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The digital double. From original to variation: architectural representation in the digital era

Alexandra Maria Pascotescu[1*]

[1]Politechnical University of Timisoara, Romania. *alexandra.vitan@gmail.com

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Abstract

In the context of the second digital turn, as it is defined by Mario Carpo in his book *The Second Digital Turn, Design beyond Intelligence,* the architectural graphical representation suffers a fundamental transformation: the digital tools aren't anymore only passive tools used for execution, but active cognitive mediums which directly participate in the process of thinking and designing. These new mediums offer the possibility to generate new architectural forms and spaces that don't derivate anymore from a unique or canonical model, but from variational and iterrational dynamic systems. Thus, the traditional relationship between the original and its copy, in which the double is a faithful reproduction or a translation of a fixed prototype, is destabilized. In the digital logic, the "double" becomes autonomous, it becomes a variation, a unique instance of production.

Keywords: Architecture, Collaboration, Trust, Convergence, Digital Revolution, Architectural Representation, Generative Design

Introduction

In the context of the second digital turn, as it is defined by Mario Carpo, architectural representation suffers a radical shift. It is no longer about the translation of the idea from mind to paper or model, but more about a new active space of production, made possible by the new digital technologies that do not merely replicate but generate. Algorithms, parametric systems and artificial intelligence act now as cognitive agents, being able to influence the architectural thinking.

This paper examines the transition from traditional concepts of "original" and "copy/double" to a new logic of variation and interation. There are analysed the way generative digital tools define the meaning of representation and the way the "double" becomes an autonomous instance, produced by dates and algorithms. The research is part of a broader doctoral approach about architectural ideation and representation in the digital era and it adressing the brief of the FAST conference - Convergence - by analysing the emergent collaboration between human thinking and machine logique.

Literature Review

The theoretical foundation of this research is primarly based on the writings of Mario Carpo, especially *The Second Digital Turn,* where the author adresses the topic of digital fabrication. Carpo argues that we are assisting the end of the paradigm where architectural object is the result of an original idea, translated through drawings to a final built form. In contrast, today we are working with systems able to produce multipe and unique results that are algorithmically generated (Carpo, 2017).

In addition, Patrik Schumachers's *Autopoiesis of Architecture* offers a complementary background through the fact that it adresses the topic of architecture as autoreferential system (Schumacher, 2010) Parametricism, the new architectural style proposed by Schumacher, alligns with the logic of variation and iteration (Schumacher, 2012). In contrast, to fullfil the undeanding, the writings of Robin Evans and

Alberto Pérez-Gómez offer an historical-philosophical perspective about drawing as a medium between idea and project.

In this context, a significant opposition between the traditional vision on architectural representation and the new digital paradigma appears. On one hand, theoreticians as Robin Evans and Alberto Pérez-Gómez argue about the intermediate and mediatical character of the architecural drawing, which is seen not only as a tool able to translate idea into matter, but also as a space of negociation between intention, technical constrains and cultural context (Evans, 1997; Pérez-Gómez, 1997). On the other hand, the contemporary architectural thinking of Mario Carpo and Patrik Schumacher propose a radical mutation, the architectural representation isn't anymore only a faithful transcriprion of an idea, but it becomes an autoreferential system, capable of producing unlimited variations through algorithms and generative processes (Schumacher, 2010). Thus, the tension between these two opposite perspectives highlights the transformation of architectural representation from a passive tool of communication to an active medium of production.

Methodology

The research follows a theoretical and critical approach, based on the analysis of the contemporary architectural discourse and the comparison of the drawing methods before and after the second digital turn. The methodogology combines two main directions:

On one hand, a conceptual comparison between traditional architectural representation, seen as an instrument of translation of an idea through drawing or model, and the digital representation, seen as autoreferential and generative medium of parametric and algorithmic systems, as briefly presented in the literature review section.

And on the other hand, the study proposes a critical analysis of essential digital tools, such as parametric design platforms (for example Grasshopper for Rhino), algorithmical scripting (eg. Pyton), visual generation tools through artificial intelligence (eg. Midjourney,

DALL-E) and BIM platforms (Building Information Modeling). The analysis is based on how these tools can influence the relationship between architectal intention, graphical representation and final form. In this sense, the study proposes a structured investigation of four digital tools, which were selected for their signifiant impact both on the design process and on the way in which the drawing is understood.

The parametric design. Analysed through platforms as Grasshopper for Rhinoceros 3D, this instrument redefines drawing as a set of parametric and algorithmic relationships. It is observed how these tools allow the generation of multiple variants, opening up the possibility of an unlimited iterative process.

Algorithmical scripting. Languages like Phyton or C#, used together with dedicated plug-ins (Dynamo, Revit API) are investigated for their capacity to extend the functionalities of parametric platforms and for their ability to automate complexe working flows. For this part, it is important to analyse also the impact the tool has on the authorship of the project and on the process of validating the generated outcomes.

AI instruments. AI instruments like Midjournay si DALL-E are representantives of new text-based visual content generators, used often in the conceptual stage of the project. It is studied how the prompt becomes the new mediation tool between idea and representation, partially replacing the traditional process.

BIM platforms. Systems as Revit or Archicad are analysed for thie interface role between geometry, dates and multi-disciplinary collaboration. The accent in this case is on how drawing becomes only one of the multiple possible visions of an integrated database.

