



**Against the Standards. Generative Architectural Details
(Paper)**

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Abstract

The concept of standardization has been one that follows architecture since its modern conception during the Renaissance. It became an imperative with modern architecture and finally a norm in all aspects of design and construction. Standardization guarantees efficiency, performance and avoidance of mistakes. In that sense it is considered “*a blessed concentration of powers (that) can create the universal and generally recognized sense of taste*” as Hermann Muthesius proclaimed during the infamous argument he had with Henry van de Velde (Conrads, 1975).

The encounter of architecture with digital technologies however, initially followed a different route: as the term ‘*non-standard architecture*’ explicitly declares, digital media could release architecture from the standard towards a new, infinitely customizable version of itself that was based on *generative* processes. The introduction of digital fabrication methods in design created initially an even stronger sense of optimism for the architects. However, like all digital processes, digital fabrication incorporate standardization as an inherent element; as much becomes apparent as digital fabrication becomes a common ground in commercial architectural production.

Despite changes in fabrication methods, the general attitude towards the concept of the architectural detail didn’t get particularly differentiated. The detail was more often than not understood as an element that comes into play after the design process is concluded. That way of thinking was not inverted after the introduction of digital fabrication in the field of architectural design. On the contrary it continued almost unchanged: The architectural detail remains a secondary part of the whole of the design process.

The standardization inherent in digital fabrication in combination with the inability of the architects to include those new fabrication methods in the design process by restoring the fundamental role of the architectural detail results in the production of highly homogenized outcomes. We need to find an alternative approach to digital fabrication that will allow differentiation in all the levels and scales of design and fabrication. In that context the challenge that the design world has to face is how to find the ways and processes that will transform digital fabrication in a defining part of the design process itself. In order for that to happen we need a change of our point of view towards the concept of the architectural detail: from a secondary element that facilitates some higher scope, towards an architectural assemblage that incorporates the possibility to produce by itself architectural multiplicities and ultimately architectural design. In other words, architectural details must be produced in a generative fashion.

The proposed paper will analyse the theoretical context of the above and at the same time will show, through practical examples of applied research in digital fabrication methods, that in order to avoid the inherent standardization imposed by digital technologies, architecture needs to look towards generative modes and methods of fabrication and detailing.

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Key words: architecture, digital fabrication, generative detail

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[2] U Conrads (ed), “*Programs and Manifestoes on 20th-Century Architecture*”, MIT Press, Cambridge, 1975

Against the Standards: Generative Architectural Details

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Abstract

The history of architecture throughout the 20th century has been defined to a large extent by the concept of the standard. An outcome of the application of the principles of Modern Architecture, standardization managed to become the norm both because of the social and political conditions that architecture had to deal with in the wake of the two world wars and because of the ideological biases that it incorporated. The standard became an ideal tool for the rationalized version of architecture that dominated the larger part of the last 100 years.

The encounter of architecture with digital technologies however, initially followed a different route: as the term ‘non-standard architecture’ explicitly declares, digital media could release architecture from the standard towards a new, infinitely customizable version of itself that was based on generative processes. The introduction of digital fabrication methods in design created initially an even stronger sense of optimism for the architects. However, like all digital processes, digital fabrication incorporate standardization as an inherent element; as much becomes apparent as digital fabrication becomes a common ground in commercial architectural production.

Despite changes in fabrication methods, the general attitude towards the concept of the architectural detail didn’t get particularly differentiated. The detail was more often than not understood as an element that comes into play after the design process is concluded. That way of thinking was not inverted after the introduction of digital fabrication in the field of architectural design. On the contrary it continued almost unchanged: The architectural detail remains a secondary part of the whole of the design process.

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The paper analyse the theoretical context of the above and at the same argues that in order to avoid the inherent standardization imposed by digital technologies, architecture needs to look towards generative modes and methods of fabrication and detailing.

