Tokyo University of The Arts

Graduate School of Fine Arts

Department of Architecture - Structural Design Laboratory

Ornament in the age of postdigital architecture

Reinventing the neo-modern discourse through the study of Japanese Katagami patterns.

A dissertation thesis presented

by

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For Kanada-Sensei, my mentor who made me a better architect.

Table Of Contents

Preface

The first time I considered enrolling in a doctoral program was perhaps six years ago. In July 2015, after a one year academic exchange program in the department of environmental architecture studies and design strategy of Kyushu University in Fukuoka, I had returned to Paris in order to defend my masters graduation project -Hashima no okuribito- in front of the La Villette architectural school committee and to receive the diploma that would allow me finally to practice architecture. The idea of returning and spending more time in Japan was very pleasing and had started germinating already few months before my departure from the far country of sharp contemporary architectural aesthetics. Back at the time two paths were available to me : the architect and professor Kenichi Tanoue had recommended me to the international section chief of Nihon Sekkei -a thousand employee workforce and a half century old firm with heavy commissions and billables-; the other one was to pursue my education. In December of the same year, zero compromise, six months later and a job opportunity turned down by Nihon Sekkei due to the closing of their international department -or at least what they said was the reason-, I was being interviewed in the offices of Christian De Portzamparc, the Pritzker laureate the least famous outside of France. The senior project architect auditioning me for an architectural assistant position seemed convinced that I would be a good fit for their competitions pole. After all he saw on my resume that I conducted several competitions already on my own, and interned extensively during my studies including for Sou Fujimoto and Riken Yamamoto. The job seemed ideal and came with the promise to work in a small team made of the senior architect, a render man and myself, on three upcoming projects development of fifty thousand square meters each; I could start the morning after for one condition : a 550 euros salary as low as four times the minimum advised by the chart of the French national order of architects. I was already teaching architecture studio sessions and software modeling lessons to private students on weekends, combined to my salary was enough to pay rent and put food on the table, I accepted to take the offer that turned in indeed a very rich professional experience. However, on closing that late afternoon meeting my interviewer said what I realize now was the exact moment I knew I wanted more education; his serious pleasantry was -if I quote well- “how old are you ? 23 ? You are too young, you don’t need to be paid anyway!”. The first week on the position reinforced my instinct; the fact that the 120 employees were strictly asked to never discuss with Christian -since only the sections directors and senior architects were allowed in the meetings-, the fact that my -ninety thousands euros of annual income- direct senior architect was either unaware or ignoring on purpose the financial realities of a fresh graduate in a post 2008 strongly hit Europe, helped me quickly draw the conclusion that the office was not meant for mentorship, and since I am still young, I would rather spend the next four or five years acquiring more knowledge, deepening and training my design abilities by preferably not spending my days in an office, but to work up to

fifteen hours a day and invest my efforts and energy in myself, and perhaps in my naiveté to build my dreams and not someone's else. The PhD journey was on.

There may be some readers -friends and professors- who might be puzzled by taking up this preface because they associate me, or rather my character, with a work-centered, architecture and aesthetics obsessed, overtly serious, emotionally cold and ruthless looking architect. More than ever, I strongly believe that our past encounters, experiences and emotions shape our decision making and therefore the paths we take on in our future, especially how our brain reality is our only reality. It is therefore important for me to acknowledge my past and my present in shaping and building this doctoral thesis and beyond. I will also come back to the writing style of this thesis in the next chapter. To paraphrase Timothy Morton1, the reader might discover that this dissertation oscillates between sickeningly between personal narrative and scientific reason.

While in Fukuoka, I encountered some foreign students conducting full educational programs in Kyushu university, while being fully funded by a mysterious scholarship that would pay for both their tuition fees and a monthly stipend to survive on. In January 2016, I started gathering informations on the MEXT -Ministry of education, culture, sports, science and technology- scholarship, also famously known as the Monbukagakushou (文部科学省). Each year, the ministry selects its worldwide laureates through its diplomatic embassies. Each Japanese embassy in each country would therefore organize a three stage screening process (application, written examination and a final interview) starting April of each year. The number of laureates varies from one country to another depending on the quality of the country's diplomatic relationships with Japan. For instance, France gets annually up to fifteen laureates, while Morocco gets a small two on average. According to the Japanese embassy in Rabat, they receive about 1500 applications every year. The difficulty also resides in the actuality that I will be competing against people of different backgrounds as different as lawyers, medical doctors, engineers and Japanese literature specialists, with the need to defend the project in front of diplomatic bureaucrats who had no architectural knowledge. Despite of the low probabilities, I decided to give it a chance; the only chance to afford a doctoral program in Japan.

In the next four months I explored doctoral thematics as various as "the architecture industrial heritage from the prewar to the modern era of Japan" and that was linked to my Hashima project; "the cultural urban reactivation through Naoshima and Teshima case studies"; "the study

1 Morton, Timothy. 2013. Hyperobjects: Philosophy and ecology after the end of world. University of Minnesota Press.

of the narrative structure for spatial representation in Haruki Murakami novels"; "the urban morphological development and anthropological studies of Ueno's Ameyayokochou market" -this thematic is still highly appealing to me as I think that each one of its parallel streets would need a full doctoral program-, and finally "the design and rationalization of building envelopes through parametric strategies". I finally chose the latest as I imagined using on my future projects and right away after the doctoral program the "direct" practical skills and new engineering techniques acquired. The topic seemed also safe in regard of the embassy scholarship judges.

In mid-summer 2016, after a half year of late afterwork application polishing and several same day Paris-Rabat roundtrips, the cultural bureau of the Japanese embassy announces me by mail that I was the one -out of two- laureate for the 2017 fiscal year scholarship. It was time to search for a host laboratory.

For a foreign national to be considered in the Tokyo architecture scene or in order to later have a chance to be taken seriously or to work for a major local office, he/she/they must belong to a Japanese Ivy League university and study under a well respected practicing professor. While keeping that in mind, I narrowed my choices to three and focused rather on the following professors: first, Yasushi Ikeda, architect trained under Fumihiko Maki for nearly a decade at the University of Tokyo, head of IKDS office, and a professor full of digital culture insights at Keio University, and recommended to me by my Paris La Villette professor François Guena. Second, Jun Sato, structural engineer with a strange admirable attraction to risk and extensively working on Kengo Kuma's wood structures and kigumi (木組み) traditional joinery, professor at the University of Tokyo.

The Structural Design Lab of Tokyo University of The Arts was my third prospective choice and is run by professor Mitsuhiro Kanada, an ultra creative trained in the University of California-Berkeley in both architecture and structural engineering, after what he joined 25 years ago Ove Arup's AGU (advanced geometry unit) by the side of Cecil Balmond and is currently its Tokyo branch director. As a structural engineer he delivered, among other projects, the Zaragoza pavilion bridge designed by Zaha Hadid, both Toyo Ito designs of the Taichung Metropolitan Opera House and the Gifu Media Cosmos library, and Renzo Piano's Maison Hermes in Ginza.

Tokyo University of The Arts, famously called by GEIDAI, is the most prestigious and unique national art university in Japan. Celebrated for its experimental practices and the centuries old craft techniques passed along from the Masters to the students. Among its alumni I can cite

Ryuichi Sakamoto (music composer), Hiroshi Teshigahara (avant-garde film-maker), Eiji Aonuma (video game designer and producer of The Legend of Zelda), Makoto Yokomizo and Junya Ishigami (architects). The university is also known for a group of brilliant art students that emerged in the late 80s, would come to maturity during the immediate post-Bubble and become the future art world leaders: the GEIDAI Gang. A group made of the Showa 40 Nen Kai art collective founders Tsuyoshi Ozawa and Makoto Aida, the soon to be prolific art curator and founder of the Kanazawa 21st Century Museum of Contemporary Art Yuko Hasegawa, Masato Nakamura (artist and art organizer), Takashi Murakami (artist and founder of Kaikai Kiki) and his gallerist Tomio Koyama. Within a deterministic ecosystem and an aggressively provoked luck, the Superflat theorist Murakami and its gang, using conceptual and explicit provocative political art, with the help of fashion editor and writer Naoi Sawaragi, the art entrepreneur and SCAI The Bathhouse gallery founder Masami Shiraishi, the Röntgen Institute founder Tsutomu Ikeuchi, and Yoshitomo Nara, would then contribute to make out of the Japanese art production a major protagonist of the international art scene, and satiate the cravings of western collectionneurs for an alternative Asian modernity and a Neo-Tokyo experience.

My first two early years in architecture education in the national school of Morocco taught me strict technical drawing skills, my stay at Paris La Villette taught me to look at a bigger scale and to take into consideration the social and urban contexts, while my stay at Kyushu University was a glimpse of how to think of the sensual experience by establishing spatial hierarchies and dividing the program elements. Conducting my doctoral studies at Tokyo University of The Arts while being surrounded by art and crafts production from ceramists, metal casters, sculptors and painters and to exchange ideas with them on a daily basis was appealing, and to study in a structural design laboratory under an engineer of talent, in the architecture department of an art university was appealing even more.

While moving my belongings to the laboratory on the fifth of April 2017, professor Kanada steps in the room to ask me informally what were my plans for the near future, and suggested me to quickly abandon my research thematic -rationalization of envelopes- submitted to the MEXT committee, describing it as a boring topic that can be studied in any university around the world. Rather he suggested to start looking for a unique research, that I should profit from my stay in an art university, and most importantly to start thinking as a geidaisei (芸大生). Four years ago I did not understand what thinking as a geidaisei meant, but I certainly do now.
It only remains for me to express my sincere gratitude to professor Kanada, for always being enthusiastic to discuss any architecture and design related matter, from philosophy to aesthetics,

from material properties and engineering to tectonics, from details to authorship, from biology and computation to robotic fabrication and additive processes and from ornament to the postdigital. All weekly Friday afternoon's face-to-face seminars were precious discussions that have made me able to road test, explore many of my ideas and helped me to crystallize my thoughts.

Tokyo, March 2021.

Introduction

The topic of "patterns" in architecture was the early aspect of this doctoral investigations and was triggered by a series of various encounters that led me to study the notion of ornament in the age of postdigital architecture. My first readings of essays and manuscripts by Cecil Balmond were a determining factor as I started this Phd program with an enthusiasm for architectures that offer a new interest in space, and that would make their users interrogate the rooms through curiosity in structure, harmony and beauty while relating to phenomenological effects of light, shadow and transparency. In "Frontiers of architecture", Balmond appears as a humanist and describes architecture as the art that makes a physical difference stipulating that architecture is the art that influences the most people's everyday's life. For those familiar with his work, Balmond makes extensive use of patterns affirming their power to impact the human perception through a quantum theory where the observer and the observed are mutually influenced in a feedback loop. Therefore in this quantum universe our perceived reality depends on our personal subjective experience. In his practice, he codifies the information observed in nature and describes it mathematically to transform it into patterns which gain architectural meaning when brought to scale. Scale, in all its applications to textures, gradients, rhythms and proportions, generates the harmony that transports our spirits. In addition to mathematics and geometry, Balmond draws his inspiration from how nature generates patterns, for instance of roots and branches, by building up on local concepts which multiply, mix and overlap, usually through an incessant repetition of a single action. Therefore looking into nature is looking into a prodigious information sampler, a pattern maker of infinite skill.

My fascination for patterns grew exponentially after reading the book Traditional Japanese stencil patterns published by Yuki Ikuta, curator for the Mie Prefectural Art Museum, and Nobuhiko Maruyama, a textile specialist. The book contains about 1600 high definition images of Ise Katagami production curated from the Mitsukoshi-Isetan collection. Katagami (型紙) are the stencil tools that Japanese artisans and artists used in the process of dyeing patterns on fabrics of Kimonos and Yukatas. Japanese Mino-Washi paper is sculpted by material removal through carving techniques; Paper is glued together using PersimmonTannin then dyed using the Katazome method that consists of applying a resisting paste developed during the Kamakura period (1192- 1333). At the end of his career, an artist reaches a level of accomplishment as he spends a whole lifetime mastering one technique and making his own tools (Ikuta and Maruyama, 2013). Japanese patterns are a result of the "point of view"; which makes them new creations and not just a mere reproduction of nature. They are not real representation but are produced by intuition, imagination, the unreal and the irrational (Belfiore and A.Liotta, 2012). The point of view is what turns raw nature into a content. Especially since everyone is able to see the plant,

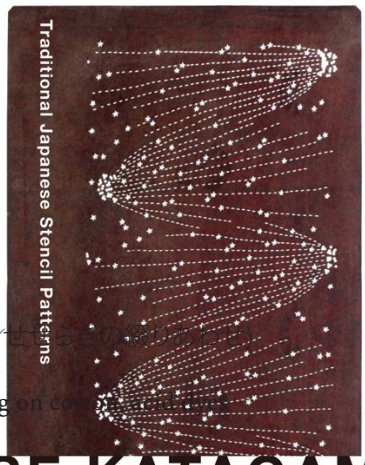
but not everyone will see it in the same way (Yanagi, 1972).

Other than the fact that these katagami patterns are highly appealing to me, the following assumptions and arguments made me utilize them, as I will demonstrate it in the next chapters, as a raw cultural asset for my design explorations. It is important to remind that the idea of using Japanese patterns in architecture has been proposed in the past and has been studied and explored by diverse architects and researchers; however their design mainly applied patterns on building envelopes by extruding and thickening the pattern geometry and by remapping it on the wall or ceiling surfaces.

First, through my early geometrical analysis of the Katagami patterns, the study showed that one unique pattern is actually made of multiple layers. One of the first hypothesis, four years ago, was that what if this flatten layering could generate a layered space when translated to three-dimensional architectures. Furthermore, the fact that these patterns are used on clothes highlighted a link to the German architect and theorist Gottfried Semper. One of his famous hypothesis is the evident relationship between costume, sculpture and architecture, epitomizing this for instance by how the Egyptians use of lotus flowers on column capitals derived from the way ladies attached stalks of these flowers to ornament their head. One can link this hypothesis to the interpretation of the ionic capital as a transposition of the ionian women's hairstyle. Semper's theory stresses the relevance of textile making -through knotting gestures for example- to understand the decorative patterns emergence conditions. The roots of Japanese patterns were brought to the islands from the Chinese Tang Dynasty between the seventh and tenth century under the form of heraldry crests (家紋). The aesthetic roots of Japanese heraldic design are to be found in the court costumes patterns imported from China. The Chinese ideograph used to signify crest in Japanese -mon 紋-, can be broken down as "thread" - 糸 - "markings" - 文 -, meaning embroidery. According to John Dower, author of The elements of Japanese design, these origin is suggestive in the way it reveals that the first aesthetic conception of Japanese patterns basic elements does not lie in the pen or brush technique, but rather in the techniques possible with thread.

Finally, as soon as I looked at a Katagami pattern I immediately imagined and conceptualized it as a series of 3dpoints. This last character might appear ordinary and rapid, but it is actually meaningful for computation design. Indeed currently the source of any topology are x-y-z

Front cover of the Ise Katagami book.
Ikuta and Maruyama



Yael Harnik
*Sounds of River (*せせらぎの綴りあわせ)
2017
Stencil dyeing on cotton, acid dyes
130x160 cm

Yael Harnik
*Sounds of River (*せせらぎの綴りあわせ)
2017
Stencil dyeing on cotton, acid dyes
130x160 cm

Katagami tsubori technique
Suzuka City Photo

coordinates organized in data trees. Three coordinates form a point in space two points form a vector or a line, three points (vertices) form a planar mesh surface, a Nurb surface is composed of a network of points organized into two arrays -or matrixes- of points in U and V directions, and a three dimensional object is nothing more than a point cloud made of arrays organized in U, V and W directions. Patterns being a form of ornament, this reflexion will be placed within the exploratory context later in this thesis using Japan -its patterns and society- as a terrain of action.

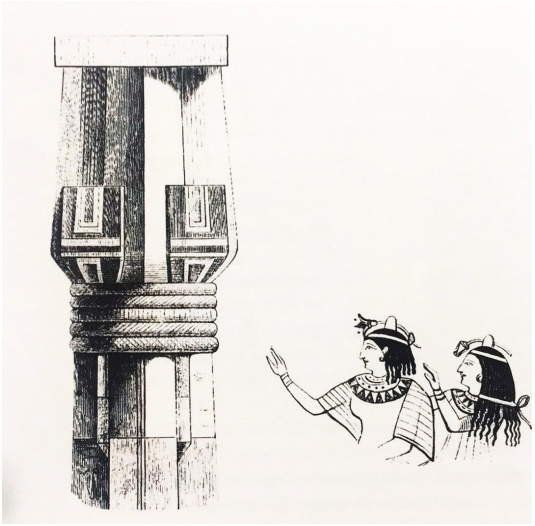
This doctoral research investigations aim, as the title suggests it, to study the ornament in our contemporary age of postdigital architecture. Ornament discourse has made its striking return in both practice (through completed buildings) and academia through published material. One has in mind the seminal "The function of ornament" by Farshid Moussavi and Michael Kubo (2005) and "Patterns and layering", a collection of essays published in 2012 and written by various architects-researchers of Kengo Kuma Laboratory. Other than these two published references, diverse historians, theorists and practitioners have published seminal work in the past decade, accompanying and documenting the revival of architectural ornament. From Mark Garcia guest-editing 'Patterns of Architecture' published in a 2009 issue of Architectural Design, to 'The politics of architecture and subjectivity' written by Antoine Picon in 2013, where he offers an overview of ornament history. This doctoral investigation is somehow a digestion of the knowledge contained in those manuscripts and hopefully is in conversation with them.

In this dissertation, the word postdigital has a manifold meaning. The first one is the cultural, societal and media context for the word. Adam Fure in his contribution to aesthetics equals politics defines it by :

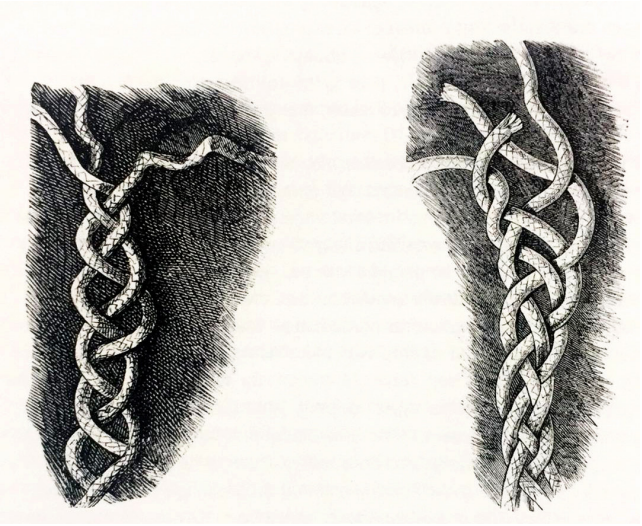
" Postdigital scholarship tracks the ***transition*** *of digital technology from* ***extraordinary*** *to* ***ordinary****. The "post" in postdigital, therefore, does not imply a time after or beyond the digital; rather it calls for an examination and evolution of what we have known as "the digital" to date. "*

To highlight this transition Fure chooses the Japanese fashion designer Junya Watanabe's sweat pants designed for the denim brand Levi's. While these pants are virtually indistinguishable from a classic pair of Levi's 501 Jeans, the pants are not denim at all but are cotton-linen trousers printed with a high-resolution digital scan of a pair of Levi's to increase the comfort of denim.

To illustrate how this ecology of digital media is affecting the architecture sphere empirically, ontologically and aesthetically, Adam Fure borrows the notion of transcoding from the new



Gottfried Semper, Egyptian capital an ladies' hair decoration, from Style in the Technical and Tectonic Art; or, Practical Aesthetics, 1860-63.