The analysis of the above presented tools is based on three case studies and examples of relevant projects from the contemporary practice (parametric facades, algorithmic pavillions, speculative AI competitions and colaborative BIM projects). The case studies are Elbhilharmonie, Hamburg, made by Herzog et de Meuron, where the architects usesd both BIM platforms for coordination and algorithmic scripting for customising the 1000 interior accustic pannels and the facade, Heydar Aliyev Center, designed by Zaha Hadid Architects,

where the parametric tools were used to generate the form of the building, VIA 57 West, designed by Bjarke Ingels Group where BIM platforms and parametric programs were used. The approach combines critical perspectives from architectural theory, the history of graphical representation and recent studies on digital tools.

Results

The results of the study highlights various essential paradigmatic mutations that define the transition from traditional architectural representation to digital representation.

Firstly, the relationship between the original and its copy or double shifts fundamentally. If in the traditional logique the double was a faithful copy of a fixed prototype, in the new digital paradigma, the double becomes a unique variation, algorithmically generated, without any immutable prototype. Secondly, the graphical representation stops being a simple medium of translation, it becomes an active medium of production, where dates, parameters and algorithms are directly involved into architectural form generation. At the same time, the author, the architect, no longer has absolute control over the result. Now the architect needs to collaborate with the machine, which becomes his cognitive "partener" which generates, filters and proposes alternatives. Also, the architectural ideation process gets an open and iterative character, in which one no longer pursues a single final result, but a series of possible outcomes, among which selection becomes an essential part of the creative act.

The comparative analysis of these aspects is synthesized in the following diagram (Table 1 - Conceptual shift in architectural representation), which clarifies the major diferences between the traditional logics of original and copy and the new digital logic based on variation and iteration. The diagram summarizes the differences in

central concept, the role of the drawing, the position of the architect, the nature of the resulting form and the type of representational logic.

Table 1 Conceptual shift in architectural representation

	Traditional	Digital
Central concept	Original and copy	Variation and iteration
Drawing	Means the translation of the architectural idea	Becomes a codified generative system
The role of the architect	Author	Curator/Editor
The resulted architectural form	Fixed, canonical	Open, nonrepetitive
The representation logique	Reproductive	Productive/Emergent
Role of digital tools	Passive execution	Active generative agent
Relationship to the idea	Mediation	Direct co-production

Besides these conceptual differences, the analysis of the investigated digital tools generated several specific findings.

Parametric design has demonstrated that parametric relationships replace fixed design with a flexible system, capable of generating multiple valid versions of the same architectural intent (for example in the cases of parametric facade studies).

Algorithmic scripting has highlightened the expansion of the designer's capabilities to automate repetitive processes and create rules for generating form that escape direct control. This approach shifts authority from drawing to code.

Generative artificial intelligence (Midjournay, DALL-E etc.) has brought the prompt into the picture as the main intergace between

idea and visualization. The results indicate a leap from traditional graphic skills to drafting and conceptual formulation skills, which profoundly changes the role of drawing as a mediation tool.

BIM platforms have demonstrated that architectural representation becomes only a "visualisation" of some integrated data, transforming the design process into a collaborative flow where the drawing as an object loses its centrality, being replaced by multidisciplinariy coordination models.

These findings show how each tool participates in redefining architectural representation as an emergent process, where the copy is no longer a faithful duplicate, but a unique instance, algorithmically generated or assisted by AI.

Discussion

Further, the implication of the transition from traditional drawing to digital fabrication are profound. On one hand, the generative tools offer an unprecendented formal freedom, being able to free the architectural design from rigid typologies. But on the other hand, such freedom rises a series of critical concerns. Firstly, the loss of the cultural reference, which rises the question on how to mantain the continuity and meaning of the architectural gesture in a context where the digital distances architectural significance from historical precedent. Secondly, the autoreferentiality of systems, and how the parametric models develop a internal rich formal logique which lacks semantics. If drawing or architectural representation doesn't mediate anymore between idea and form, but between sets of dates, architecture risks to become a formal game lacking substance. And thirdly, the epistemological change, where the author of the architectural object is destabilized. In a digital context, who is still the author, the architect, the programmer, the dataset, the algorithm?

These challanges reflect a more profound convergence, not only between technologies, but also between ways of thinking. Nowadays, architecture must adress these new tools critically, instead of only adopting them passivelly. Oherwise, architecture risks to become a by-product of the technological process, without any cultural meaning.

Conclusion

The article proposes a reassesment of the architectural representation through drawing in the digital era, where the traditional relationship between idea and form, original and copy, is replaced by a new logique of variation and iteration. The new digital tools become co-authors of the architectural idea or object, and the architectural representation becomes a generative process. The research invites to reflect on how architectural theory, practice and education must adapt to this new reality.

The future of architecture won't rely soley only on keeping the stilistical identity, but also on defining some critical frames through which these new generative tools could be understood, managed and perhapts even humanized. I believe that if they are consciously used, these technologies could potentially extend the creativity of the architect. Otherwise, the risk remains an architecture empty of cultural and symbolical meaning.

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Dublul digital. De la original la variație: reprezentarea arhitecturală în era digitală

(rezumat)

În contextul celei de-a doua transformări digitale, așa cum este definită de Mario Carpo în cartea sa The Second Digital Turn, Design beyond Intelligence, reprezentarea grafică arhitecturală suferă o transformare fundamentală: instrumentele digitale nu mai sunt doar unelte pasive utilizate pentru execuție, ci medii cognitive active care participă direct la procesul de gândire și proiectare. Aceste noi medii oferă posibilitatea de a genera forme și spații arhitecturale noi, care nu mai derivă dintr-un model unic sau canonic, ci din sisteme dinamice variaționale și iterative. Astfel, relația tradițională dintre original și copia sa, în care dublul este o reproducere fidelă sau o traducere a unui prototip fix, este destabilizată. În logica digitală, „dublul" devine autonom, transformându-se într-o variație, o instanță unică de producție.