The Standard

The concept of standardization has been one that follows architecture since its modern conception during the Renaissance. It became an imperative with modern architecture and finally a norm in all aspects of design and construction. The importance of the standards for modern architecture, along with the opposition to them, is explicitly codified in the famous argument between Hermann Muthesius and Henry van de Velde that took place at the beginning of July of 1914 at the Werkbund conference in Cologne: Muthesius was clear as to his idea of architecture's future and the aim of the Werkbund: "*Both architecture and the whole area of Werkbund activity go toward standardization. Only thanks to standardization these branches can be respected again, like it used to be during the epochs of harmonious development of civilization. Only standardization, as a "blessed" concentration of powers can create the universal and generally recognized sense of taste*"[1].

But while Muthesius was clear as for his commitment towards an industrialized version of architecture, van de Velde was not willing to surrender and emphatically declared that "*[a]s long as there are artists in the Werkbund they will oppose to any suggestion of a norm of standardization. The artist is in his heart of hearts an ardent individualist, a free and spontaneous spirit. He will never voluntarily subject himself to a discipline which impose on him normes and types*"[2]. That juxtaposition between the standards and the individualistic expression of the architect – a juxtaposition between a conception of the architect as an engineer and of the architect as an artist – would follow modern architecture throughout its course.

The Bauhaus for example would begin in 1919 in Weimar as a highly individualistic expression that excluded any form of standardized or industrialized production; but 6 years later, when relocating in Dessau, Walter Gropius had already changed his mind and incorporated the concept of the standards in the new approach of the school. Equally, Le Corbusier expressed both positions: on the one hand the architect as an artist and at the same time the architect as a 'scientist' that applies specific standards to his/her design. The extent of this 'co-existence' of the two approaches goes that far that one could actually argue that it that very juxtaposition between the two ideas of the architect that form the backbone of modern architecture.

But while both approaches remained active during the 20th century, it was clearly the 'architect-engineer' and the design through the establishment of standards that defined the mainstream of architectural production. The opposite position was always present but most of the times as an exception – as if being there just in order to justify through dialectical opposition the other side.

To a large extent, it was the conditions that the societies of the era had to face that defined the outcome of the juxtaposition: the two World Wars and the destruction that they brought gave rise to an urgent need for fast, cheap construction that could answer efficiently to the vast housing issues that arose in the aftermath of both wars. Ultimately, the reasons behind the will to practice architecture and design through standards were 'humanitarian': standardization guarantees efficiency, performance and avoidance of mistakes. Standardization, by making a claim to universality, can ultimately warrant the well-being of those that will occupy and use the produced architecture and will enhance its ability to provide for those that are most in need.

The non-standard

The encounter of architecture with digital technologies however, initially followed a different route: The first experimentations with digital design during the 90s were ultimately categorized under the term 'non-standard architecture' in the 2004 exhibition at the Pompidou Center [3] that tried to provide a common framework for them. The term explicitly declares the belief that digital media could release architecture from the standard towards a new, infinitely customizable version of itself that was based on generative processes. Standardization was no longer understood in that new context as a prerequisite for the well-being of the inhabitants of designed space, but rather as a limitation on its possibilities; as a force of homogeneity. The introduction of digital fabrication methods in architectural design created initially an even stronger sense of optimism for the architects: the possibilities offered by those methods were treated as the vehicle that will carry architecture from the idea of mass production towards that of mass customization, creating in the process a revolution of kinds in the way we understand architectural fabrication and construction. In that context, and since non-standard architectures were largely based on generative processes and techniques, the term 'generative' became almost an antonym for 'standardized'.

However, like all digital processes, digital fabrication – and digital design tools at large – incorporate standardization as an inherent element. The aforementioned standardization becomes more and more apparent as digital fabrication becomes a common ground in commercial architectural production and in projects of larger scale. It is there that it becomes clear that control of fabrication methods is moving away from the architect towards an almost abstract system of the technological protocols that allow the use of those technologies. The digital computer, itself the epitome of modern thinking, is the ultimate application of modern principles; standards being of course one of them. What initially looked like a liberating force that would push architecture towards non-standard paths was revealed to be based on an even harsher and inelastic application of standards. If the standards during modernity could incorporate a certain degree of tolerance, digital standards are rigid and inflexible; they can be either followed completely or not at all. And where 'generative' was initially understood as the opposite to the standard, we can now start to realize that the later might be a prerequisite for the former.