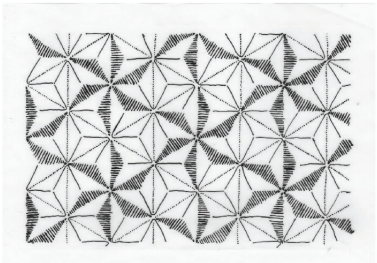
Gottfried Semper, plaiting, from Style in the Technical and Tectonic Art; or, Practical Aesthetics, 1860-63.

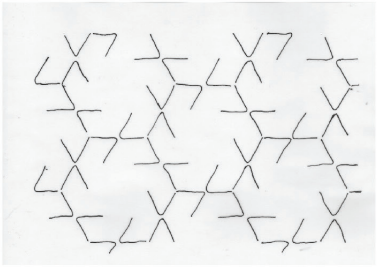
Personal drawing.
Katagami pattern's layering and properties study.
Chinese Ink on tracing paper.

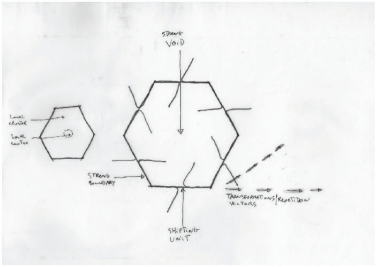
Layering

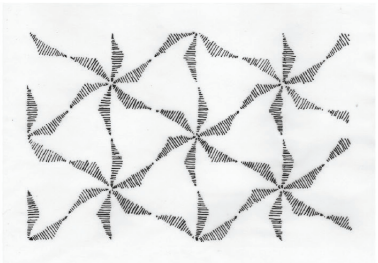
Properties

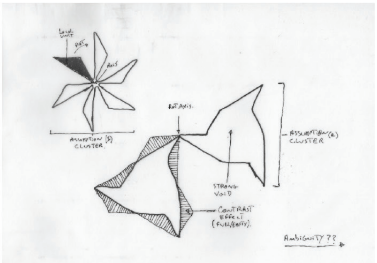
katagami Pattern for analysis

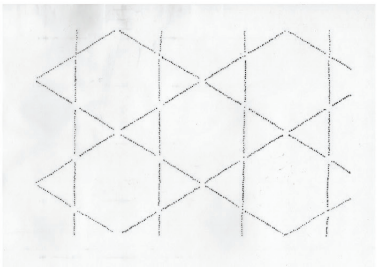












media theorist Lev Manovich, pointing to how transcoding in architecture is epitomized through the trend of using digital color gradients in architectural representations.

" Recently, gradients have replaced solid colors and images of physical skies as the background of choice for drawings and renderings, and this happened at precisely the moment that rendering engines made photorealism as simple as hitting a button. Today, architects are placing their speculative designs in overtly digital environments, rather than realistic physical settings. […] designers are starting to see the computer not as a tool to represent the "real", but as itself another real, one in which they are deeply embedded. "

The second meaning of the postdigital is technical and is linked to the fabrication and materialization of architecture through discrete strategies as introduced by Gilles Retsin. This will be discussed at the very last chapter.

This research aims first to redefine the meaning of ornament and to explore new design approaches differentiated from the systemic usual space configurations. In order to conduct this studies, and before inventing, or before reinventing anything, one must first build a solid knowledge upon ornament historical foundations. Therefore a solid knowledge must be built upon ornament historical foundations in order to conduct this studies. The first chapter of the thesis, on one hand, explores historically and brings an overview of all the subjects involved in the production and the reception of the ornamental production. By subject, I mean the political, economical and societal environment and its codified meaning at each era; by subject I mean the producer of ornament, be it an artist, a craftsman, an architect, a scientist, an inventor or a machine learning powered artificial intelligence. I also mean the available fabrication technologies and tools of production moving ornament from paper to reality; last but not least, a subject is also the client and the passerby. On the other hand, the first chapter will showcase how ornament has evolved through time by studying many centuries old preference for highly ornamented architecture, its invention and design, its fabrication and its social implementation - from Vitruvius to Piranesi, from the renaissance to classicism, passing by Alois Riegle, Gottfried Semper, Karl Friedrich Schinkel, John Ruskin and Louis Sullivan- to how this preference agonized and gave way to clean lines and unadorned surfaces of modernism condensed into the Adolf Loos statement. Moreover, despite the main interest being around ornamental strategies applied to architectural design, anecdotic instances such application on textile, jewelry and tattoos will be discussed as they are all linked to the human being living in society and its need for individuality, illustrating differently the questions of superficiality or functionality of ornament. Finally, after exploring how ornament evolved in the west, the chapter will conclude on ornament

Oomiyamae gymnasium; masterplan.
Jun Aoki, 2013.

You+Pea (Sandra Youkhana and Luke Pearson). Video Game Urbanism.
The Bartlett RC12.

Ornament Agents;
Descriptive diagram.

Environment	Production	Theory	Des. Strategy	Affect	Fabrication	Consumption
Political	Architect	Vitruvius	Mapping Image	Kinetic	Hand	User
Economical	Artist	Piranesi	Texture | Material	Pleated	File to factory	Client
Social	Str. Engineer	K. F. Schinkel	Pattern	Dematerialized	CNC Carving	Passer-by
	Craftsman	A. Riegle	Tectonic | Topology	Complex	Additive process	
	Scientist	G. Semper	Program	Moired	Agents	
	Inventor	J. Ruskin	Branding	Geometric	Robots | Drones	
	Agents	L. Sullivan		Amorphous		
	AI | M. Learning	A. Payne		Aggregated		
		N. Tsuji				
		S. Yanagi				

in the far east : how ornament was imported to Japan from China, how Japanese eccentricities philosophy was born in relationship to nature and religion as explained by Nobuo Tsuji and Soetsu Yanagi.

How could one re-invent a meaning without a prior study and understanding of how and what has been produced before ? The second chapter focuses on technologies, design thinking and strategies. As architectural ornament revival started to strongly reemerge with the eighties postmodernists, this thesis first investigations start with a brief overview to epitomize these design strategies (program, cladding, light, shape and tectonics, construction material, branding, etc…) and their respective ornamental affects (aggregated, spiral, banded, dematerialized, amorphous, rusticated, pleated, complex, kinetic, moiréd, geometric, etc…). Moving afterward to the nineties first digital shift and the conceptualization of the file-to-factory that addressed for the first time the notion of non-standardization through a continuous chain between computer-aided design and production by numerically controlled machines. Ornamentation in architecture is indissociable and inseparable from the fabrication tools. Here, the machine operations are integrated from the start of the design and produce objects (and later ornaments) adapted to each human being. These 1990s exploration and materialization tools increased the formal potential and the manipulation of topological surfaces. As the early digital shift operated in a context of theoretical experimentation, case studies of the "tectonic as ornament" -such as the Deleuzian Fold- are conducted focusing on Bernard Cache, Greg Lynn and their contemporaries. In a simultaneous way, I question the narrative discourse and the rhetoric of these architects by investigating how philosophy is used to theorize their practices and understand the creative potential of the speculative analogy of metaphor and its impact on the formalization, tectonics, topology and therefore ornamentation of architecture. By 2010, the first wave of digital design has left parameters of mathematical equations ending at the same time the rise of the curve, giving room to new experiments both physically and digitally thanks to the computational methods; the second digital shift has come. The second part of this chapter will showcase experiments conducted around the world, based on the one hand on computational power and bottom-up agent-based algorithms (cellular automata, randomness, flocking, stigmergy, parasites, chemotaxis, etc…) and on the other hand the tools to materialize the generated complexity and mass customization at no cost thanks to additive processes, 3d printing extrusion, robotics and distributive systems.

After conducting historical, analytical, case studies and document research, the last chapter of the thesis is seen as practice-based research approach aimed to investigate personal theory,

assumptions and hypothesis to be verified through the graduation physical production of a one-to-one scale pavilion. This last chapter is a digestion of the knowledge contained in the previous chapters and is in conversation with them. Thanks to it, I would like to introduce both a workflow method and a theory showcasing how ornament and state of the art fabrication technologies could play a great role in reconciling and reconnecting ornament to object to architecture, and proof that they can come together under the same narrative, leading to a redefined neo-modern era addressing the function of the sculptural-object matter, aesthetics and society, spatial quality, simplexity and democratic -accessible to all- mass-customization. Within this framework I rely on the incommensurable creativity held in the Japanese katagami patterns in order to translate them into architectures. While many designers are diving in the algorithmic design world by developing new personal methods, I recycle the existing production of Katagami Patterns into three-dimensional objects, perpetuating the artists work and making their design go beyond time, borders and scope of applicability by relying on agent-based algorithms to study the architectural potential of the Katagami patterns as a top-down clean and simple initial topology as social animal behaviors are applied to the patterns to make them emerge, self-organize and generate spatial forms. This research aims first to redefine the meaning of ornament and to explore new design approaches differentiated from the systemic usual space configurations. Most importantly, I rely on the hypothesis raised by Alina Payne emulating speculative ideas questioning the relationship between ornament, objects and architecture. In addition to this first argument, I will argue on the importance and the power of ornament and patterns to create a bound between users and their environment when well codified in society; for this I consider Japan as a terrain of action and use its traditional Katagami patterns to demonstrate my rhetorical discourse built on Japanese ornament as a well codified -society anchored- cultural asset. All arguments will be developed within three points.

The dissertation will culminate on an analytical conclusion bringing to light answers and overall conclusions to the following problematic questions raised all along the doctoral investigations : What does " ornament " mean in our postdigital times ? Does ornament impact our society in the same way it did in the past ? Who are the agents involved in the production of ornament currently ? What are the technologies involved in the production of ornament currently at both a visual and a materialized level ? Does technology goes with or against ornament crafts culture ? Do western and Japanese converge in ornamental aesthetics philosophy ? By implementing technology in the ornament process, do we loose important aesthetics philosophy ? Is ornament (and patterns) only role to produce visual effect and appeal to the human senses ? Do we still need to look at ornament in a modernist way ? Can ornamented architecture still display meaning

without falling in historicism or easy symbolism ? Is it still relevant to talk about “beauty” in contemporary aesthetics ? Is it still a factor of ornament design ? Can abstract ornament be invested with definite symbolic content ? Does ornament need to be political in the sense to convey lessons ? Doest it need to be connected to knowledge ? What are the consequences of the eclipse of the artisan and craftsman ? Under the influence of spectacular development of material sciences and digital tools, is contemporary architectural ornament appeal only owed to the desire to experiment on these new frontiers ? Is the postdigital ornament anti-perspectival ? As the act of seeing becomes akin to touching and experiencing space, does it abolish the notion of a privileged point of view from which one should contemplate the building ?

Answering the above questions within a practice based fine arts doctoral program was not an easy linear process. In Tokyo University of The Arts, it is mandatory for the PhD candidate to both finalize his dissertation and produce a final artistic work demonstrating a high level of artistic achievement to complete the program. In the case of a standard structure for a research argument in social sciences, the researcher and the object of research are separated; there is an objective reality. In the case of an art practice based research, I believe there is no division between the researcher and object of research. In GEIDAI one can question any kind of hierarchy: In my case I am not certain if my graduation architecture work - sakuhin 卒業作品- is supporting and demonstrating the theory contained in the dissertation or the other way around. Rather I see it as a culmination art work and a result of a mutually informed loop-feedback between the two. On GEIDAI website they stipulate that “It is often stated that artistic creation is primary in the arts, and an artist conducts some type of research in the process of such creation”. Therefore one can ask the legitimate question “ Could a dissertation itself be an artwork ? ”. Others before me have dared, it is the case of James Jack, a 2015 graduate of the oil painting department whose dissertation, in addition to his art work, came under the form of a poem. In my case, I always imagine what if I had decided that my dissertation was a unique literal audio transcription of my recorded weekly discussion sessions with professor Mitsuhiro Kanada of nearly two hundred hours length. They indeed contain all the ideas extrapolated from my readings, the ideas and questions raised from the discussions, the bad ideas that consumed sometimes months of investigations, and the ideas that got lost in the process.

Last but not least, I would like to shed light on my research corpus content in conclusion of this introductory chapter. The bibliography is subdivided into six main reading categories : western ornament and patternology, Japanese ornament, philosophy and aesthetics, digital culture in architecture, peer-reviewed research articles on computation and fabrication and finally Japanese

architecture theory. As many of the questions raised within this doctoral program are novel and were not discussed in published scholarship, it was mandatory to conduct qualitative interviews with theoreticians, curators and protagonists from the practice world: artists, architects, ceramists, patternists that work with ornament on a daily basis. Parts of the transcripts of those interviews are therefore included in the body of this dissertation and not simply relegated in the appendices.

A Schrödinger Kind Of Function

How could one define the word "ornament" ? According to the French dictionary Larousse, ornament is an element that decorates, embellishes an ensemble, that is part of a composition; it is an accessory that enhances it, but could be removed without detracting from the main subject.

To introduce "ornament", I decided to choose not literal definitions, but to discuss it etymologically, aesthetically and philosophically, thanks to the problematics and paradoxes that is is currently creating in the architecture world. Antoine Picon (2013), in the politics of architecture and subjectivity, presents ornament paradox by looking at the origin of the word. Picon attracts our attention on two words : cosmetics and cosmos. Both derive from the the Greek verb Kosmein meaning to adorn as well as to arrange. This highlights an intimate relationship between superficial appearances covering reality like make-up applied to a face, and the structures present under the skin. Pierre Gros, French archeologist and specialist of Roman architecture, discusses as well this paradox in an essay titled The notion of ornamentum from Vitruvius to Alberti and published in the aesthetics magazine of the National Institute of Art History; he explains that the latin word for ornament, ornamentum, has a shared a etymological with the verb ordino, and that means to organize and to order. Gros stresses his argument further by an analysis of the word ornamentum sense, as it is inseparable from the processing of architectural orders. He writes :

"In his French edition of this treatise, in 1684, Claude Perrault already noted: "The word 'ornamenta' in Vitruvius particularly means the three parts that are placed on the column, namely the architrave, the frieze and the cornice, which is a very different meaning from the ordinary meaning, which includes all the things that are not essential parts but are added only to make the work richer and more beautiful". 4 In fact the contradiction Perrault points out is even more sensitive than he foresees. The Vitruvian ornamenta in most cases refer to the entablature which, from the structural point of view, is an essential and indispensable component. But these "ornaments" are also, in the Vitruvian treatise, elements of which the author endeavours to demonstrate not only the functional necessity but also the formal legitimacy. Nothing is less gratuitous, less overdid, less arbitrary than the ornamenta of the Latin treatise. "

The above proves how ornament was used to emphasize the architectural rhythms and orders, rather than, as commonly and wrongly assumed, spreading a superficial decorative layer. Ornament, supposedly as a supplement, distinguishes itself by its ability to be a characterizing aspect of the object to which it was added2; to be concurrently added and indispensable as described by Jaques Derrida in his philosophical text Of Grammatology.

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2 Picon, Antoine. 2013. Ornament: the politics of architecture and subjectivity. Wiley.

In concluding[3] his famous manuscript the mediation of ornament, Oleg Grabar exposes his initial assumption *"[…] most of the traditional approaches to ornament tend to be taxonomic. They order and classify. […] These approaches are all in reality ways to identify certain technical functions operative in the perception or in the making of works of art and of artifacts. What these categories of classification and of description state is nearly always accurate, but they do not reflect an often expressed characteristic of ornament, which is that, in the logic of aesthetic hierarchies, it alone among the forms of art is primarily, if not uniquely, endowed with property of carrying beauty and of providing pleasure. Such, at least, seems to be the consensus of books and encyclopedias about the function of ornament."* Through this first chapter, I would like therefore to expose my thoughts crystallized through my readings and how I think that, above all, all ornament is functional. Either to convey a political or a socio-economical meaning, to expose one's power and rank, or to stress the human individuality through one's enhanced beauty, ornament should be thought of as a necessary supplement bearing meaning and function.

I. Functions of ornament

Attempting to answer the question of "what is ornament" is of a persisting complexity due to the concept's paradoxes, in the same way "what is the function of ornament" knew many attempts from historians, critiques and architects to ascertain the definitions and domain of action of ornament. Ironically, while scholars tried to catalog all possible definitions, purposes and raison d'être of ornament in always an exhaustive way, this versatile object always slips away and eludes us by appearing under an unexpected shape and performing an unexpected function. Ultimately, how does an object earns an ornamental value ? For instance, are the trees necessary in the "Mille Arbres" mixed-use project by the Japanese Sou Fujimoto and the Moroccan Manal Rachdi ? Would this architecture be of quality even when denuded of the added nature ? Is nature here performing an ecological function, an ornamental symbolic one, an aesthetic one, or all synchronously ? Looking at Kazuyo Sejima and Ryue Nishizawa's architecture, one has in mind their obsession with phenomenal properties of transparency, continuous space and materiality, and the seamless frontier between the architecture and the landscape within which it sits. SANAA's architecture appears denuded of any ornament, but I would like to think that it is actually "topologically"ornamented. Indeed, the slightly curvature of their walls goes almost unnoticed. One example to illustrate my thoughts of this topological and eccentric ornament is the Louvre Lens, where by looking on the plans drawings one can clearly identify the walls curvature. Finally, one can also wonder if the tectonic joints created by a simple assemblage of discrete objects and hyper objects, as seen in the Taichung cultural center by Tom Wiscombe, can

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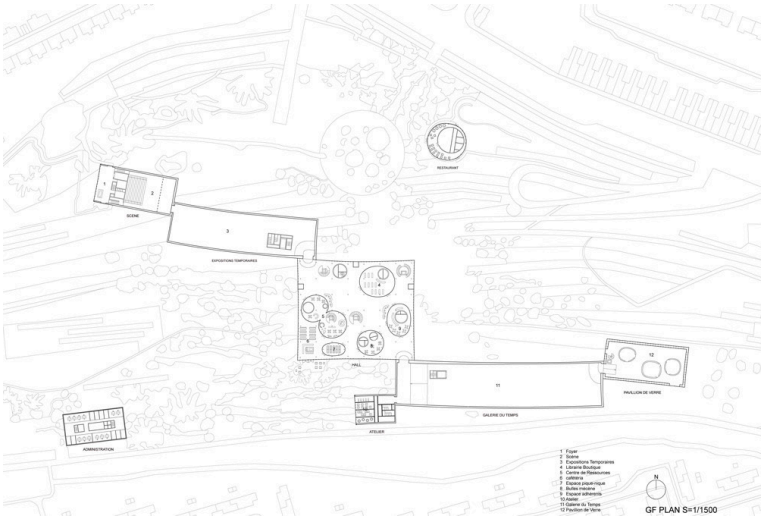
3 Grabar, Oleg. 1989. The mediation of ornament. Princeton University Press.

Mille Arbres
Sou Fujimoto and Manal Rachdi.



Louvre Lens Museum - Plan
Kazuyo Sejima and Ryue Nishizawa, 2012.

epitomizes a topological ornament.

In this subchapter, my aim is not to present an exhaustive definition of the function of ornament, but rather to draw attention to its absolute non-superficiality and convince the reader that ornament is always performing by being performative.

As presented in the introduction of this dissertation, Japanese patterns ancestors have been imported from China under the form of heraldic designs for the early Japanese sovereigns4. For the best part of Japanese history, those crests were used on battlefields to prevent attacking mistakenly its allies hidden by an armor. Dower informs us in his manuscript how the earliest imperially commissioned court history book Shoku Nihongi (続日本紀) describes the heraldry crests design being depicted in the year 701 on the banners of the emperor Monmu (文武天皇). After all "all Chinese emblems are of great antiquity, and together they carry a ponderous mythology which made the ruler the pivot of cosmic harmony5". In their early life Japanese crests were a by-product of the battlefield as war was always a genealogical affair between the several lords and Shoguns (将軍), and all men were fueled by extreme competition. By the mid 17th century, all families have adopted an official crest that would display their war power, their pride and their rank.

