, above all. A great number of authors have depicted how the architectural context has taken on an