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From the built architecture to the design of the interface of Blender 3D

When the architectural result modifies the tool that generated it

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Synopsis

This research is focused on the interaction between the tools we use for architectural design and design itself and how this relation can produce new forms in architecture. At the same time, these built architectures, which are generated with software that was not designed for these architectural purposes, or rather, its users, are activating a new research in terms of improving and adapting the interface of these software to their use in an easier and more intuitive way for architects.

Key words: Parametric architecture, blender, user interface, design.

If it is true that "Media is the message" as Marshal Mc Luhan¹ claimed at the dawn of the digital age, it is also true that the tools we use are a fundamental part of the Architecture. The project comes from the interaction between our mind and the tools we utilize.

We can say with absolute certainty that the transition from traditional tools to its analogue digital ones has radically changed the architecture design. Our purpose is to try to understand how this happened and make some hypotheses about what we can expect for the future and how it can change the tools itself, and the way we interact, the interface.

The fundamental and paradigmatic difference between traditional analogue and contemporary digital instruments lies in the fact that today we have the possibility to use tools able to manipulate time.

The transition from the paper to the screen, at first, has changed considerably the way we work, but very little the way we think. This is because all the interfaces of digital drawing software were born with the precise intent of imitating the operational processes of the manual design on screen.

The real paradigm shift has occurred with the development of so-called parametric systems, which make it possible to go back and forth over time in a complex way. It is no longer only possible to draw and delete, but it was possible to manipulate the form in space and time.

This fact is comparable to that represented, for example, by the invention of the mechanical clock, the printed book or the perspective representation.

Mario Carpo², situates this origin in "some" moment of the beginning of the 90s, when the digital design and industrial production tools began to inspire new theories on design and the architects and theorists began to think that we could design and build something in unprecedented form³.

The theoretician of software history, Lev Manovich, points out in his book *Software takes command that working with 3D* animation software has conditioned the architectural imagination from both a metaphorical and a literal point of view⁴.

Project presentations and architectural research have begun to include variables generated with parametric software such as the pioneer Gregg Lynn's project for the New York Metropolitan Transportation Authority building (1994), generated from a cloud of points that are moved into space. Lynn has captured these movements and turned them into curves that make up his building proposal.

This project did not win the competition in which was taking part, but, as noted on the architect's webpage⁵, was "the first architectural project in history to use animation software to generate a form. A series of 'forces' representing traffic and pedestrian flow were modeled using the "Wavefront" software.

¹ Mc LUHAN, Marshall, 1964. *Understanding the media: The Extensions of Man* Berkley (USA): Gingko Press. ISBN 1-58423-073-8

² CARPO, Mario, 2009. *La desaparición de los idénticos La estandarización arquitectónica en la era de la reproducibilidad digital* in *La digitalización toma el mando*. Barcelona: Gustavo Gili, p. 59-67. ISBN 978 84 252 2275 7

³ *Ibidem*

⁴ MANOVICH Lev, 2013, *El software toma el mando [Software takes comand]*. Barcelona: UOC. ISBN 9788490298633.

⁵ GREG LYNN, 2018. GLFORM [online]. glform [accessed 20 february 2018] Retrieved from: <http://glform.com/>

Equally important was the exposure of architects to the new generation of modeling tools for commercial animation software in the 1990s. For twenty years, the main 3D modeling technique was to represent an object as a set of flat polygons. But in the mid-nineties, thanks to faster computer processing speeds and increased memory size, it was possible to offer another technique on desktop workstations: spline modeling.

This new technique of representation of form shifted architectural thinking away from modernist rectangular geometry and brought it closer to smooth and complex shapes elaborated by continuous curves.

Therefore, from the second half of the Nineties, the so-called BLOB aesthetics came to dominate the thinking of many architecture students, young architects and even some recognized "star" professionals such as Zaha Hadid, Eric Moss or UNStudio.

This was the consequence of moving from computer-aided CAD design software standards (such as AutoCAD) to software born for animation and special effects.

Traditionally, architects have created new projects starting from an existing type. A church, a private house or a railway station follow known typologies: spatial models that determined the layout of the space. Similarly, when designing the concrete details of a project, the architect has always chosen between different standard elements with known functions and shapes: columns, doors, windows, etc. In the twentieth century, mass-produced dwellings did nothing but accept this logic, which was eventually coded in the interfaces of CAD software and more recently in BIM software.

When Gregg Lynn, the company Asymptote, Lars Spuybroek and other young architects, started using 3D software in the early 1990s designed for other industries (computer animation, special effects, computer games and industrial design), he discovered that CAD programs for architects assumed that the basic components of a structure were rectangular shapes: but the 3D animation software did not start from the same assumptions. (In fact, splines were first introduced in computer graphics in 1962 by Pierre Bézier for use in computerized car design).

The exhibition held at the Pompidou Center in 2004 *Non-Standard Architectures*, which presented the work of 12 international teams of architects who had developed their research into the application of digital tools for the design of architectural elements, represent a milestone of this research. This exhibition allowed to measure the social, economic and political changes caused by the widespread implementation of non-standard production of architecture, design and urban territorial policies⁶.

It was not just a question of digital architecture or an exhibition of "virtual" architects concerned primarily with issues of representation (virtuality, hyperspace). The widespread use of applications based on algorithms involves transformations of design and production tools. A "non-standardized" architecture is a reflection on the language of this discipline and on its scope from the exploration of digital

⁶ MIGAYROU, Frédéric, 2003. *Architectures non standard*. Paris: Editions du Centre Pompidou. ISBN 2844262317

elements.

Following these arguments, we set ourselves the goal of hypothesizing future scenarios in the field of architectural projects with the use of software. To do this we will analyze the interaction process of Blender digital modeling software. This software rather than a drawing tool represents a further important step in the evolution of digital thought. This is not a paradigm shift, compared to the software of the early 90s, but an evolution of extraordinary importance. It represents a "suite" created to realize animation projects, that has the potential for a new kind of invention and manipulation of the space and the shapes of the architecture. The most interesting thing is the coexistence of different ways of manipulating objects. Some classics in architectural modeling such as Mesh and Nurbs, others closer to the world of animation such as Sculpting and Pencil. The fact that Blender is Open Source also makes it open to new yet unpredictable additions. But for that scope, as we have discussed several times in its annual covention "Blender Conference"⁷ its interface should be simplified and adapted to the architectural use.

Finally, it is important to underline how this process of evolution and re-search in the field of computer generated architecture proceeds in both directions. The tools of digital processing influence, as mentioned, the shape of the architecture. But loathing happens to the instruments themselves. They are in fact in turn modified and deeply influenced by the evolution of the architectural trend that they themselves contribute to develop and to modify their interface.

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⁷ BLENDER CONFERENCE, 2017. Blender Conference [online]. Blender Conference [accessed 20 february 2018] Retrieved from: <https://www.blender.org/conference/2017/>

Biography

Gianluca Emilio Ennio Vita. Architect specialized in architectural representation and communication and its relationship with the design of the project. He has developed a detailed knowledge of classical and digital representation. He has used and taught, both academic and professional field, a wide range of software for digital representation and parametric modelling, his research is focused on the theoretical aspect of the use of computer media as a tool for designing. He teaches computer graphics both in the Politecnico di Milano and in the Accademia di Belle Arti di Brera.