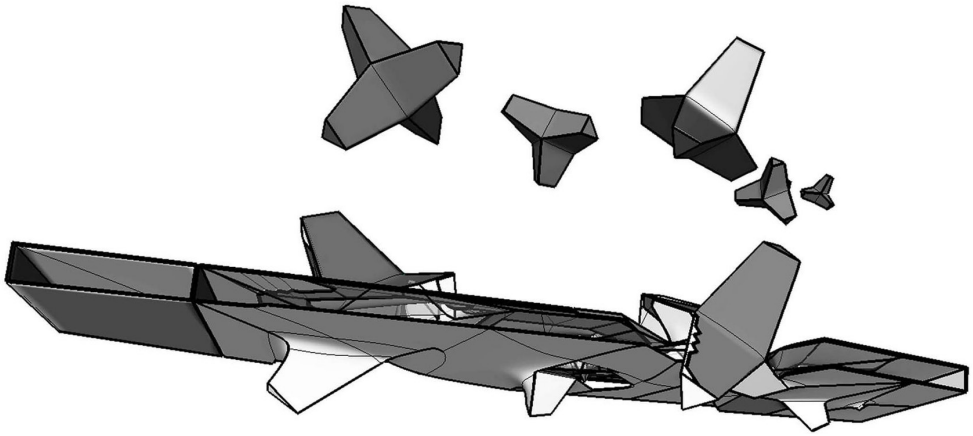
By opposition to the European crests, Japanese ones could survive history by becoming art. Heraldry crests of single design repeated over the entire object, patterns and designs emerged as a tool for family identification with the Heian aristocracy. The breakup of families due to the rule for the inheritance of an estate forced the sons to form their families and adopt new surnames. As a direct consequence, this led to the incommensurable enrichment of the Japanese early crests designs and patterns, and the variations extrapolated from a common motif. Dower summarizes this process well :

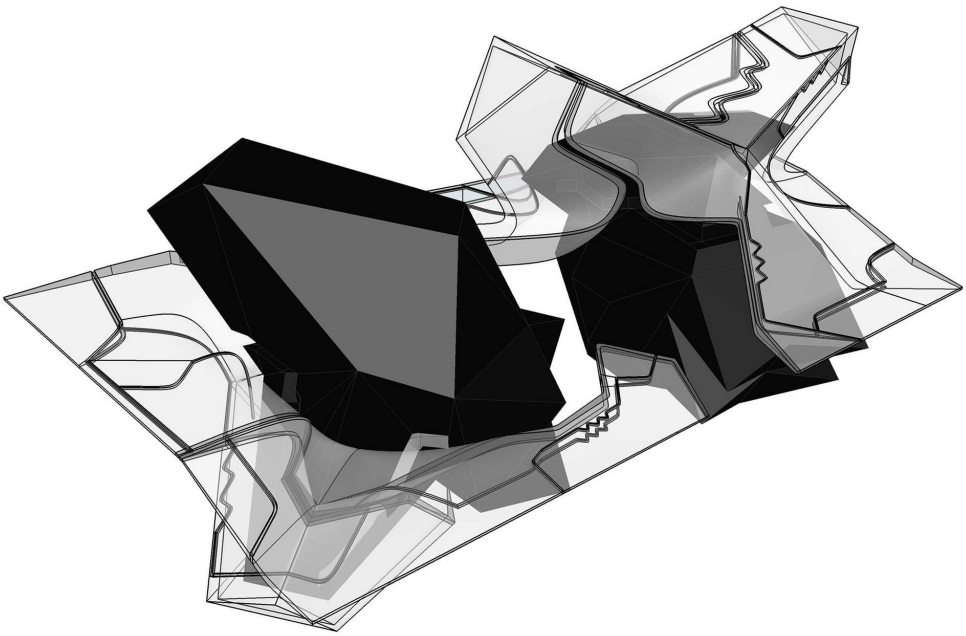
"In a manner similar to the conventions of Japanese poetry, once a body of standard forms has been established, there was little inclination to range afield in a search for strikingly new motifs. If for some reason no one had used a fish before - and it seems curious that they did not-then no one used one later. […] The most common method of alternations the addition of an enclosure, either circular or rectilinear, and here alone there were developed some fifty or more

4 Dower, John. 1971. The elements of Japanese design : A handbook of family crests, heraldry and symbolism. Shambhala Publications.

5 Ibid.

Kinmen Port Terminal.
Tom Wiscombe, 2014.





Taichung Cultural Center.
Tom Wiscombe, 2013.

conventionalized forms. Alternatively, a crest might be revised by introducing new elements, to the established design itself; by simplifying it; by changing the style of drawing; or by altering the perspective from which a given motif was portrayed. ”

Thanks to a designed crest and pattern drawn on a banner -putting aside its aesthetic and visual qualities-, this ornament conveyed crucial information on the rank of the individuals using it. Ornament, as an object, performs the qualifying-symbolic function, carrying meaning to its own subject, no matter the shape under which it is personified.

In the winter of 2018, Taku Sakaushi, architect and professor, invited me to his Tokyo Rikadai6 laboratory's workshop review. Following that critique session we headed to a koshitsu (個室) inside an izakaya (居酒屋) in Kanamachi area and while sipping beer, all of a sudden Sakaushi-san asks me in a sincere way if my handlebar mustache was to display a certain kind of prestige; a question and an idea I found very curious. To my lack of knowledge and coming from a culture where no such thing exists, I discovered in the following days through some targeted readings on the question, that actually hairstyle -to be seen as ornament for the body- also informs on the individual's political and social status. Stenn7 describes how in eastern countries such as Korea and China, citizens were forced to arrange their hair in a manner to mirror their rank. He writes in his book :

“The hair style was so deeply rooted in a lifestyle and cultural tradition that people strongly resisted any change, committing both murder and suicide in its defense. During this period it seemed that many peasants valued the arrangement of their hair -or rather, the social and political values represented by their hair- over their own lives.”

From chonmage (丁髷), to yoko-hyougo (横兵庫) and shimada (島田), in Japan as well hair ornament displayed not only rank from noble to samurai, but also one's marital status.

Marx8 talks about how private property and exclusive ownership permit to human to preserve their personality and distinguish themselves; it is “hence essential existence”. Therefore appropriating works of art from furniture to paintings to adorn space and walls, from costume t

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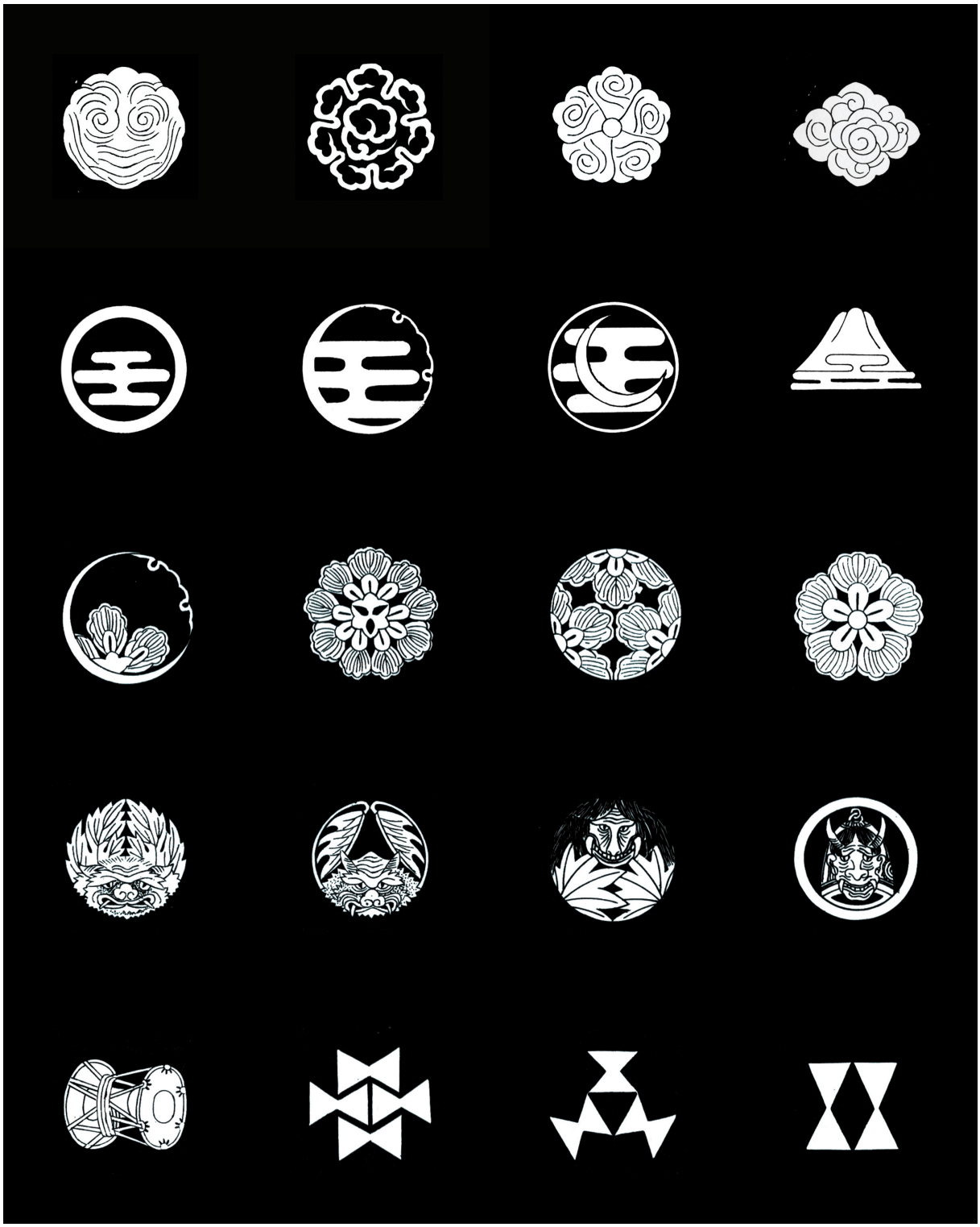
6 Tokyo Rikadai is the short abbreviation for Tokyo University of Science -東京理科大学-.

7 Stenn, Kurt. 2016. Hair: A human history. Pegasus Books.

8 Marx, Karl. 1974. ‘Excerpts from James Mill's elements of political economy’ in early writings. Harmondsworth, Penguin. Cited in Bourdieu, Pierre. 1979. ‘La distinction: critique sociale du jugement’. Les Editions de Minuit. p277.



Japanese crests.
Extracted from John Dower's book : Elements Of Japanese Design: Handbook Of Family Crests, Heraldry and Symbolism.

o hairstyle and tattoos and irezumi (入れ墨), is "to asset oneself as the exclusive possessor of the object and of the authentic taste for that object". Bourdieu9 further claims that objects that demand a long investment of time and capacities to acquire -such as musical culture- are the best indicators of the quality of a person.

Architecture, as a monumental art, builds its vocabulary and meaning from still objects10. This idea , starting to germinate in the Germany of the second half of the 18th century and beginning of the 19th century, known as kunst-industrie, was stressed by Gottfried Semper, expressing that it is in the objects of daily use of technical arts - jewelry, pots, textiles, etc.- where both our instinct for arts and where forms-as-symbols emerged11. Alina Payne also writes on how the connection of ornament and its function has been deeply rooted ever since antiquity and the renaissance, and that there is no distinction between its expression in architecture, decorative arts and other objects12.

Traditionally, ornament also pulled out of anonymity architectures of artistic approach. It was also meant to propagate knowledge and meaning as well as to moralize, and finally to inform on the power, rank and prestige of either an individual or of the institution hosted sited within the architectural construction.

Tom Heneghan, in a series of retirement lectures given in midsummer 2018 in Tokyo University of The Arts, dedicated his last one to meaning in architecture by titling it : Isozaki - Michelangelo. Heneghan reminds us how Isozaki described architecture as a "machine for the production of meaning". One of the key chapters of this lecture was Isozaki's design for the Tsukuba City Center project. In this new city, he deliberately made the architecture ambiguous by referring to Michelangelo's Campidoglio in Rome and placing the same pattern design on the floor, denuded of a statue of course and replaced by a drain. In one of the several goals of this project, Isozaki wanted to first give legitimacy to this new town yet to be constructed. For this, he used

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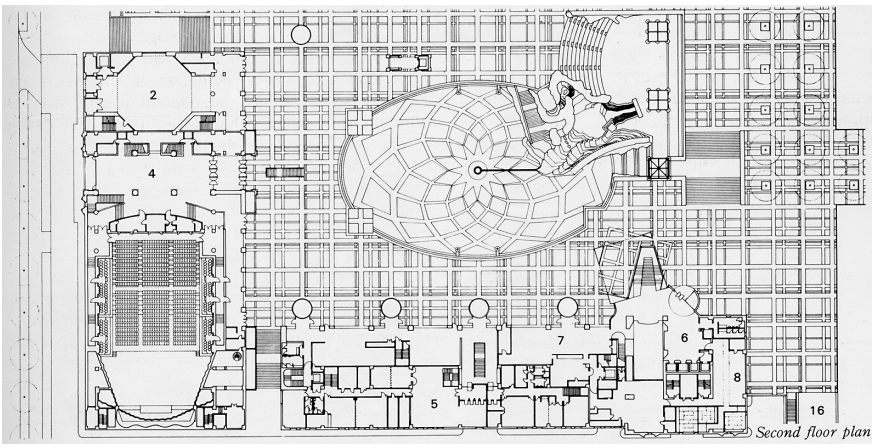
9 Bourdieu, Pierre. 1979. 'La distinction: critique sociale du jugement'. Les Editions de Minuit. p278.

10 Payne, Alina. 2012. 'From ornament to object: Genealogies of architectural modernism'. Yale University Press. p37.

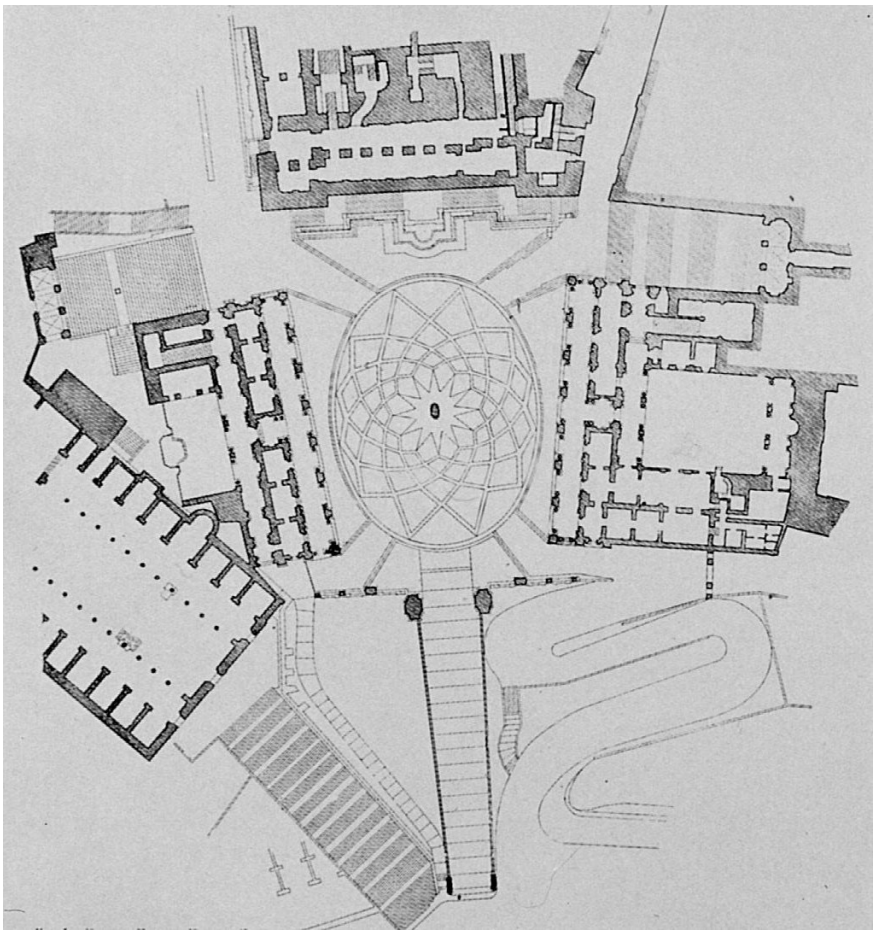
11 Herrmann, Wolfgang. 1984. 'Gottfried Semper: In search of architecture'. MIT Press. Cited in Payne, Alina. 2012. 'From ornament to object: Genealogies of architectural modernism'. Yale University Press. p37.

12 Payne draws this conclusion citing texts from Leon Battista Alberti (On the art of building in ten books), Lucian (the hall) and Sebastiano Serlio (Tutte l'opera d'architettura et prospective).

Tsukuba Project,
Arata Isozaki, 1983.



Second floor plan



Piazza del campidoglio,
Michel-Angelo, 1546.

intentionally historical western elements and simultaneously delegitimized Tsukuba's urban center as Michelangelo's symbol was legible only to westerners, in order to invite Japanese users of that plaza to receive and transform that outside influence13.

During a diner with my former professor and architecture historian Yoshitake Doi after my return to Tokyo in 2017, he shared with me one of his personal speculative and pleasant theory that he later published in a book in 2020. According to Doi, the fact that Kenzo Tange gave to many of his architectures a pitched roofing element -for instance the Saint-Mary cathedral and the Yoyogi Gymnasium- is not anodyne. In fact, Doi suggests that in designing those forms Tange has drawn his inspiration from the roof element of the Ise temple in Mie prefecture. In that element would reside sacrality and spirituality that later Tange wanted to place in his modern architecture to contaminate with such meaning and to sacralize them14. This epitomizes how an architectural object-element -the roof form as ornament- was conferred a meaning function (sacrality) and became to adorn its architecture in a part-hole relationship.

In Perspecta, Saarinen writes with conviction about the communication function of architecture: "inside or outside the building sings with the same message15". Architecture in the past, through various tools such as allegories, metaphors and symbols, informed clearly on the political, economical, philosophical and ideological.

Looking at the nineteenth century architecture two buildings can epitomize the former: first, Paris Hotel de Ville, where on one hand the facades lay dozens of ornamental sculptures of French scientists, poets, architects, authors and people of intellect, and on the other, the main facade is is surmounted by a clock framed by two stone groups symbolizing instruction and work, and two lying figures: the Seine and the Marne rivers. Above the dial is laying the City of Paris, by and, on the pediment, two seated figures: the prudence and vigilance.

One other construction from the same period is the 1851 remarkable Bibliothèque Sainte-

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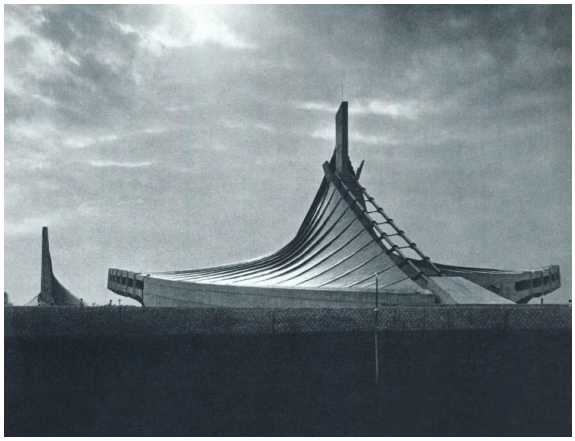
13 Heneghan, Tom. 2019. 'Speculations: 10 lectures on modern architecture'. Tokyo University of The Arts Press. Pp157-170.