The architectural detail

While all of the above were constantly changing architecture's approach towards the standard, the general attitude towards the concept of the architectural detail didn't get particularly differentiated from older attitudes, despite the vast changes brought forward by digital fabrication and the digital tools in general. Until now the detail was more often than not understood as an element that comes into play after the design process is concluded or, at best, towards its last stages. It could be understood maybe as an afterthought that has to express in a smaller scale the ideas and properties of the general project. As a part of secondary importance (as the term 'detail' itself implies) and at any case, as an element that has to be subordinated to the greater design idea without affecting or changing it much.

The above way of thinking, initiated by modern architecture, was not significantly inverted no matter how many changes were brought in the field of architectural design. On the contrary, and in a quite paradoxical way, it continued almost unchanged: The architectural detail remains a small part of the whole of the design process which is always (according to the dominant conception) much more than a simple sum of its parts. Very much so that in some cases the architect/designer does not even take part in the process of defining the specific fabrication methods of his/her design and opting instead to let someone else take those decisions.

It is characteristic of the above that Greg Lynn, in the 10th anniversary of the 'Folding in Architecture' issue is describing architectural detail as an architect's fetish: "*The term intricacy is intended to move away from this understanding of the architectural detail as an isolated fetishised instance within an otherwise minimal framework. Detail need not be the reduction or concentration of architectural design into a discrete moment. In an intricate network, there are no details per se*"[4]. Greg Lynn here, declares in a way the death of the architectural detail. Ben van Berkel shares a similar attitude towards it: "*It has become essential to define the detail anew. Its classical meaning, as a part of the whole, as articulation, has become obsolete. The idea of ornamentation had long been discarded, but that the notion of articulation has been abandoned too, comes as a shock. And yet the conclusion is unavoidable, seeing that contemporary architecture has severed every link between what takes place inside a building and what can be seen of this from outside. What could possibly be left to articulate in this new architecture...? Neither its structure nor its place in its surroundings says anything about the purpose it serves. There is absolutely nothing substantial left that can be related to articulation of any sort, and when this architecture, despite its radical otherness, is suddenly imbued with 'detail' in the conventional sense the result is monstrous*"[5]. Therefore the concept of the detail for Ben van Berkel, as for Greg Lynn, becomes irrelevant: all three functions facilitated by architectural detail become obsolete: part of the whole, articulation, ornamentation. And while Ben van Berkel is less explicit as to the role of digital technologies and generative processes in the 'becoming obsolete' of the architectural detail, he is in fact subscribing to the same credo with Greg Lynn. Digital technologies and digital fabrication have a large role to play on the extinction of the articulation or the connection, and therefore of the detail.

A new condition

All of the above however, when combined, threaten to create a condition where the architect is left without tools to deal with the complexity of the current situation and is ultimately facing the danger to become himself or herself obsolete. Because on the one hand architects have to deal with the standardization that is inherent in all digital technologies, digital fabrication of course included. On the other hand we are confronted by the inability of the architects to include those new design and fabrication methods in the design process which could have been done – contrary to what Greg Lynn and Ben van Berkel argue – by restoring the fundamental role of the architectural detail: when architects would engage directly with digital fabrication on a one to one level, architectural detailing will inevitable re-emerge as a crucial factor and detail could be themselves be transformed into generators of design. However, the outcome of the combination of those two existing factors – standardization and lack of innovative detailing – is the production of highly homogenized results, along with the downgrading of the role of the architect/designer in the whole process; in this context the architect is rendered almost unnecessary.

Therefore it is crucial in the current condition to re-evaluate the role of the architect and to find an alternative approach to contemporary (digital) fabrication processes that will allow differentiation and creation of innovative fabrication methods in all the levels and scales of design and construction. In that context the challenge that the design world has to face is how to find the ways and processes that will transform fabrication into a defining part of the design process itself. And it has to do so right from the beginning of that process while at the same time giving rise to possibilities for the production of novel fabrication methods. In order for the above to happen we need a change of our point of view towards the concept of the architectural detail: from a secondary element that just facilitates some higher scope, towards an architectural assemblage that incorporates the possibility to produce by itself architectural multiplicities and ultimately architectural design. Details can become, in a rather paradoxical turn, generative.