14 土居義岳『建築の聖なる者—宗教と近代建築の精神史』東京大学出版会、2020年、202、309ページ. (Doi, Yoshitake. 2020. 'The Sacred in Architecture--Religion and Modern Architecture as a History of Ideas. Tokyo University Press. pp.202, 309).

15 Saarinen, Eero. 1961. 'Discussion' in Perspecta 7: The Yale Architectural Journal. New Haven: Yale University School of Art and Architecture.

Saint-Mary cathedral.
Kenzo Tange.

Yoyogi gymnasium.
Kenzo Tange.



Ise Shrine,
Mie Prefecture.

Geneviève by Henri Labrouste and that depicts on its facade the name of nearly 800 intellectuals, making an analogy between the container construction and the contained books.

In a straight forward manner, Jacques François Blondel offers a concise summary in his famous "Cours d'architecture" on the relationship between the function of a construction and the ornamental style elements used to erect it. For instance, due the simplicity of the Tuscan order elements, it was not employed in the erection of distinguished architectures, but in the construction of civil, military and naval architectures. The doric order, due to its masculine character and its symmetrical aesthetics, was rather employed for public and sacred buildings. The Ionic order, with lighter proportions than the precedent, was rather employed in private houses and apartments, both in and outside. The corinthian, thanks to its delicate order and certain beauty, was employed in royal mansions and temples, depicting elegance and magnificence16.

Such rules and orders are still permeable in our contemporary society and culture and can be found in multiple situations. In the popular television show run by Vince Gilligan "Breaking Bad", the lawyer Saul Goodman sits in his personal office decorated with parts of the constitution on the walls and white ionic pillars. The show runner explains that it is made to impress and intimidate clients of low educational background and gangsters that might think that what the law and justice are.

Of course, in this chapter the purpose is not to depict and bring an exhaustive list of all ornament functions, but to stress the most representative and the ones I am relying on to construct my rhetoric. The last function I will be discussing in this part is the one linked to the hedonistic, aesthetic and sensual capacities of ornament to appeal to the senses and to create a sympathetic mutual bond between the objects17. This function is famously known as the affect of ornament as brilliantly documented by Farshid Moussavi and Michael Kubo. In their famous book, they catalog a series of constructed projects around the world and that used design strategies ranging for instance from mapping images, material textures, tectonics, programmatic, branding, cladding, color and shape, to produce affects such as kinetic, pleated, dematerialized, complex, spiral, moired, geometric, amorphous, aggregated, etc. In these case studies "affects seem to grow directly from matter itself".18

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16 Blondel, J. François. 1771-7. Cours d'architecture, ou traité de la décoration, distribution & construction des bâtiments. Desaint. T1, pp 216-219.

17 Here Humans are seen as objects as well.

18 Moussavi, Farshid and Kubo, Michael. 2005. The function of ornament. Actar.

Hotel De Ville - Main Facade,
Paris.

Sainte-Genevieve Library,
Henri Labrouste, Paris.

Saul Goodman Attorney in Law's office,
Breaking Bad, Screenshot.

II. Superficiality of ornament and the Loos misunderstanding

In discussing the function and necessity of ornament it is mandatory to stop briefly at the famous essay "ornament and crime". It is important because one of the most polemical statements of modernism as it was used as a catalyst to drive away modern architecture from historicism. Various scholars and architecture related media have ignored the real roots of Loos' theory, and it is only recently that scholars started linking his modern architectural theory to criminal anthropology as described in an essay by Canales and Herscher19.

Canales and Herscher invite us to understand and read literally 'ornament and crime' as they write "Loos infantilized, orientalized, feminized and criminalized specific Austrian and German architects and designers who employed ornament". The authors offer us a clear image and analysis of Loos arguments and their strong link to tattoos and criminals as Loos wrote "a modern person who tattoos himself is either a criminal or a degenerate20" and "people with tattoos not in prison are either latent criminals or degenerate aristocrats". Building his arguments on bourgeois and aristocratic ideology -considering criminal disposition to primitiveness-, Loos assimilates ornament to crime against the modern values as he affirms further "I can accept the ornament of the African, the Persian, the Slovak peasant woman, my shoemaker, because they have no other means to achieve elevated states of being. We, on the other hand, possess the art that has superseded ornament21".

While Kantian aesthetics established a parallel form of free beauty between tattoos and ornament, tattoo became the link between criminology and architectural theory22. Indeed authors such as Darwin and Owen Jones started to link tattoo to primitiveness and sense of awe after the European expeditions' encounter with aborigines. Loos links further tattoos and criminality by relying on the writings of Cesare Lombroso -Italian criminologist- and his idea that both primitive and criminal minds converge through their use of tattoo ornamental practice.

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19 Canales, Jimena and Herscher, Andrew. 2005. 'Criminal skins: Tattoos and modern architecture in the work of Adolf Loos' in Architectural History Vol. 48, pp. 235-256.

20 Loos, Adolf. 1908. 'Ornament and crime', pp 79-80.

21 Ibid.

22 Ibid 19.

Augmented Agents

When it comes to the ornamental expression of a building architects have always been going back and forth between displaying their invention genius of aesthetics, rules and available technology. In term of rules and aesthetics, architects have been following the "harmony", orders and proportions as dictated by the Vitruvian ideal until the end of the 18th century. Being constrained by the discipline's vocabulary and syntax to the detriment of one's imagination and thirst for creativity, we can wonder where is the art ? Piranesi broke with such tradition by stating the famous "they despise my novelty, I their timidity" in the Parere su l'Architettura (opinions on architecture) and by making extravagant virtual drawings of ornamented facades composed of a new tectonic order made of Greek, Egyptian, Roman, and Etruscan elements23.

Other than the aesthetic and design innovation further parameters are at stake : the agents involved in the fabrication and production of ornament. In a Ruskinian philosophy connecting architecture to arts and crafts, the primary pleasure and expressive vocation of ornament is achieved only if the craftsman is spirited by enjoyment and inspiration when left with room for maneuver. John Ruskin appears as a fervent defender of the irregularity and imperfection of craftsmen hands and is in opposition to the machine precision.

On the other hand, Picon reminds us that multiplication and increase of the number of agents involved in the production of ornament comes with the cost of professional boundaries between architects, craftsmen and entrepreneurs. For instance Philibert Delorme wanted to control entirely the ornament details and shared his dissatisfaction with craftsmen malpractices. In a 17th-century drawing, Augustin-Charles d'Aviler organizes in two parallel columns the various ornamental elements, and their respective appellations and representation methods given by workers on one side, and by architects on the other; an important negotiation process to proceed to construction24.

The rise of the industrial machine and steel and the ubiquity of skilled craftsmen involved in construction raised the question of the cost, a problematic with which emerged a strong interest for standardization and prefabrication of ornamental components remotely in large factories.

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23 "Piranesi as a designer", Cooper Hewitt National Design Museum, accessed December 2019, http://archive.cooperhewitt.org/piranesi/piranesi.cooperhewitt.org/design/imaginary-architectural-composition-with-inscription-from-sallust-in-osservazioni-sopra-la-lettre-de-m-mariette-parere-su-larchitettura-della-introduzione-e-del-progresso-delle-belle-arti-in-europa-de-tempi-antichi-1765/index354c.html?c=

24 Picon, Antoine. 2016. "Ornament and its users: From the vitruvian Tradition to the digital age". In Histories of ornament: From global to local, edited Payne and Necipoglu. Princeton University press, pp 10-20.

Before modernists democratize the use of standard elements, industrialization of terra-cotta made ornament was already present in the 19th century[25].

Mario Carpo opens his manuscript -The second digital turn- by architects tend to be late in embracing technological change. A rhetorical formula to affirm why architects that embraced digital tools were the best architects of their time[26]. As architectural ornament revival started to strongly reemerge with the eighties postmodernists, moving afterward to the nineties first digital shift and the conceptualization of the file-to-factory method, addressing for the first time the notion of non-standardization through a continuous chain between computer-aided design and production by numerically controlled machines. Here, the machine operations are integrated from the start of the design and produce objects (and later ornaments) adapted to each human being. These 1990s exploration and materialization tools increased the formal potential and the manipulation of ornament, objects, tectonics and topological surfaces. Greg Lynn, Bernard Cache, Peter Eisenman, Hani Rashid and Reiser-Umemoto -some of them known as the Fold architects, others as Derridian deconstructivists[27]- are the pioneers that embraced these tools during the first digital turn[28]. In the first half of the 90s, Lynn relies on mathematical and biological models to demonstrate the geometrical potential for the architectural project[29].

What epitomizes Lynn's early explorations best is the Stranded Sears Tower project entry for the idea competition launched by the University of Illinois in Chicago in 1992. In this project Lynn rethinks the monumentality of the Sears Tower by laying it down horizontally to reconnect it with its context. Florence Plihon, specialist of Cache, Lynn and the Deleuzian Fold, informs us on how the software and mathematic notions were deployed in the Chicago project :

"The different flows and trajectories of pedestrians are transformed into vectors that bear internal and external transformations depending on different parameters: the banks of the river, the city urban grid, transportation. These flows are then translated into the tubes of the tower.[30]".

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25 Nègre, Valérie. 2006. Ornement en série: Architecture terre cuite et carton. Sprimont: Mardaga.

26 Carpo, Mario. 2017. The second digital turn: design beyond intelligence. The MIT press, pp 1-3.

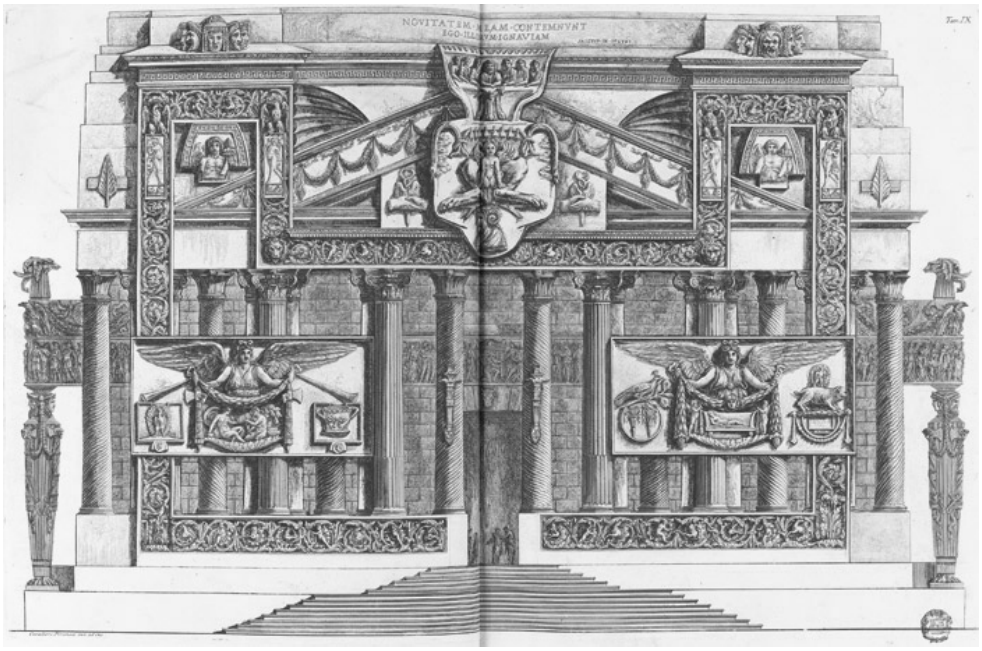
27 1993. Folding in architecture, Architectural Design n*63, edited Greg Lynn.

28 Plihon, Florence. 2016. Architectures numériques et résurgence baroque: Bernard Cache, Greg Lynn et le Pli de Deleuze. Architecture, aménagement de l'espace. Université Charles de Gaulle - Lille III.

29 Lynn, Greg. 1992. Multiplies and inorganic bodies in Assemblage n*19.

30 Ibid 28, pp 52-53.

Speculative composition,
Giovanni Battista Piranesi, 1767.



Stranded Sears Towers, Chicago.
Greg Lynn, 1992.

Greg Lynn focuses then on the conception of the architectural project rather on its fabrication. Using an arsenal of softwares such as Maya -initially used in the animation industry- and Micro-station to establish the parameters of geometrical primitive curves.

While Lynn focused purely on the conceptual side, Bernard Cache had a more pragmatic approach and manifested his interest mainly for the non-standard architecture fabrication and questioned the industry model of the 19th and 20th-centuries by democratizing the file-to-factory, despite having defended his thesis under Gilles Deleuze and naming his office Objectile. His atelier is then the first architecture firm to ever establish a continuous workflow between conception software and CNC (computer numerical control) machines. Theorizing for the first time the idea of variable and parametrical architectural elements Cache develops TopSolid, a software that goes further than simple industrial drawing softwares that simply allow to draw on a screen; his actually implements programming interface to enable parametrical functions and to associate the design of double curved surfaces and the fabrication of complex elements31. Plihon informs on how with Bernard Cache architecture becomes entirely digital, computational, logical, mathematical.

The notion of the non-standard is brought to life in a real public blind-tender by Jesse Reiser and Nanako Umemoto for the Yokohama Port Terminal, where its shed's topological complexity borrows the aesthetics of industrial 19th century halls roofing but with a structural truss made of unique elements at each section point of the roof32.

As the first digital shift operated in a context of theoretical experimentation, it is fundamental to acknowledge the role of philosophy in shaping the narrative discourse and the rhetoric of the Fold architects -and beyond- in order to understand the creative potential of the speculative analogy of the metaphor and its impact on the formalization, tectonics, topology and therefore ornamentation of architecture, especially, as we will see it further in this chapter, more and more architects, creatives, students and scholars call on philosophical ideas -sometimes wrongly misinterpreted- to inject them into their generative computational algorithms.

Eisenman's Rebstock Park is a good demonstration of "ornament" at the scale of a city, and a good illustration of philosophy's metaphorical power to generate topology. In this project,

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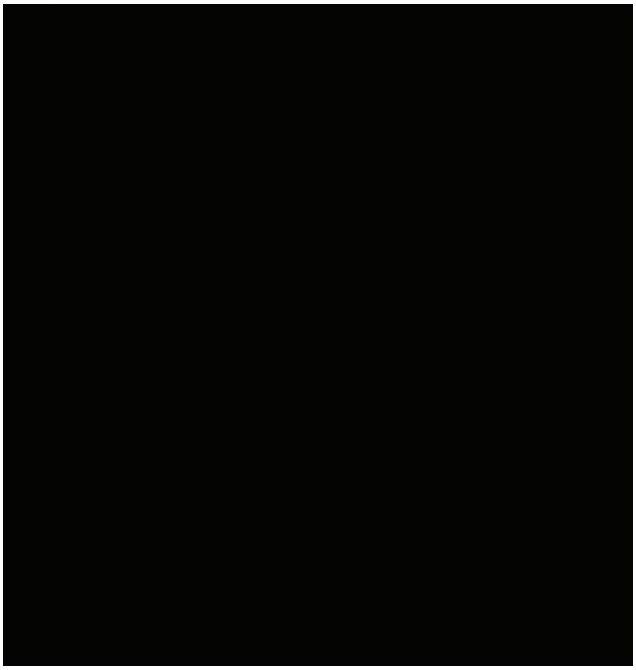
31 Ibid 28, pp 88-91.

32 Lynn, Greg. 1996. Blobs, or why tectonics is square and topology is groovy in Any: Architecture N*14, tectonics unbound: KERNFORM AND KUNSTFORM REVISITED!, pp 58-61.



Yokohoma ferry terminal competition,
Reiser-Umemoto, 1995.

Eisenman abandons Derrida's deconstruction to turn to the deleuzian fold; his intervention on the grid appeals to the seven deformations as presented in the mathematical catastrophes theory of René Thom.

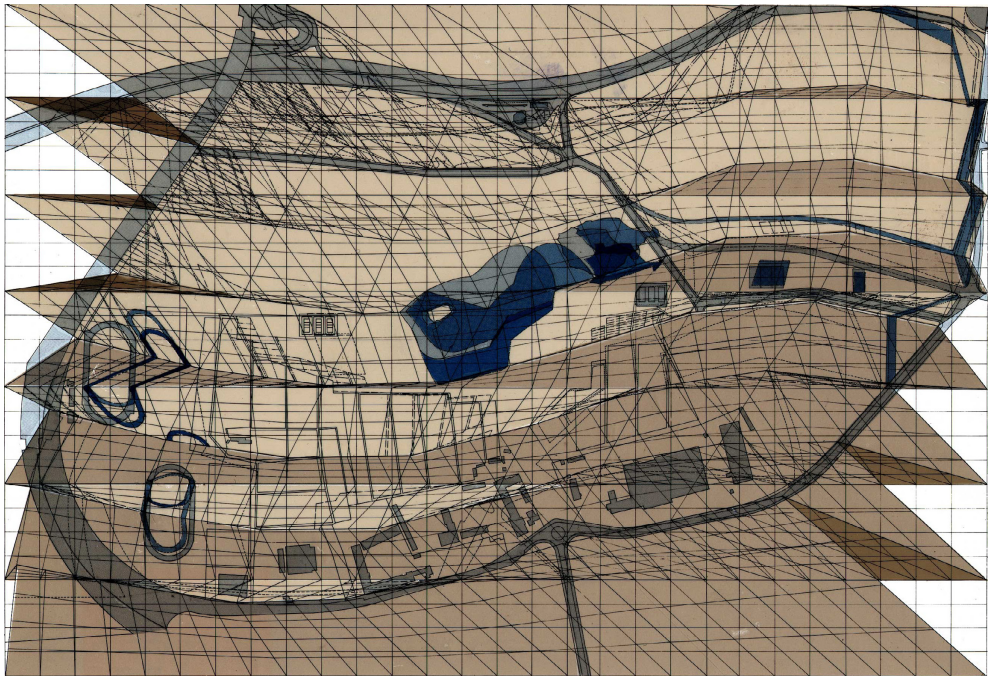
Mentioning historical facts of the first digital turn is of crucial importance. Indeed the production of ornament is greatly linked to the agents involved in its design and production. Modern standardization brought with it moulds and the logic of the more we make, the cheaper the element gets. Small batch productions to target fewer customers come at expensive costs. By contrast, digital fabrication does not need any casts or moulds and therefore does not utilize them to decrease the cost.

Our generation's computers are more powerful and faster, with more cores in their CPUs, more powerful GPU based acceleration, and larger SSD hard-drives for larger files. Today, as Carpo titles in his manuscript so well "Data compression technologies we don't need anymore", we can manipulate files of dozen millions of polygon meshes in ZBrush to sculpt any form, import high resolution 3D scans made of millions of 3dpoints, and run multi-threaded bottom-up agent-based algorithms for either generative or rationalization tasks.

In the following subchapters, I would like to depict the current investigations and exploratory work undergone around the world and that demonstrates the relation ship between ornament and its generation and production in the second digital age and beyond it in the postdigital. By all means, this can not give a faithful testimony as in every university in every country on every continent, an army of architecture students and researchers is conducting personal work, using softwares and workflows unheard of, producing therefore always novel work. The following is therefore only a glimpse of the current international scene.

I. Voxel is the new pixel

There is no doubt, voxel is the new black. Thanks to it, ornaments and novel patterns are generated at no precedently seen high resolutions, and fabricated through materials of variable properties that can be laid down (additive processes) or extruded by an end tool effector nozzle attached to a robot arm. Voxel is the new grain; a granular materiality that comes at no cost (computationally and physically). As I will illustrate it later, voxels and octrees are individually printed and used to create objects of different granularity and size to respond to the structural needs, independently from the geometrical complexity.



« Folding in Time, the singularity of Rebstock Park»,
Peter Eisenman, 1993.