The architectural detail as an exception

Both the concept of the standard as well as that of the architectural detail were established in the architectural world during the reign of modern architecture. While the seeds were planted earlier, it was during the previous century that the creation of standards became an imperative. At the same time the word 'detail' was hardly used before modern architecture in architectural contexts: "Detailing is not a word one often finds in premodernist writings on architecture. Words like trim, molding, and ornament were more precise and more useful". Therefore the two of them – the standards and the detail – were bound to work together: standardized details became more and more prominent for architecture, something that up to a certain extent had to be expected: as materials and architectural parts were becoming standardized, so did the ways to assemble them. The convergence of the two becomes complete as we move towards the present day: today architectural detailing is indeed highly standardized in most ways. Digital libraries and BIM software packages make that even more apparent to the extent that in many cases the architect doesn't even have to think about the detail or the fabrication method: it is already embedded in the software employed.

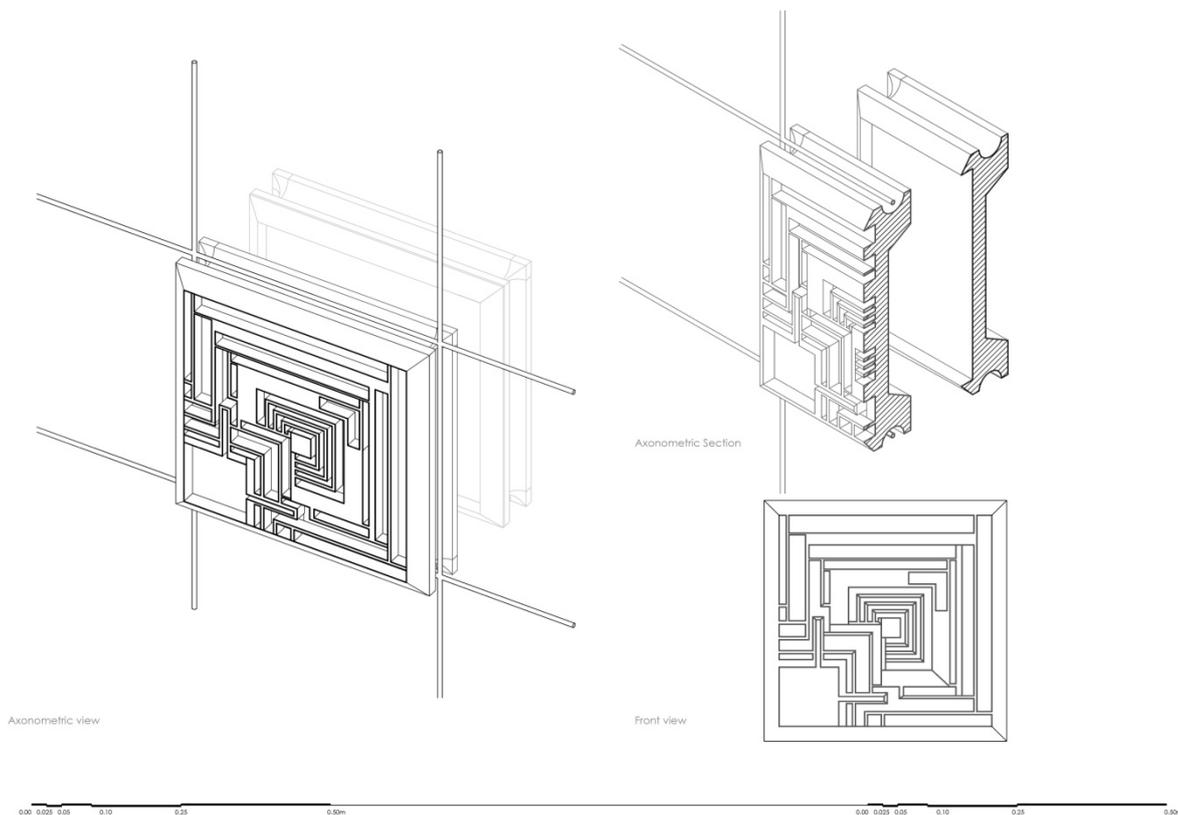


figure 13: Detail of the Ennis House Façade by Frank Lloyd Wright. Fabrication Protocols / The Details of Architecture seminar, spring 2018, post graduate program 'Advanced Design', School of Architecture, Aristotle University of Thessaloniki. Student: Nefeli Papagianni, Instructor: Dimitris Gourdoukis.