Alisa Andrasek, Croatian architect, is perhaps one of the designers that epitomizes best the voxel generation. Recently partnering with NVIDIA for GPU computing and acceleration, sensing, deep-learning and path generation for robotic fabrication using MAS (multi-agent systems)33.

Using voxels to generate porous and poly-scalar structures in Andrasek's Abundance project (2016-2017), the density is controlled through data and agent population simulation over time. A vector field charged with information controls directionality and transforms the modular system into a lattice structure. A mix of Perlin noise and agents generates a plethora of patterns and design variations. At a further stage, the robotic printing relies on a path-finding algorithm to generate a printing choreography, finding the shortest non-continuous navigation path and avoiding material collision34.

In Modiform project (2016-2017), Andrasek focused on transforming a uniform lattice voxel grid into a non-uniform lattice. The chair design is first translated into a series of voxels populating the geometry; after what MAS agents are conditioned to grow around the chair geometry and densify areas subject to higher structural forces and stress. The seat area necessitating more comfort and adaptability, its voxels are of finer resolution. In this project, by contrast to the previous one, was fabricated through a continuous robotic path, with low deformation areas with easy printing and collision free, and highly deformed lattice areas with more heavy collision-sensing35.

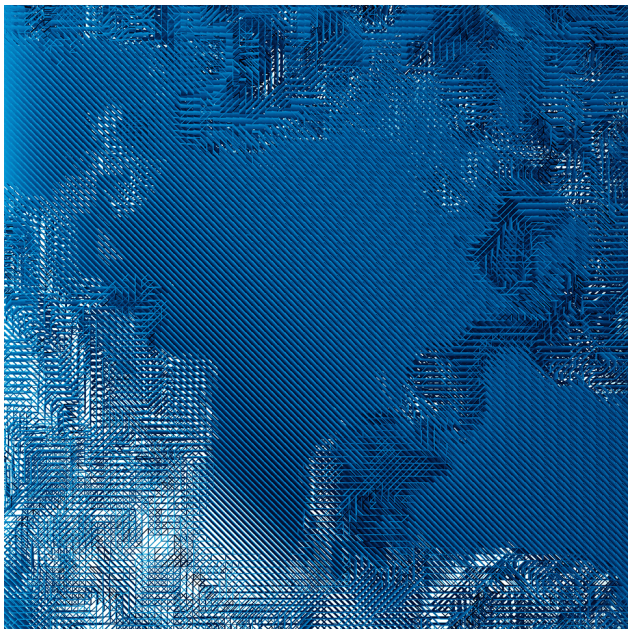
In the tower project Gossamer Skins (2015-2016), Andrasek appeals to stigmergy based agent system to investigate contrast aesthetics made first of the organic geometries left by the stigmergic behavior, and then discretized into a rational voxel geometry extruded toward the normal vector of the surface. The system proves to able to generate a great sample of ornamented facade skins36. Stigmergy is a coordination mechanism and organizational principle taking place in a communication process between different agents observed in social insects for instance and that rely on a stimulating trigger -pheromone- to perform or not an action. In architecture, stigmergy is used for flow urban data or a solar-lighting informations turned into a

33 While an agent-based model (ABM) follow a collective behavior and obeys to simple rules without necessarily being intelligent, a multi-agent system is a software made of multiple intelligent agents created to solve problems

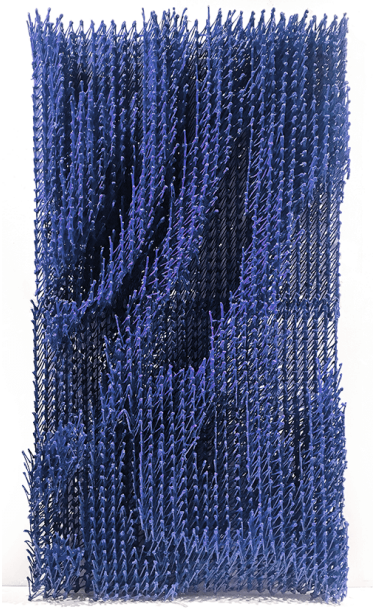
34 https://www.alisaandrasek.com/projects/abundance

35 https://www.alisaandrasek.com/projects/modiform

36 https://www.alisaandrasek.com/projects/gossamer-skins

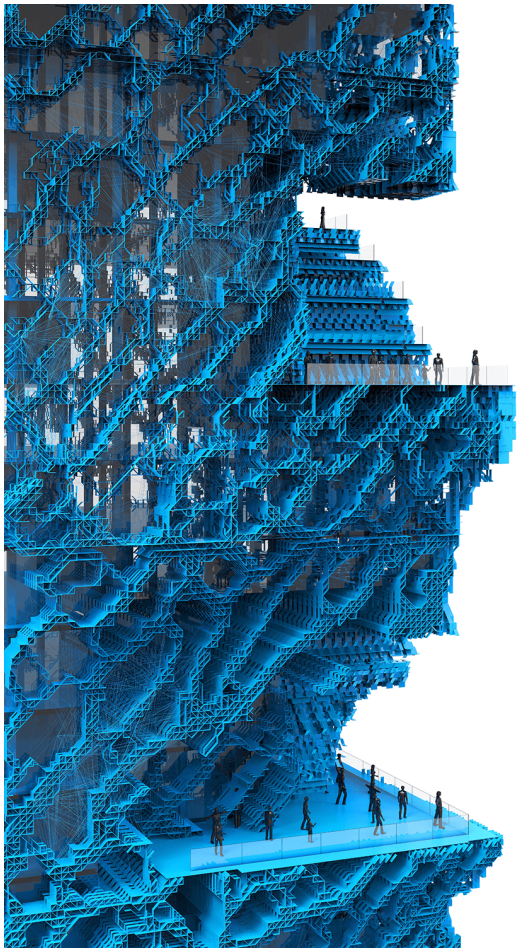


Abundance project,
Alisa Andrasek.

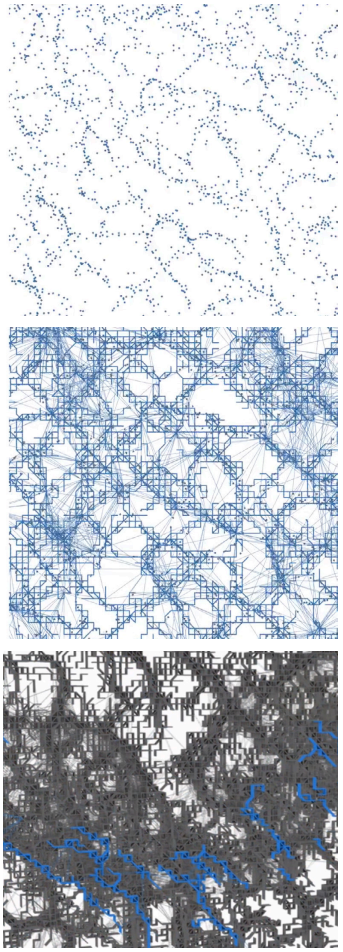


Modiform project,
Alisa Andrasek.

Gossamer skin,
Alisa Andrasek.



Agent organization (stigmergy)
Alisa Andrasek.



vector field for example[37].

In a much more recent timeframe, Gilles Retsin proceeds to the serialization of the tool path within the voxels using a combinatorial design method that allows for faster material extrusion, more complexity and differentiation of materials. This method actually bridges the virtual to the real in the way both the design and the fabrication are digital. While other spatial printing methods use a repetitive tool path made of voxel wireframe connected with a triangular polyline, his team uses a different approach as described in their paper[38] :

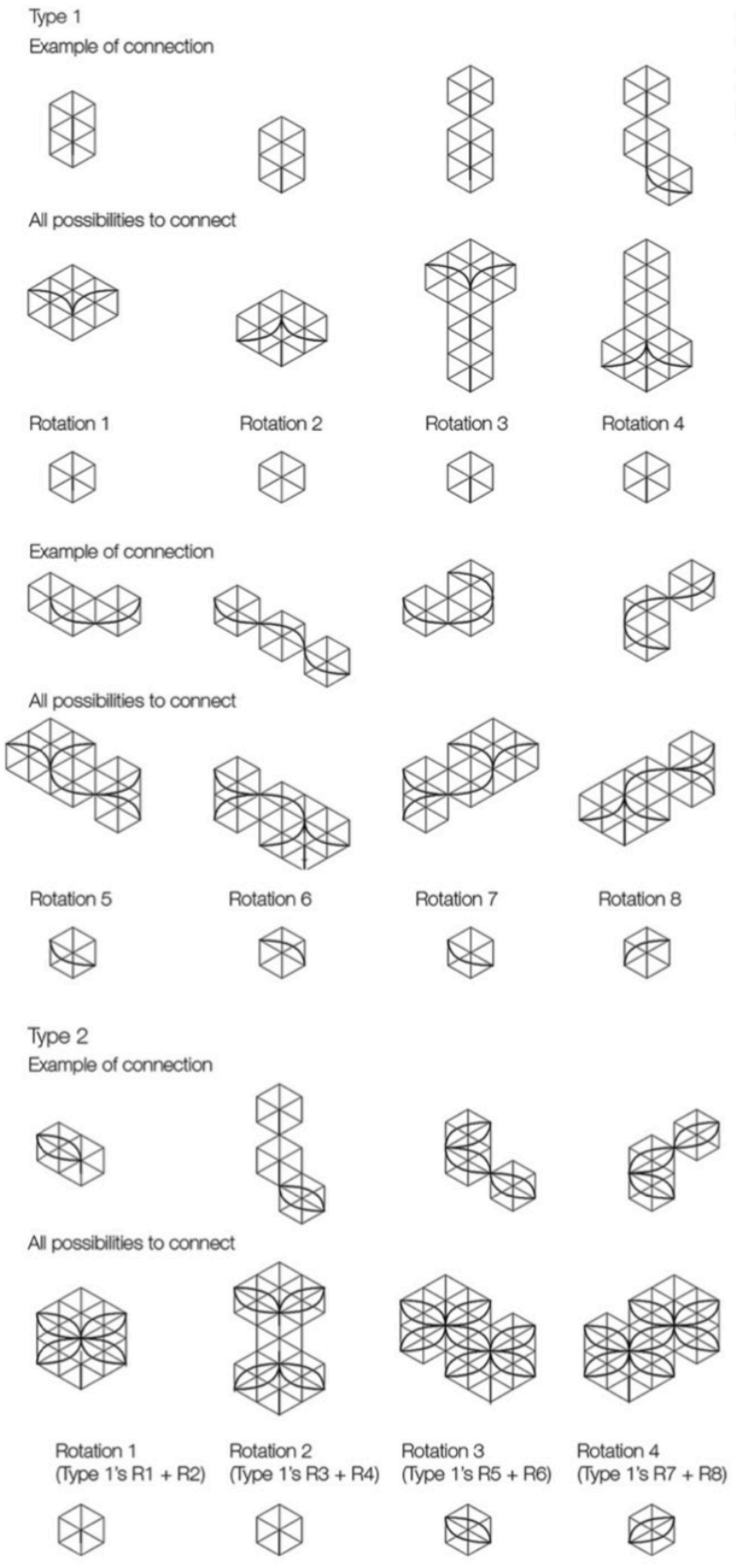
"CurVoxels' computational approach is based on discretisation: a voxel space is developed, where every voxel contains a tool-path fragment. It was decided to use a Bézier curve as a unit to compose the tool-path. The team then developed a process that cycles through the voxel space in a layered and linear fashion, simulating the trajectory of the robot. Every time a voxel is accessed, the Bézier curve inside the voxel is rotated to connect to the line in the previous voxel. In principle, there are 24 rotations possible but a number of these are not printable, as the extrusion tool would intersect with the curve. The logic of combining separate tool-path fragments is essentially combinatoric: there is a discrete set of options for how curves can connect without losing continuity. The printing process can be prototyped on a few voxels, rather than having to compute and prototype an entire tool-path. The error space is not continuously differentiated, but discrete and limited. After the tool-path is tested for a single curve-voxel in 24 different rotations, it can be used to assemble thousands of tool-path fragments together into one continuous, kilometres long, printable line."

II. Cellular growth

Translating a biological and life-like behaviors into an agent-based algorithm will most likely generate form similar to that present in nature. The cellular division and growth algorithms are popular for what they produce three dimensional shapes apparent to flowers, presenting a tremendous ornamental potential. In his IGeo library tutorials, Satoru Sugihara has dedicated several web pages to coding and programming such performance: First a cell agent needs to grow its size across time, once it has reached the collision moment with another cell it starts pushing its neighbors to proceed for a division operation; the parent cell is then divided into two equal child cells. Growing a three dimensional mesh made of triangular faces consists of considering three

37 Bonabeau, et al. 2000. Three-dimensional architectures grown by simple 'stigmergic' agents in BioSystems.

38 Retsin, Gilles. Jimenez Garcia, Manuel. Soler, Vicente. 2017. A generalized approach to non-layered fused filament fabrication in the proceedings of ACADIA-Association for Computer Aided Design in Architecture, pp 562-571.



Voxel and OcTree robotic path optimization
Retsin, Jimenex Garcia and Soler, 2017.

cells as the vertices and linked by three edges. Once a new cell is created, this permit the creation of a divided triangular face into three. This chain growth produces closed meshes by avoiding holes in the geometry39.

Among popular and media-published designs one has in mind Andrasek's Wrinkle In Space project meant to produce architectural fabrics of variable folds in space where according to the author smaller scale wrinkles provide more density and structural force, while larger scale ones are forming inhabitable textured space40. In a similar aesthetics, the students work of the ETH MAS studio led by Mania Aghaei Meibodi generates -speculatively- their Deep Facade design using a cellular division and growth ornamental algorithm and later fabricated it using 3d printing sand mould and metal casting technology.

In his paper Cellular Design41 and by contrast to other researchers and designers who place the cells in a regular equidistant lattice arrangements, Christoph Klemmt allows cells to reallocate their neighbor cells based on their position and accumulate in a multi-layered volume rather than in a linear single layered surface. Klemmt then runs different typologies of cells to test and generate a variety of morphologies that could be of interest for architectural design.

Later42, due to the fact that today's construction industry is still mostly relying on repetitive assemblage of discrete elements, Klemmt (et al) uses the spatial voxels occupied by cells to place repetitive components by either controlling their locations on the grid or their alignment and patternisation.

III. Robotics, additive processes and distributed systems

Theoretically, after thirty years of pushing forward the limits of the file-to-factory system we have reached now the era of mass-customization. Thanks to more accessible 3d printing machines and more ubiquity of robot arms in the architecture industry and academia it is now

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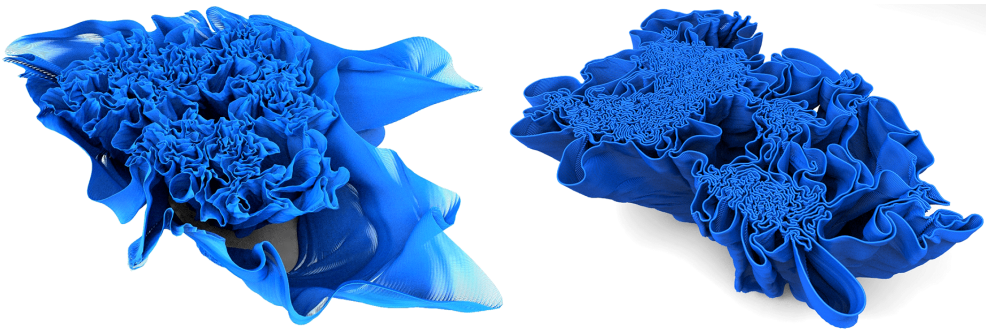
39 The details of the behavior and its code are accessible via http://igeo.jp/tutorial/56.html

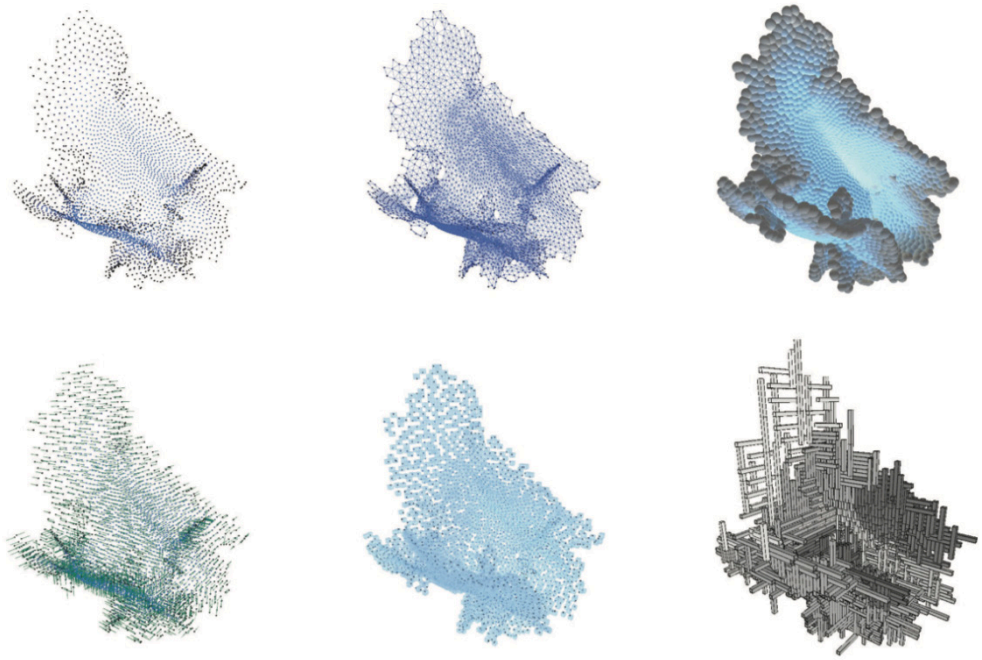
40 https://www.alisaandrasek.com/projects/wrinkle-in-space

41 Klemmt, Christoph. 2019. Cellular Design in The e-journal for the dissemination of doctoral research in architecture, 2-6, pp. 46 - 63.

42 Klemmt, Christoph. Pantic, Igor. Gheorghe, Andrei and Sebestyen, Adam. 2019. Discrete vs. Discretized growth: Discretized fabrication of geometries generated with cellular growth simulations in the proceedings of The Association of Computer Aided Design In Architecture, pp 542 -552.

A wrinkle in space
Alisa Andrasek, 2016.





Cellular growth and discretization process,
Klemmt and Pantic, 2019.

possible, without any mould or die cast, to reach the no economy of scale status[43] : the first object cost in a series is the same of all the following ones, be it all different or all an exact copy. The 3d printing community is growing day after day, from amateurs to researchers, sharing hardware and to firmware and hackable scripts. Furthermore machines are getting more democratic and accessible with technologies such as stereolithography (SLA) as cheap as 4000 $ (Formlabs), and larger for large objects fabrication (3d Wasp). Moreover, currently every owner of a robot arm can transform it in a 3d printing machine with no layer depositing limit; in academia, students and researchers are setting up end tool effector extruders, handmade from assembled pieces. Others, such as the London based startup AI Build, has partnered with Kuka robotics and is now offering ready to ship cells of different size for architectural firms, including a software interface.

While additive processes for architecture manufacturing have proved to be able to produce large scale parts and chunks of complex geometry, it is now common knowledge that FDM technology (layer deposition) and binder jetting produce products of low tensile properties due the layering process, making them unsuitable for the industry, unless filled with ultra-high performance concrete. In the winter 2018, the team of the Block Research Group has tackled such an issue by generating after a Thrust Network Analysis form-finding process a highly aesthetically pleasing rib pattern and that can work mostly in compression, making use of the compressive strength of layer deposited materials. This resulted in a lightweight vaulted rib-stiffened floor of large size 3d printed in silica-based phenol-binder sand[44].