And yet, when looking back at the iconic details of modern architecture, they are everything but standard. On the contrary, architectural detail becomes in the hands of architects like Louis Kahn, Frank Lloyd Wright and Ludwig Mies van der Rohe a tool for architectural innovation. In those iconic details the architects invent the assembly of materials – they ways in which they come together – and turn them into a design tool. By designing a detail that goes beyond the standard

practice of the time, modern architects were in fact inventing for themselves new ways to design. In many cases those details were iterated and expanded through several projects. The detail was continuously modulated – not necessarily refined but nevertheless altered. The ways in which Mies worked with the corner details of his building is such an example. Beginning most probably with the 860-880 Lake Shore Drive in Chicago (1951) he kept iterating on the same idea and modulating it in projects such as the Commonwealth Promenade Apartments in Chicago (1956) the Seagram Building in New York (1958) the One Charles Center in Baltimore (1963), the 2400 Lakeview in Chicago (1963) and the list could go on and on. Looking back to those details we could argue that while the architect was still solving construction issues he was operating in fact more like an artist or creator than like an engineer. Instead of using standards he was constantly generating new variations on the theme. Detailing in the hands of modern masters was in fact generative.

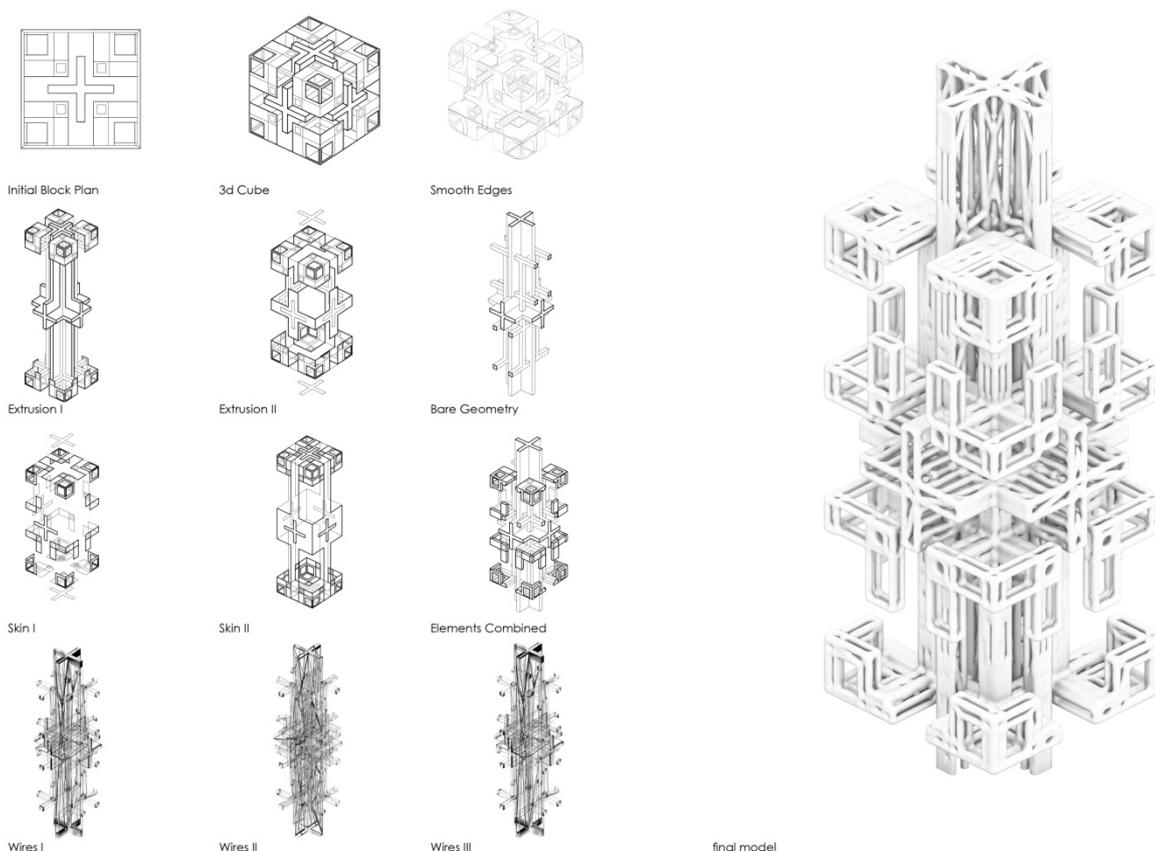


figure 14: Generative Detailing based on the work of Frank Lloyd Wright. Fabrication Protocols / The Details of Architecture seminar, spring 2018, post graduate program 'Advanced Design', School of Architecture, Aristotle University of Thessaloniki. Student: Nefeli Papagianni, Instructor: Dimitris Gourdoukis.

That innovation of the modern masters in terms of detailing – by going against the stream of standardization – can inform architectural detailing today and provide insights into how architects can deal with the extreme standardization brought by digital technologies and how they can overcome it through invention. By revisiting them, categorizing them and understanding how they operate in terms of structure, enclosure, ornament and function one might be able to use the results in order to transcend contemporary processes in design and fabrication. In that way an architect can become an inventor of assemblies instead of the one who chooses between a number of pre-defined possibilities – that last option, the act of selection, soon enough will be an operation that computers will be able to carry out much more efficiently anyway.