Another challenging aspect of 3d printing casts is the complexity of object's geometry; undercuts and hollow-unreachable areas create a risk for the human task force to break entirely the part or damage the final surface details. For this, Matthias Leschok and Benjamin Dillenburger of ETH Zurich have focused on a sustainable FDM fabricated formwork system that enables the casting without leaving material waste behind and without compromising the the potential of 3d printing and form complexity. In this project, they relied on a water dissolvable, non-toxic, biodegradable formwork made of Poly Vinyl Alcohol (PVA), bringing to life full-scale columns and column

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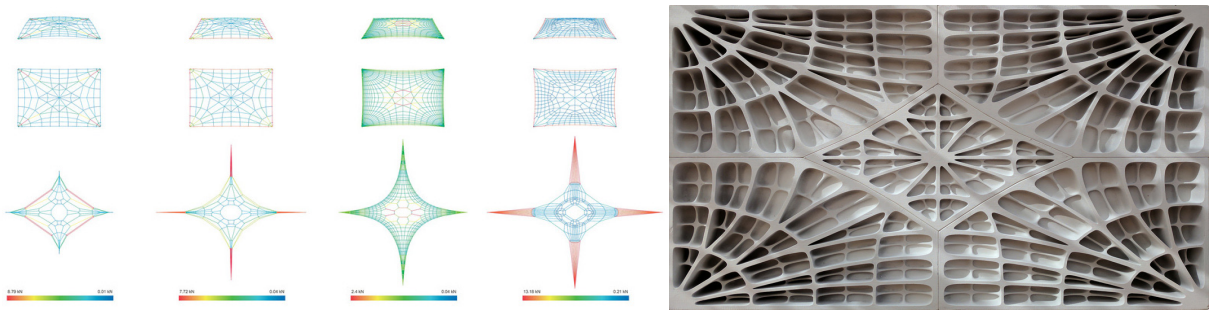
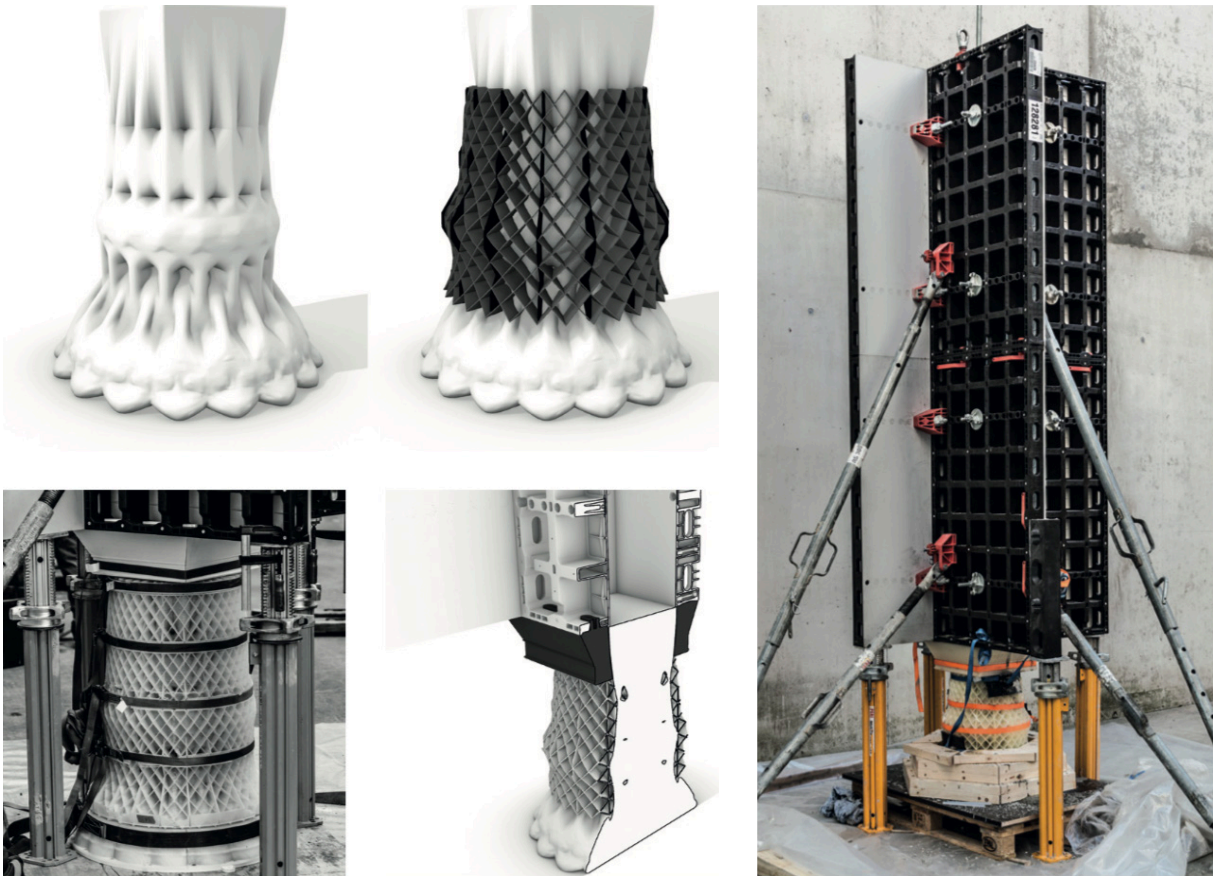
43 Carpo, Mario. 2017. The second digital turn: design beyond intelligence. The MIT press, p 151.

44 Rippmann, Matthias. Liew, Andrew. Van Mele, T. Block, Philippe. 2018. Design, fabrication and testing of discrete 3D sand-printed floor prototypes in Materials Today Communications. Elsevier, pp 254-159.



TNA generated pattern - 3d printed silica-based phenol binder,
Block Research Group (Rippmann, Liew and T.Block), 2018.

Dissolvable 3d printed formwork,
Leschok and Dillenburger, 2019.



capitals highly ornamented to proof their concept and feasibility45.

In term of sustainability when pouring concrete in 3d printed molds, a coating separation layer is necessary to avoid adherence, making the CNC milled foam formwork recyclable only if the coating is separated, same goes for sand printed molds when the binder is burned away -necessitating in the process intensive energy-46. To counter this matter, various students and researchers around the world are taking up the challenge of printing high resolution geometries without a cast, extruding and layering directly clay or concrete. One of the most challenging projects so far is the Concrete Choreography project by an ETH team that set up a series of nine high resolution columns and that have been installed in the Origen Festival of Culture. In this research, the team challenged the material properties and robustness, high production speed and process stability, while always challenging the economic motivation for rationalization. In this project, all the nine columns of 3.2 meters high were printed in an automatic mode for safety reasons, and discretized into layers of 500 millimeters height, enabling the print of a 300 mm diameter and a 1000 mm in height column to be printed in just twenty minutes. Furthermore, all columns are composed of an internal shell cavity kept rational to increase stability and an outer material driven ornamented shell, optimized by trigonometric functions to solve the printing path deviation from one layer to another47.

On another front of structures marked with an ornamental character, and far from the multi axis based robot arms, distributed-systems48 are currently investigated to avoid the severe mobility and workspace scale mandatory for a robot arm to operate. The idea of Maria Yablonina of the Institute for Computational Design is to deploy collaborative robot systems of small scale working together to achieve a common final goal. Here these small machines, called Wall Climbers, are manipulating, varying, anchoring and passing lightweight filament materials to achieve on-site architectural objects. Using a vacuum strategy the machines are creeping vertically on the walls and are adapting and relocating depending on the requirements of the space.

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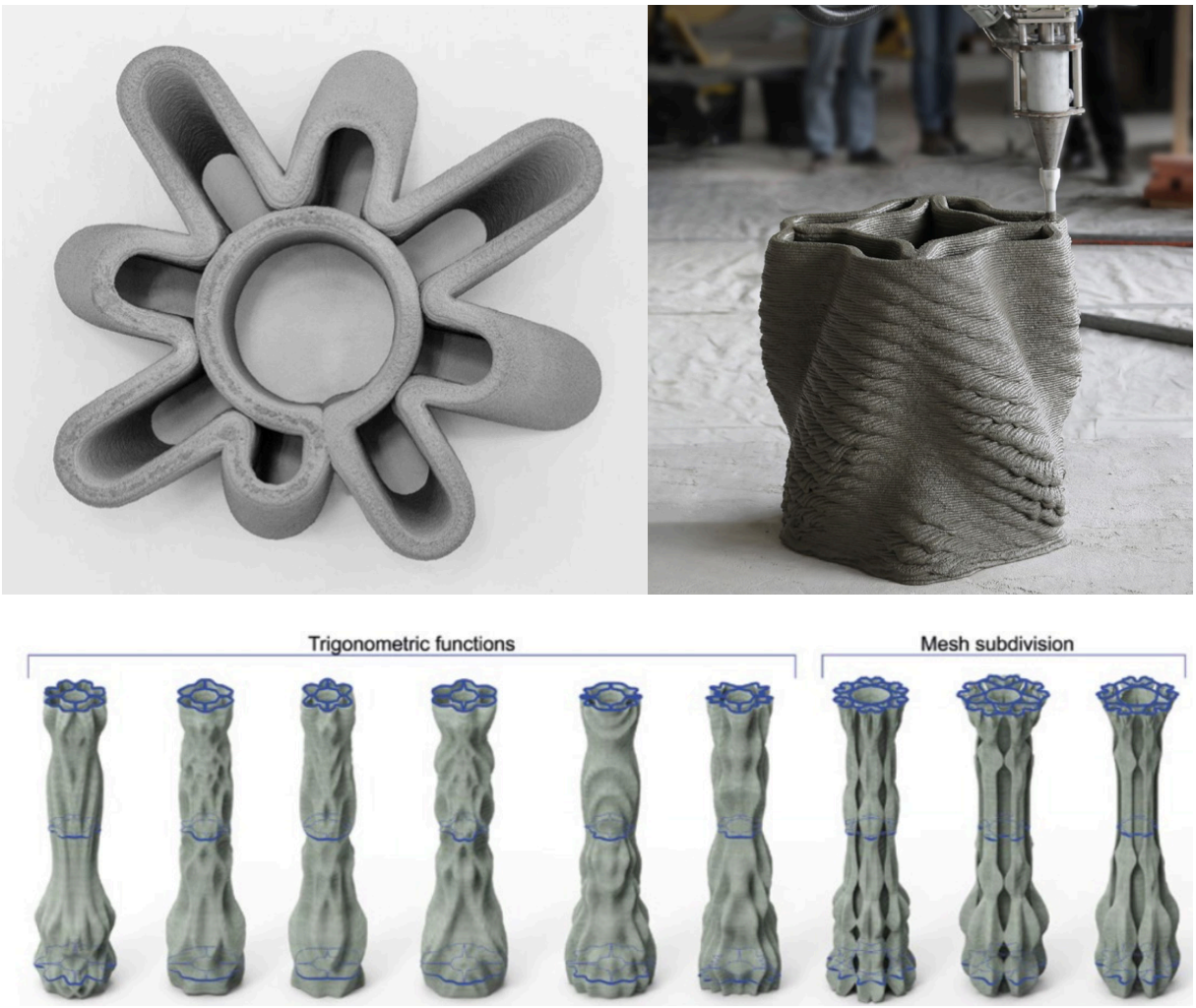
45 Leschok, Matthias. Dillenburger, Benjamin. 2019. Dissolvable 3DP Formwork: Water-dissolvable 3d printed thin-shell formwork for complex concrete components in the proceedings of ACADIA (The Association for Computer Aided Design In Architecture), pp 188 - 197.

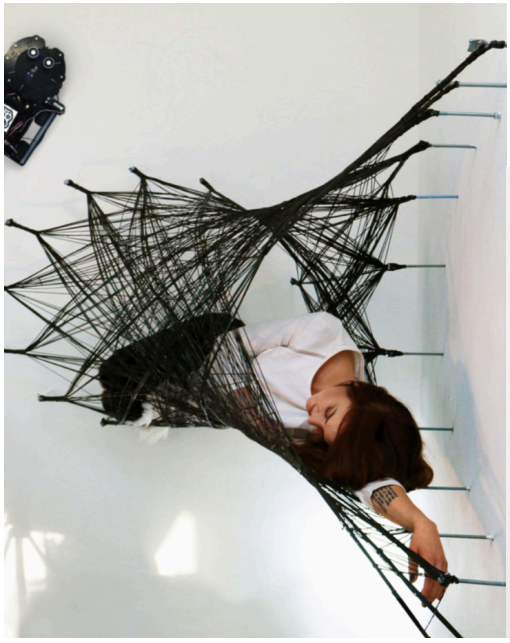
46 Ibid.

47 Anton, Ana et al. 2020. Concrete Choreography: Prefabrication of 3d-printed columns in Fabricate 2020. UCL press, pp 286-293.

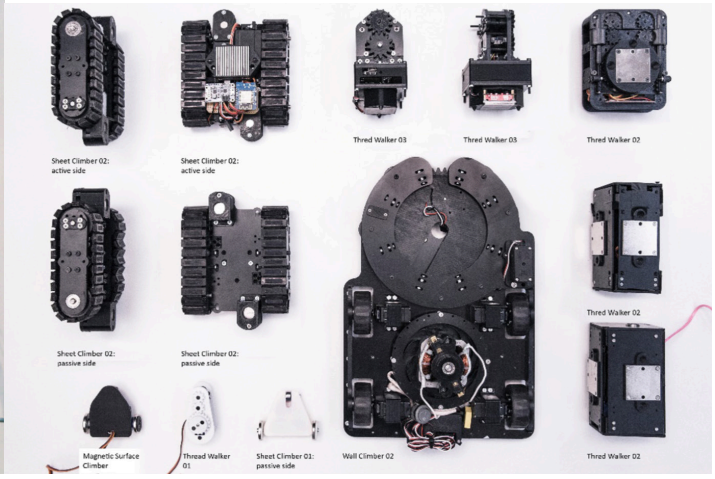
48 A distributed-system is made of multiple components located on different machines that communicate and coordinate actions and appear as a single coherent system.



Concrete Choreography,
Anton, 2020.



Distributed systems generated architecture - Catalogue of filament mobile robots
Maria Yablonina, 2019.



For this, Yablonina is constituting her own library of machines and softwares. Each robot is augmented with a perception ability to continuously update its position and orientation thanks to a camera and a reacTIVision[49] marker[50]. At each step, each Wall Climber on each wall is passing the thread around a fixed metallic support, returns to the edge shared by the two walls, and passes the thread to the second Wall Climber that goes to the next fixed support.

IV. Experimental research, between the postdigital, art and craft aesthetics, ornament and theory

The following few experimental projects are blending postdigital and past aesthetics, arts and crafts, and revolve around -sometimes un-purposefully- ornamental practices. I would like first to introduce HYPNEROTOMACHIA NATURAE by Giacomo Pala. This project, conducted within the University of Innsbruck, is a wink to the famous Hypnerotomachia Poliphili written in 1499 and questions our reality made of 'humankind and technology; traditions and progress; myth and innovation'. Pala asks if the should follow technology or go back and idealize the past; in a similar fashion he questions if we should transform the architecture discipline through technological processes or to avoid new techniques and forms. To answer his problematic, he describes his project by the following :

"we propose a concrete and dream-like reverie –a hypnerotomachia (a strive of love in the form of a dream): an allegory where elements are used as parts of a 3D hieroglyph that must be decoded, composing a collage of physical figures. It is a fragmentary, imperfect and possibly incomplete composition telling the story of Nature finding itself in a dream where it encounters all the things of the world - technologies, myths, histories, humans, abstract visions and, ultimately, love. Myths, legends, dreams and technologies find a coexistence, accepting the fact that culture incubates ancient, mythical and archetypal instances arising from the world of dreams, while being inseparably linked to new technologies, new possibilities, new languages and new opportunities. It is a world where the archaic and the utopian - the past and the future - seamlessly come together, shaping our reality."

Combined and merged all together into a mesh element, these objects form a larger vertical sculptural piece which could be interpreted as a column. I am wondering if Pala intended to

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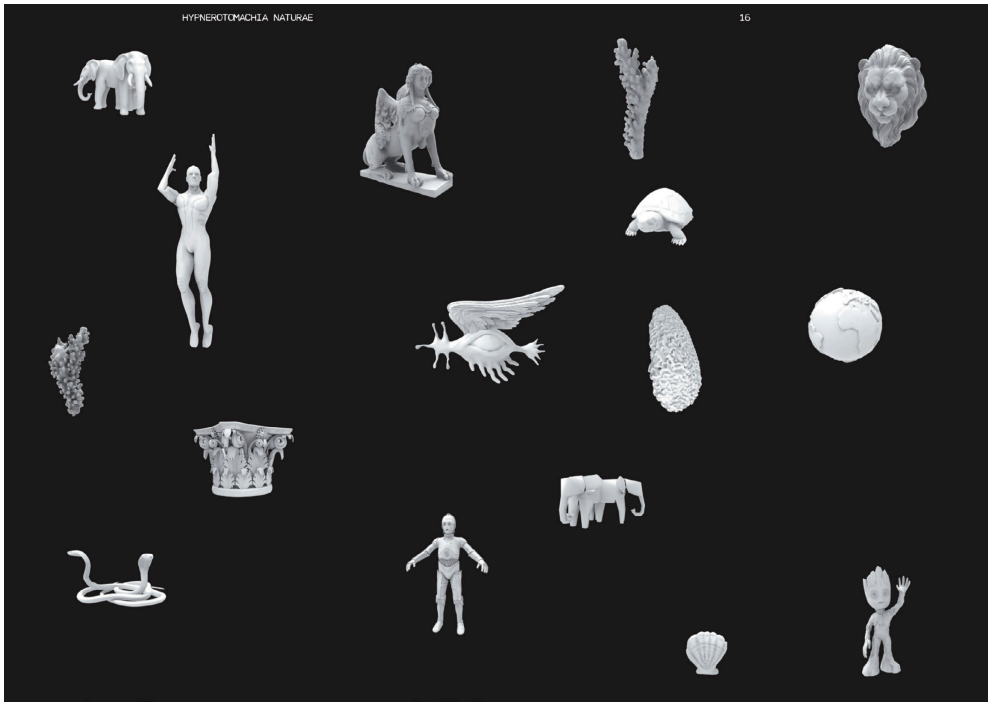
49 reacTIVision is an open source, cross-platform computer vision framework for the fast and robust tracking of fiducial markers attached onto physical objects, as well as for multi-touch finger tracking. Accessible via http://reactivision.sourceforge.net .

50 Yablonina, Maria. Menges, Achim. 2019. Towards the development of fabrication machine species for filament materials In: Willmann J., Block P., Hutter M., Byrne K., Schork T. (eds) Robotic Fabrication in Architecture, Art and Design 2018. ROBARCH 2018. Springer, pp 152-166.



Hypnerotomachia Naturae,
Pala, 2019..

converse with the past by making and forcing the emergence of the ornamental aspect, of if the aesthetic affect is a pure result of the assemblage and the blend of the different parts ? Is it an attempt to somehow suggest a novel column based on object from the past ? His column including a Corinthian capital part, I am wondering if this is an attempt of renewal; after all, Claude Perrault tried as well in the 17th century to invent a French order by replacing acanthus leaves by ostrich feathers on what looks like a composite order51.

In an alternative narrative, Ebrahim Poustinchi is orienting his research and teachings toward an alternative understanding of the postdigital discourse thanks to UI/UX, robotics and human-machine interactions. I included a selection of his work for its remarkable ornamental characteristic made of weird aesthetics. The Animo[embryonic]solids52 project studio is investigating for instance forms of architecture as a set of an alive-animal like embryos—objects at an early stage with a potential for development-. For this, his students were asked to question the notions of growth, deformation, textures and objects within objects. The output is a series of object-animal alike architecture, gradiently colored, covered with fur and creating a unique ornamental aspect. In the same spirit, the Mech{a}Systems53 studio investigated the production of high level resolution objects and architectures, made of assemblages of machine alike parts and generating industrial machinic ornaments.

The Tallinn Architecture Biennale 2019 curated by Yael Reisner around the theme of Beauty Matters has selected a wining project depicting a perfect blend between crafts and technology. The team, made of Soomeen Hahm, Igor Pantic and Fologram, proposed a 4.5 meters high pavilion constructed with steam-bent chunks of wood. The complex geometry of the pavilion has been constructed entirely by hand using primitive-analog tools. The construction consisted of 422 wood parts of 120x12mm, 382 stainless steel brackets of 50x4mm and 213 stainless steel footings of 100x6mm. The dynamic effect of stripes and the assemblage of the discrete elements have a highly ornamental affect as the designers wanted the architecture to be read from the street and vehicles with consecutive understandings of the qualities of the material and the secondary cladding on top of it.

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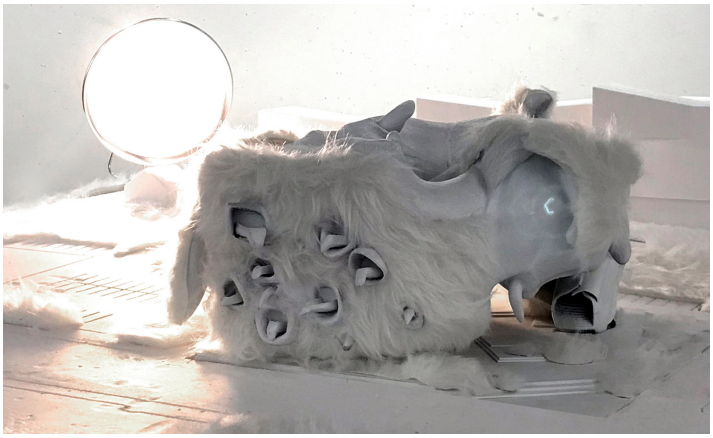
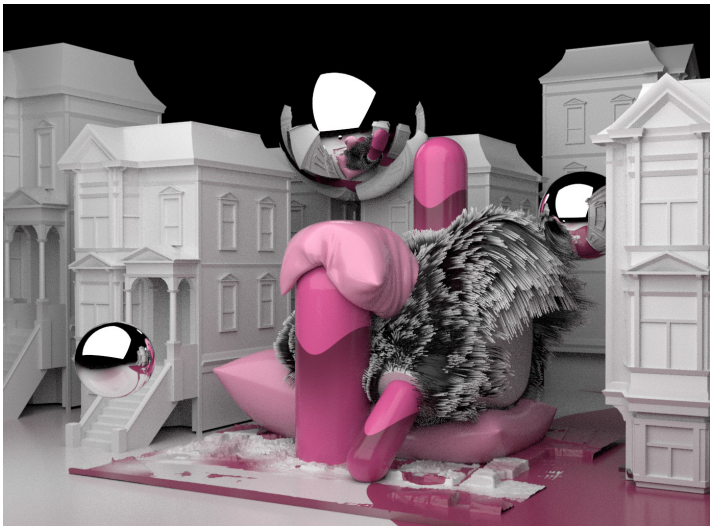
51 Pala, Giacomo. 2019. HYPNEROTOMACHIA NATURAE, in http://www.architecturaltheory.eu/, pp 11-16. Accessible via http://www.architecturaltheory.eu/architekturtheorieINFO/wp-content/uploads/2019/09/Giacomo-Pala_Hypnerotomachia-Naturae_Brochure-Version_20190923.pdf

52 https://www.ebrahimpoustinchi.com/animo-embryonic-solids

53 https://www.ebrahimpoustinchi.com/mech-a-systems

From Top to Bottom:
-David Merchant in Mech[A]Systems,
-Niles Hand in Animo[Embryonic]Solids,
-Unknown in Animo[Embryonic]Solids,
-Ebrahim Poustinchi, SumBody House.





Seen as a primitive hut constructed from available ready materials and tools, the geometry has been digitally discretized into 12 meters long timber that were inserted into hermetic plastic bags full of hot steam, which allowed more time for wood bending, after what they were adjusted on site as much as possible to the projected hologram model. The app tool, Fologram, had been developed to reduce 2d drawings and documentation labor, permitting to the manipulator to have all the elements projected in real size, at their real position in space with the correct perspective and depth. This way, following a choreography on site, the person with the headset guides the team members to adjust the bending angle to the right position. Here, precision does not matter.

On the jointly level, each bracket is unique and goes to a unique position which needed more accuracy and more sophisticated process. Here, each bracket was reloaded again after each bending step and updated each time. Due to the rigidity of the wood, there was an inability to position some pieces correctly on the steel brackets. To counter this issue, the onsite pavilion was scanned trough Qr code trackers, repudiated digitally with the current wood positions, and new brackets were generated and adapted in-situ. All this process has enabled the success of the project, without any drawing, no preparation on a messy site.

In the opening ceremony talk session, Gilles Retsin asks if the team is falling in crafts nostalgia. Soomeen Hahm replied back by stating that recent distributive systems including robotics and additive processes have made fabrication too easy and that it was their way to provoke and question how digital architecture is developed nowadays in the sense that it over simplifies turning people in ignorants of the complexity nature of the making process; it is therefore not nostalgia but it is learning again from the traditional craftmanship and bringing back that knowledge. Mixed reality was used therefore to connect new complex aesthetics to the beauty of crafts54.

To conclude this chapter, I would like to introduce the recent research activities revolving around the Urushi lacquer and in collaboration55 with Kenji Toki -Artist, Urushi master and professor of Miyagi University-. Urushi is a natural material extracted from the eponym tree and that is found all around eastern Asia in China, Korea and Japan. It is applied mainly on objects made

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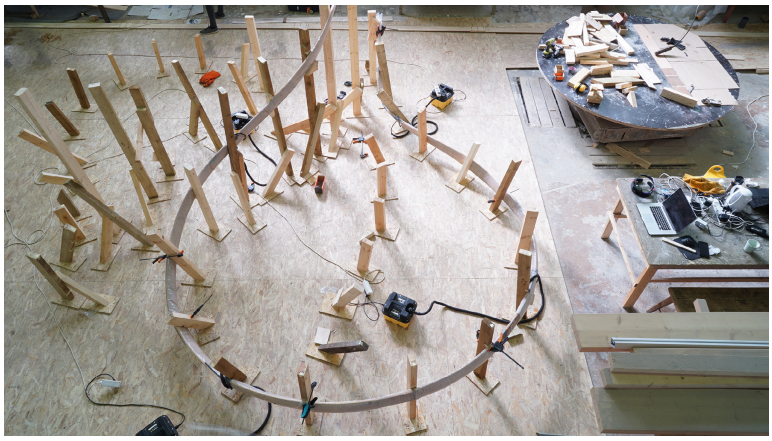
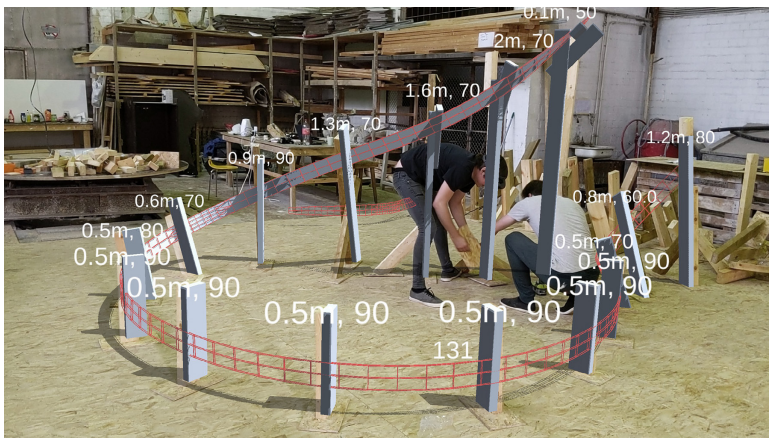
54 All informations regarding the design and construction process of the SteamPunk pavilion has been extracted from the TAB online opening ceremony (minute 46 to minute 68) accessible via https://www.facebook.com/TallinnArchitectureBiennale/videos/579314769270665/?v=579314769270665

55 Collaborative research project between Miyagi University (Toki laboratory) and Tokyo University of The Arts (Mitsuhiro Kanada laboratory).

Steampunk Pavilion - TAB Biennale, Soomeenhahm, Igor Pantic and Fologram, 2019.





of wood or earth, or as a form making material using the Kanshitsu (乾漆) method consisting of applying the Urushi paste on natural fiber such as hemp. The more layers of hemp and the more layers of Urushi the stronger the composite material gets. It is seen as the ancestor of Fiber Reinforced Plastic (FRP)56. Attracted by the power of digital generative and fabrication tools, Toki started investigating coating double curved surfaces by Urushi to take profit of both the material and the object aesthetics and as early as 2003 he started applying laser cutting and SLA printing technologies57 to merge both creative modeling and surface decoration techniques.

In August 2018, I was invited to join a new research project consisting of reproducing the most basic lacquer painting technique -the brush painting- using a robot arm. Starting from the hypothesis that currently robot arms have been able to reproduce human hand movements and tasks, it will be perhaps possible to brush urushi using a robot.

I had at my disposal a small 6 axis arm Cobotta -collaborative robot- developed by Denso and two method were used to investigate the different brushing tasks : offline programming based on coordinates and tool paths, and direct teaching. We also invited an Urushi master to come and offer insights on the brush manipulation movement by the robot58. Movements, approaching the surface and the pressure have been adjusted during three weeks to avoid dripping or unclean application of the material on the surface to be coated59. In term of the outlooks, Toki expects to be able to translate the craftsmen movements into robotic parameters, including how to express the pattern of the brush strokes. This investigation will also help the Urushi savoir-faire to live across the future as the number of craftsmen mastering this technique has been declining in the past years.

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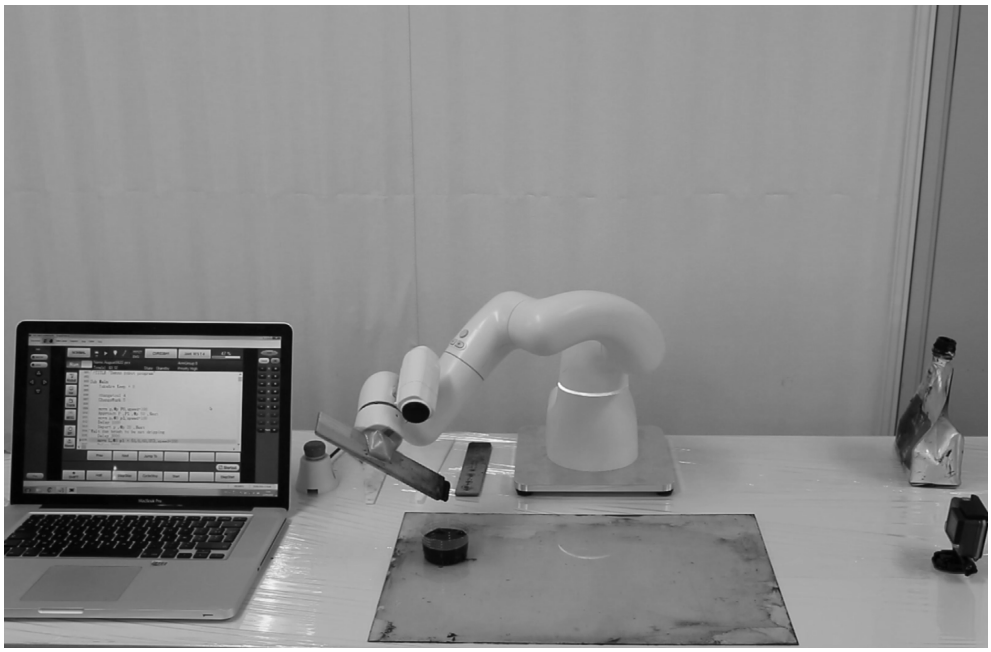
56 http://kenjitoki.com/articles_prospects_uk.html

57 http://kenjitoki.com/linked_ovals.html

58 Bouayad, Ghali. 2018. Urushi x Robotics. Film, 3min03, accessible via https://vimeo.com/344968680

59 Toki, K. Kanada, M., Bouayad, G., Tanaka, H and Masuyama, E. 2019. ロボットアームによる漆の刷毛塗り, research note for the 2019 JSPS Kyoto Symposium.

Urushi X Robotics
Toki, Kanada ans Bouayad, 2018.



Untitled - Urushi on Kanshitsu, Ginza Tea House competition
Lo Aki, 2018.

Haptic Translations

Architecture needs tools that allow it to be constantly connected to culture. This state of fusion is attained only after it has succeeded in capturing and transforming the forces that govern society into a new material. The materiality of architecture is thus composed of visible and invisible[60].

Investigating the expressionist materiality of architecture is the opportunity to find new methods in order to interact with the urban configuration and to converge towards culture. For this, new cultural mechanisms could help in the production of new concepts instead of recycling.

Society has evolved, changed and with it new, more complex and more versatile social modes. To meet these needs is an architectural challenge, which from a current point of view would regard modernism and its anti-pattern minimalism as a historical error[61].

As architects, we focus our current debates on relationships, boundaries, buffer and transition spaces, energies and especially on more inclusive and narrative spatial experiences. In order to meet these needs today, a synthesis between nature, energy, culture, society, user, spatial experience and technology is essential. Rethinking the role and interpretation of patterns and their layering could generate new spatial organizations and new architectural elements. Architecture can and must, if the program allows it, display an expression through the skin of the building and thus connect it to the urban.

As indicated earlier in the introductory chapter, the third part of this dissertation will mainly showcase my design investigations and assumptions through a research based practice. In this research, I rely on the Japanese Katagami and Katazome traditional patterns and consider Japanese society as a terrain of action to verify my hypothesis and theoretical framework. While I only gave a short limited preview of some Japanese ornamental practices in the first chapter, a more detailed insights and aesthetics qualities of Japanese ornament and pattern practices were kept on purpose to create a more logical, more fluid reading process and clarify the design strategy and speculative ideas behind.

It is important to remind that the following ornamental aesthetics has been thoroughly investigated by other researchers specialized in the field and that I will be presenting pragmatically essential ideas that present an echo to my practice work. Following the first sub-chapter, I will showcase my design explorations subcategorized into top-down and bottom-up methods.

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60 Moussavi, Farshid and Kubo, Michael. 2005. The function of ornament. Actar.

61 Ibid.

I. Japanese ornamental aesthetics and pattern making

In 1893, European and American architects discovered the Japonisme at the Columbian World's Fair. F.L Wright got inspired then by Japanese architecture in the organization and composition of his plans, transitions and bone structure, notably through several exhibited Nikko temples.

Several years have passed since Japan reopened its ports in 1853, its art invaded Europe and its techniques of ornamentation used in the Ukiyo-e have greatly and considerably influenced the movements Art Nouveau, Arts and Crafts and the School of Chicago.

The artists in contact with this Japanese art have radically revolutionized the design of their time. Through the patterns used in the Japanese production, artists and architects then begin to emulate a strategy of design made of balance, geometry, modularity and surprising simplicity.

In his autobiography F.L. Wright asserts that his understanding of Japanese spatiality, its depth and its transitions is due to his encounter with the work of Hiroshige Ando known for his woodblock and layering techniques62. While Wright focused on layering techniques applied to spatiality, he deeply impacted architects like Mies Van der Rohe. On the other side, Arts and Crafts and Art Nouveau movements focused on traditional Japanese patterns, which demonstrated a new way of learning and getting inspired from nature and geometry.

The Japanese have long been inspired by nature. But the Japanese pattern is not a faithful transcription of the original shape. It is only a symbol of the vegetal63. In Japan, the pattern is often an exaggeration of reality and is assimilated by impulse, presentiment and intuition: the later will translate the pattern into its totality. In his book, Soetsu Yanagi describes the transformation into beauty and the transformation into pattern as having a great relationship. Therefore to value the meaning of the pattern is to understand beauty. The later being a mystery, it can not be palpated by the intellect but by intuition.

For Soetsu Yanagi, the Japanese pattern immediately suggests the plant without being a

62 Belfiore, Matteo and Liotta, Salvator-John. 2012. Patterns and layering : Japanese spatial culture, nature and architecture. Gestalt-en.

63 Yanagi, Soetsu. 1972. The Unknown Craftsman; A Japanese insight into beauty, Kodansha. Yanagi is described as the first philosopher and artist who tried to understand, decode and emulate theories about Japanese pattern.

Teacup, porcelain. Imare Wari, Saga prefecture.
19th century
5,5 cm

Noburo Ofuji
Bagudajou No Touzoku
1926; Screenshot, animated film, black and white, 14 min. the 1926 Noburo Ofuji's official debut work and the first Japanese silent black and white animated film 'Bagudajou no Touzoku proves how ornamental patterns are a major cultural element. As we can perceive in the movie screenshot, both various characters and their environment being highly ornamented.

literal representation. It remains faithful to nature and to the artificial. The plant is certainly a production of nature, but the pattern has a human point of view in addition. The point of view is what turns raw nature into a content. Especially since everyone is able to see the plant, but not everyone will see it in the same way.

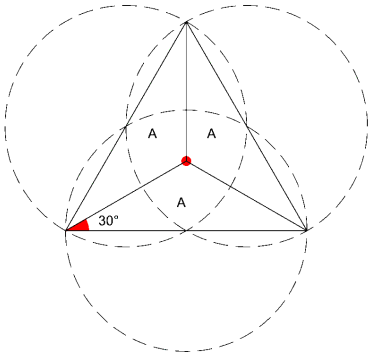
All Japanese patterns are a product of the 'point of view', which is why they should not be seen as a reproduction of nature but as new creations. However, the pattern is not a real representation but an intuitive vision, a product of imagination, unreal and irrational. The Japanese pattern puts at our disposal an enormous unlimited field for our imagination. Its design offers no explanation, it leaves us the freedom to interpret its beauty and meaning.

In the other hand, geometric studies conducted by Rafael Balboa within the Kengo Kuma laboratory at the University of Tokyo explored and decoded the hidden forces and order in the Japanese pattern. The starting point of his research was to determine the centroid and to deduce the degree of eccentricity. His study revealed that the eccentricity present in Japanese geometric patterns is a preference and not an accident. The Japanese, for their part, have always believed in morality, philosophy and religion as the engine of hope, joy, peace and freedom. Thus for Japan, religion and its geographical isolation were two essential factors for a unique and singular understanding of the duality "man and nature". " Being among " nature and " being " nature are two different ways of reading the world. The first idea creates a hierarchy between its components and its relations, while the second moves the human and its existence slightly from the center in order to leave room for an eccentric attitude towards all that is based on a centrality. This eccentricity reveals singularity and creativity (while western culture has always favored centrality and symmetry, notions considered symbols of perfection and harmony). Therefore Japanese patterns are assimilated not by their centrality but by the interaction of their decentralized components, leaving room for evolution and growth for new possibilities64.

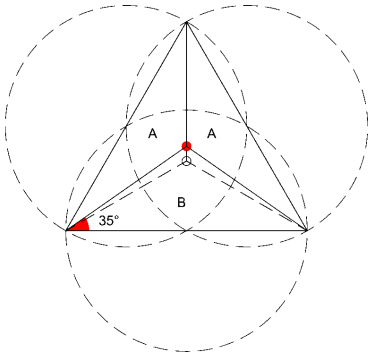
Yanagi speaks of the beauty of the irregularity and the will of the first Japanese to appreciate these notions to the point of including them in their artistic works: the tea ceremony Masters. In "The book of tea", Kakuzo Okakura defends this art of imperfection and tries to describe this love for asymmetry. So for the ceremony, Tea Masters never use perfect or regular tools and one

64 Balboa, Rafael and Paklone, Ilze. 2012. On Japanese Pattern Eccentricities in Patterns and layering : Japanese spatial culture, nature and architecture, edited Belfiore and Liotta. Gestalt-en, pp 98-105.