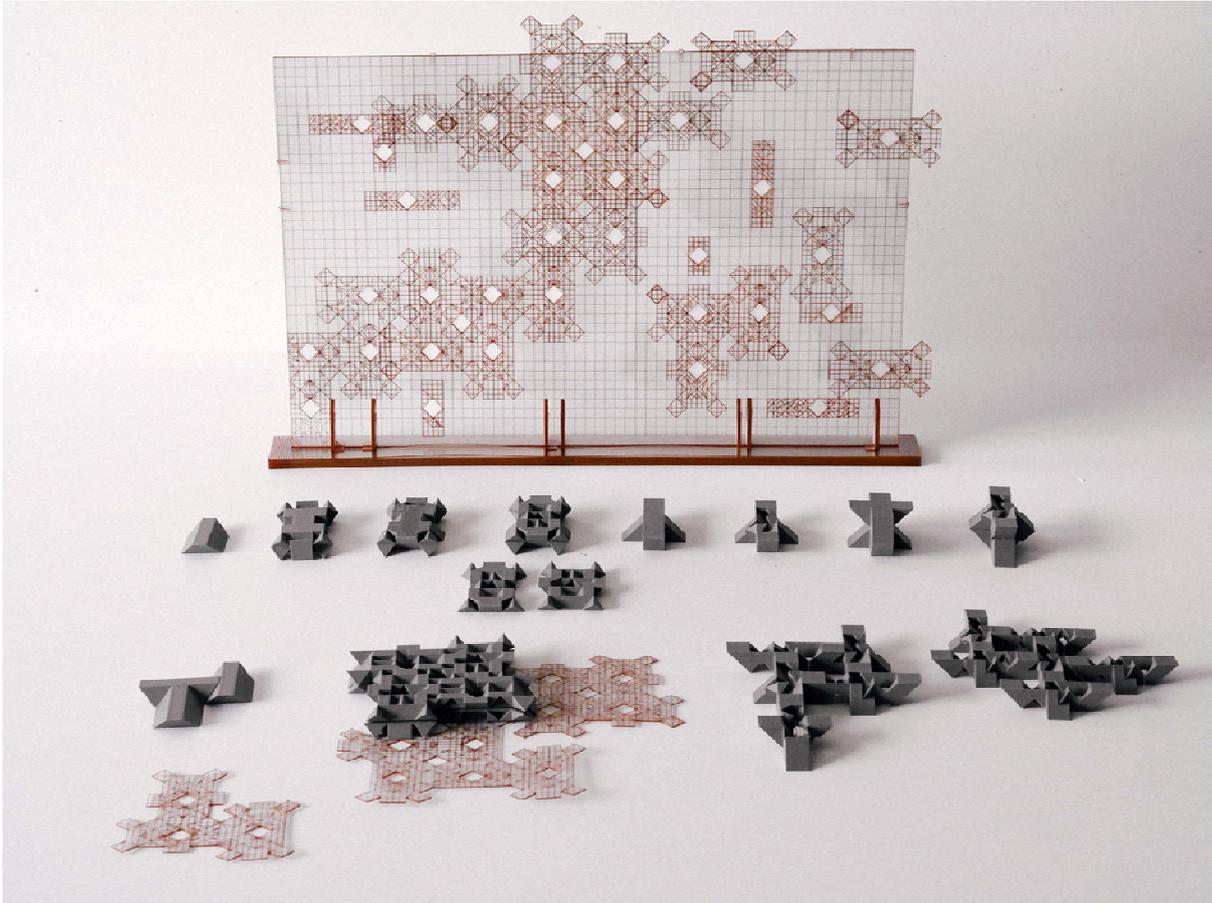


figure 15: *Generative Detailing. Fabrication Protocols / The Details of Architecture seminar, spring 2018, post graduate program 'Advanced Design', School of Architecture, Aristotle University of Thessaloniki. Student: Maria Kyrou, Instructor: Dimitris Gourdoukis.*

Analog modes of production

A second direction that architecture could follow in order to avoid the inherent standardization imposed by digital technologies, would be to look back to analog modes and methods of fabrication and detailing. Not in order to return to a pre-digital state, but instead in order to graft digital processes with an analog way of thinking that will allow differentiation and multiplicity. In other words, a way of thinking that while employs digital tools understands the continuity of the analog through a constant modulation that can't be reduced to any binary logic and instead is able to introduce true customization in the process. Gothic construction techniques for example might provide very useful insights that can help architects create custom fabrication routines without following the ones imposed by the protocols employed by specific software packages. Traditional construction methods can be equally helpful. It is in the ways of the past that architects need to look in order to move towards the future of architecture. Not in order to reproduce that past, but instead to graft it with the current condition and become able this way to innovate.

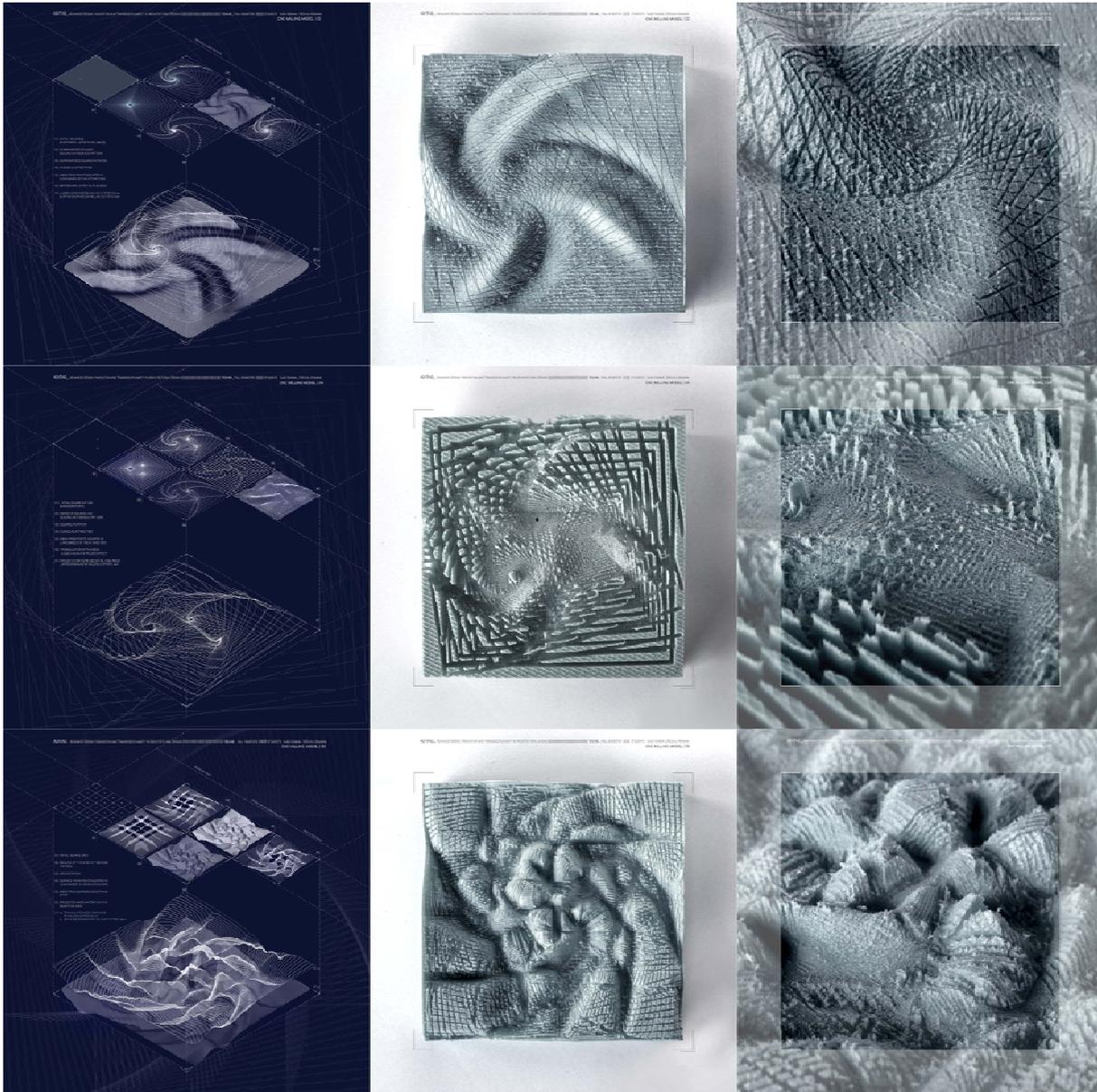


figure 16: 3d milled study model, details and fabrication strategy. Fabrication Protocols / Modulated Surfaces seminar, Fall 2016, post graduate program 'Advanced Design', School of Architecture, Aristotle University of Thessaloniki. Students: G.Illiadi, A.Mexili, Instructor: Dimitris Gourdoukis.

Looking at the two conclusions of the above line of thinking one could easily observe that both appear to go against the fundamental properties of generative thinking and designing. After all, the way of the master architects is counter-generative in the sense that it denies the autonomy of the generative mechanism: it is the architect, the human as author, and its individuality that creates. At the same time looking back at analog techniques is a practice that seems to deny the very nature of generative processes: their digital and algorithmic starting point. The analog, at least if understood as the opposite of the digital, is excluding generative results.



figure 17: 3d milled model and details. Fabrication Protocols / Modulated Surfaces seminar, Fall 2016, post graduate program 'Advanced Design', School of Architecture, Aristotle University of Thessaloniki. Students: A. Arampatzoglou, V. Gaiserlidou, Instructor: Dimitris Gourdoukis.

And yet, if one looks closer might be able to observe that while the above might be true up to a certain extent, it is only when we focus on the technique instead of the intention that they hold their ground. Because both propositions – on the one hand going back to the idea of the architect/author and on the other employing analog processes – in effect champion the main scope of generative processes as they were initially understood: the production of novice, previously unseen design solution that will erase any concept of the standard and will emerge through iterative processes.

To conclude, the ultimate goal of the above direction is to restore architecture as a 'dispositif', if we were to use Michel Foucault's terminology, of the contemporary society. As an autonomous mechanism of production of subjectivity. In other words as a generative mechanism. Only when architecture will reclaim its role as a cultural dispositive it will become able to re-invent its role as an active element of the social and political spectrum and contribute towards a better future. In a

certain sense, returning this way to the aims once present behind the concept of standardization, but reframed in a totally different manner. And certainly by becoming generative independently from the nature of the tools that it employs.

References

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[3] *Architectures Non Standard* (Paris: Editions Du Centre Pompidou, 2003)

[4] Greg Lynn, ed., *Folding in Architecture*, Revised edition (Chichester, West Sussex ; Hoboken, NJ: Academy Press, 2004).

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This research is implemented through IKY scholarships programme and co-financed by the European Union (European Social Fund - ESF) and Greek national funds through the action entitled "Reinforcement of Postdoctoral Researchers", in the framework of the Operational Programme "Human Resources Development Program, Education and Lifelong Learning" of the National Strategic Reference Framework (NSRF) 2014 – 2020