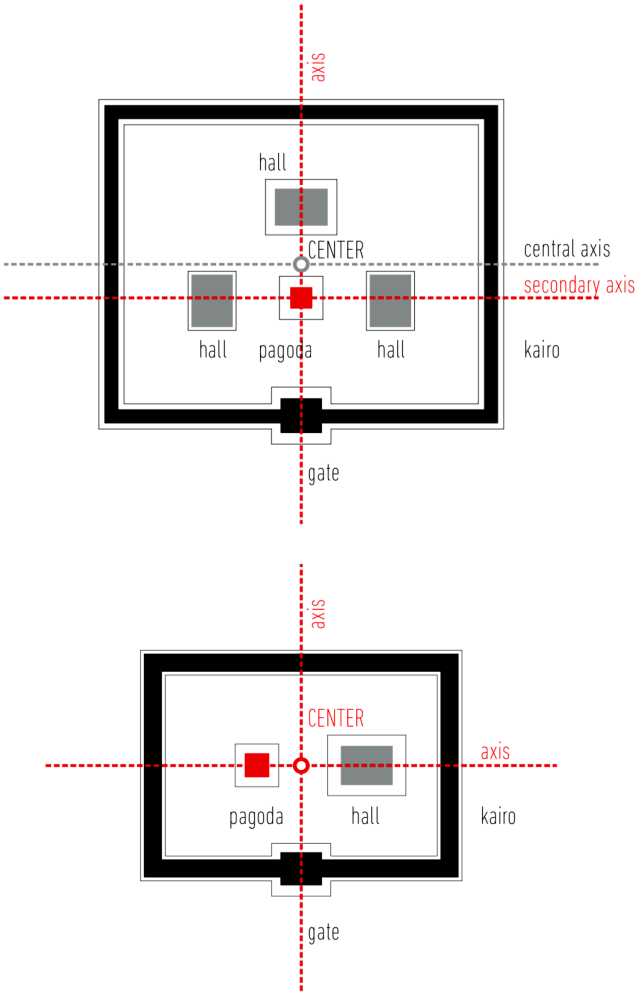
Drawing showcasing the eccentricity aesthetics hidden in the Asanoha pattern,
Research by Rafael Balboa,
Screenshot extracted from Patterns and Layering, 2013.



component centricity (rationalized)



component eccentricity (de-centered)



Comparative drawing showcasing the eccentricity aesthetics hidden in the plans of Buddhist temples from Nara period (Asukadera above and Horyuji below).
Screenshot extracted from Patterns and Layering, 2013.

often refers to " Fukinsei65, Shibui66, Wabi67 and Sabi68" in order to describe this beauty hidden in the irregularity69.

The blending of Buddhist and Shinto cultures resulted in a great sense of the entity and its components. Yuichiro Edagawa says in his book "Japanese identities" : «Most Japanese architectural styles were based on daily activities rather than monuments, hence the symmetrical style did not develop. In other hands, it was not possible to create symmetrically according to the Japanese creation process, starting from the parts".

II. Top-down parametric early investigations

The very early investigations of this doctoral research revolved around the study, analysis and translation of Katagami patterns, initially bi-dimensional, into three-dimensional shapes applied to building envelopes. The word "translation" here is of tremendous importance; in the same way when translating from one language to another and loosing some exact meaning, the translator would reformulate the meaning by choosing words of the target language. By analogy, the early research focused on experiments to build unique effects and the pattern was considered as raw cultural material, analyzed historically, geometrically, disassembled and reassembled to produce new sensations open to new experiments. The Katagami pattern is therefore denuded of historical connotation to focus on its geometrical properties and its aesthetics when translating it to a three-dimensional object.

This translation took into account the relations between geometry, art, materials, light and shadow. A way of creating architecture that offers a new interest in space, which forces the user to question his practice and questions his curiosity about the envelope and its harmonious composition. The research would have been all the richer since each pattern can be interpreted in several different ways because the extrapolation of the three-dimensional shape from the 2D design will depend mostly on the imagination and the creativity of the architect, the aesthetic

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65 Fukinsei : That denotes asymmetry and irregularity.

66 Shibui : Of an elegant simplicity, in order to serve exactly why it was created.

67 Wabi : Denotes simplicity, quietness and artistic beauty. It can also describe elements that are accidentally born but give this unique side.

68 Sabi : The beauty acquired through age, proof of appreciation of the cycle of life and the passage of time.

69 Okakura, Kakuzo. 1906. The book of tea. Createspace Independent

philosophy, the materials, the extrapolated algorithm, the architectural program targeted and other factors as seen in the following diagrams, where each one represents a very unique strategy related to the pattern interpretation. The early goal was to find a new language of interpretation that would have resulted in non-immediate geometries, forms and effects.

Up to today, Katagami production has been referenced by the Isetan Mitsukoshi Collection and contains more than 1600 patterns (Ikuta and Maruyama, 2013). In terms of pattern selection, a total of twenty patterns were chosen and organized in two groups (structured, and un-structured) in order to study their three-dimensional architectural potential with the hypothesis that these two geometry criteria will have different sort of outputs when used as a top-down input patterns in the different scripts.

In the early phase of the research, Criteria for such differentiation were based on the ideas of the architect and systems theorist Christopher Alexander who assumed that each system -either artificial or natural- can be analyzed thanks to fifteen properties that help us understand and appreciate its physical and geometrical character (Leitner, 2015).Helmut Leitner, who summarized Alexander's lifetime work on patterns, describes the fifteen properties as the following: scale, strong center, boundaries, alternating repetition, complementary (when centers expand more and more to fill the available space and come in contact to each other), good form, local symmetry, ambiguity, contrast or difference, gradients, individuality, similarity, voids, simplicity and connectedness. According to him, some properties are conflicting by character and therefore only up to four or five properties can occur within the same pattern70.

As a personal assumption, a structured Katagami pattern will therefore have few of the above properties or is made of different layers of sub patterns. Figure (?) is an illustrated example of one of the structured pattern that has been disassembled for layering and geometrical property analysis. By contrast to the previous example, an unstructured pattern will not be made of layers of sub patterns and will be inspired by nature or depicts a landscape or an every day life scene as seen in figure (?).

In terms of the design process, I relied first on the visual parametric programming software Grasshopper and that is generatively capable of producing complex geometries and shapes based on simple parameters. All the more it allows for a real intellectually effective performance that

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70 Leitner, Helmut. 2015. Pattern Theory: Introduction and Perspectives on the Tracks of Christopher Alexander. CreateSpace.

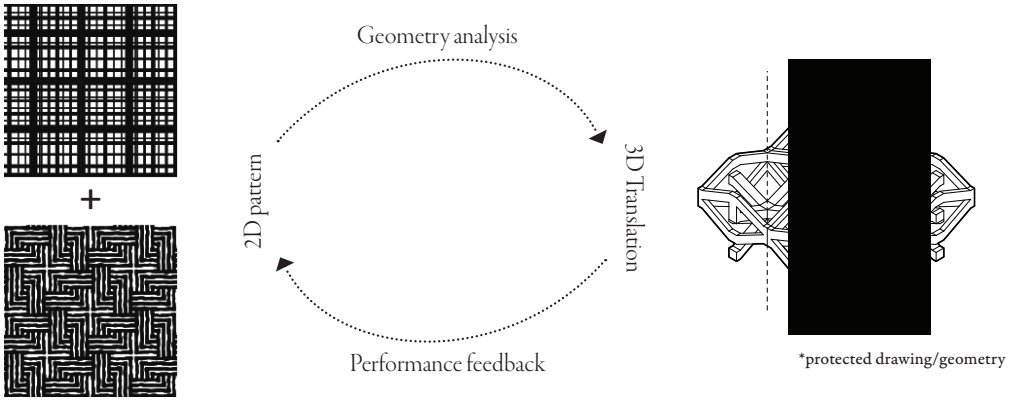
comes to describe an idea according to simple axioms capable of being injected in the parametric script. Patrik Schumacher -architect and philosopher- describes algorithmic architecture as a "computer aided design approach that considers the geometric properties as variables. The dimensions, angles and geometric properties are malleable as the creative process progresses. It means that the technology consists in maintaining the relationships between the various elements of the composition as the model is conceived as a network of relations".

Cecil Balmond, in his various studied works (Informal, crossover, frontiers of architecture) describes pattern as an action between an idea, an abstraction, an event and vice versa between reality and metaphor. The latter, coupled with parameters such as color, rhythm, proportion, texture, scale or multiplier71, generates patterns capable of transcending the human mind. Everything can therefore be included as a parameter. Just after the delivery of the Serpentine Gallery pavilion, Toyo Ito then described Cecil Balmond as someone who used algorithms to produce rules : «He claims that when people try to imagine randomness on their own they run out of ideas very quickly and instead begin to think of conventional spaces. An approach based on algorithms offers greater freedom. It allows you to create unpredictable complexity and hybrid situations». As our generation has sufficiently sophisticated technological tools, the pattern can once again occupy a central place in the architectural debate. We are able to study a pattern and its parameters, edit it, abstract it and finally interpret it into a three-dimensional shape. The study of its geometry must be conceptual and qualitative because it would be necessary to be able to distort the form without losing its essential properties. Finally, the other advantage of visual parametric scripting lies in its ability to codify the design of the pattern through a geometric and mathematical algorithmic expression, allowing a high precision in the generation of the form and a high speed exploration of the different shapes. And despite the fact that all the properties of the pattern are not assimilated at the beginning, the process of "trial and error" will discover new generative aspirations.

The very early attempt to translate a Katagami pattern was on the Koushi family (格子) for the application on a tea house pavilion for the Architectural Institute of Japan Ginza Grand Prix competition held every year in summer and that raised a very important question : what is actually being three-dimensional ?

To depict this problematic, I like to take the example of a simple standard brick wall. Most people will consider it as bi-dimensional element, even if we know that it is made of many

71 The Multiplier is the parameter that transforms a unit into pattern.



Ghali Bouayad
Explanatory diagram : カタガミ模様の建築要素への変換
2017

crossed layers in order to obtain structural stability. However, if the wall is impacted by a parametric or another design strategy as epitomized by Grammazio-Kohler brick wall project, the shifting bricks will create an interesting pattern, which will add a new dimension to the design and have a different effect and impact on people. This borderline is really interesting, because by slightly having a shift, bidimensional becomes three-dimensional.

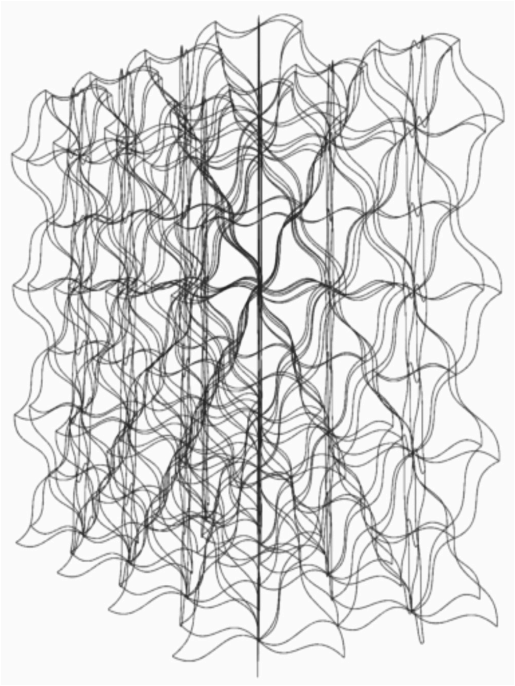
The example of my reinterpretation of Koushi pattern is demonstrating the following : From far, it looks completely flat bidimensional grid, and many people will call it bi-dimensional wall/ surface. However, the more we approach it, by changing distance or point of view angle, and the fact that people move around it, the geometry starts to change and shift from bidimensional to 3dimensional units, creating a non physical kinetic effect, and becomes even richer in term of quality affect.

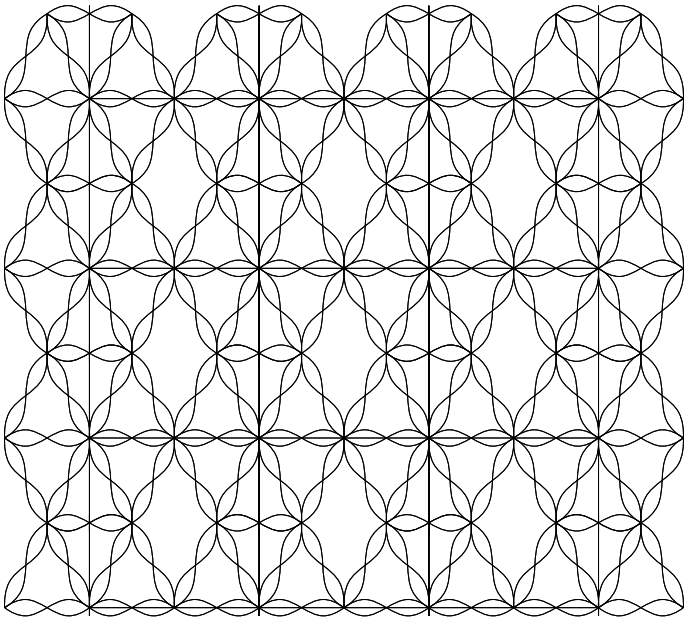
Finally the last translation of a katagami to be presented in this sub-chapter is that of the famous and popular Asanoha (麻の葉) pattern. The parametric rules applied allowed for a structure growth that when seen from the side offers a brand new -flower like- pattern, and when seen from a diagonal point of view, original units of the Asanoha pattern appear gradually.

III. Bottom-up agent-based algorithms investigations

The results of the previous top-down parametric investigations were directly linked to the input Katagami pattern. Changing the software method to bottom-up algorithms will permit to ideally explore not only what is is already in my mind -to paraphrase Kostas Terzidis- but beyond. Satoru Sugihara -computer scientist, software developer and architect- brings a clear comparative definition between top-down and bottom-up methods. The main difference lays in whether the algorithm implements and includes the generated output in its definition. In a top-down algorithm, such as the ones used in visual programming parametric interfaces such as grasshopper, the input is always independent from its output (even though some plugins such Loop-snake, Octopus and Anemone offer looping possibilities, they remain very limited in their performance). This is due to the fact that these visual scripting platforms rely on directional graph tree data structure and that prevent from implementing bottom-up algorithm's recursive execution72. The bottom-up algorithm must include itself in the definition as it inputs the state

72 Sugihara, Satoru. 2011. Comparison betweenTop-Down and Bottom-Up Algorithms in Computational Design Practice Proceedings of the International Symposium on Algorithmic Design for Architecture and Urban Design.Tokyo :ALGODE.





Top-down Three-dimensional translation of the Asanoha pattern - Elevation and perspective view. Personal production, 2017.

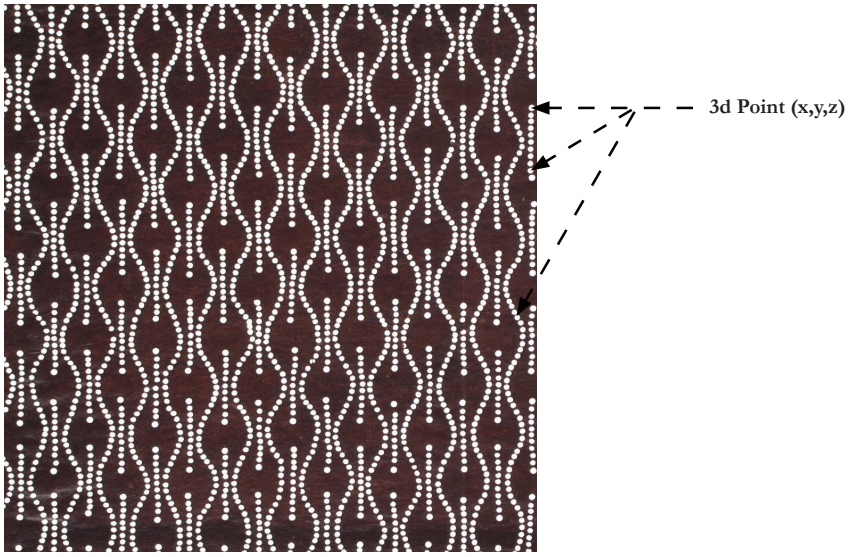
parameters to change them in the output. The other typical characteristic is that it produces a non-linear behavior that generates complex and chaotic states over repetition in time and in space. Sugihara summarizes it well in saying that top-down scripts lack the ability to generate irregular and emergent self-organizing geometries as they have static rules that cannot include interactions between the different components.

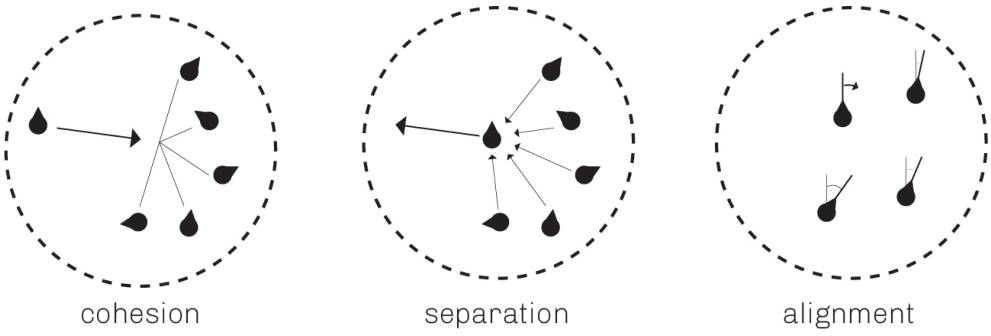
The behavior of various animal species and social insects produce very complex architectures that demonstrate great sense of proportion while fulfilling multiple functions such as protection from predators, humidity regulation, reproductive activities, etc...(Hansell, 1984; Jeanne, 1975 and Wilson,1971 cited in Bonabeau et al, 2000, pp 1-2). In the very recent years, various researchers have relied on biological and animal behavior where agents reacts to their environments such as stigmergic planning (Gerber, 2014) and (Ireland, 2010) , parasitic behavior (Alborghetti and Erioli, 2015) and cellular growth (Klemmt, 2019) to cite a few.

In this research, I imagine the Katagami patterns as a series of 3dpoints and focus on the flocking behavior described by Craig Reynolds (1986, 1999) in order to give my top down initial Katagami pattern the ability of locomotion and self organization in the three dimensions while I store each particle coordinates at each time frame update and build geometry on it in order to get a spatial structure that emerges as a consequence of the system's behavior.

As I did not have prior solid skills in computer sciences, I needed to train first and get knowledge of programming languages. I chose to use the IGeo library (Sugihara / ATLV, 2011) developed for the Processing environment (Fry and Casey, 2009). Sugihara (2011, 2014) developed IGeo in order to fight obscurantism in computation design field and bring more easy and ready to use tools for a larger number of architects and designers by minimizing the coding effort. The website not only offers full training tutorials to get familiar with the fundamentals, agent-based algorithms and swarms simulations, but also explains and illustrates in detail different situations for interaction depending on the population number and the computation power needed (IGeo, 2011. Available at http://igeo.jp/tutorial/32.html).

Japanese Katagami pattern components seen as 3dpoints.



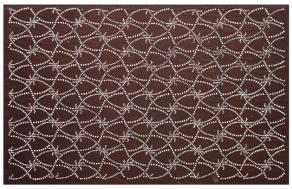


Flocking behavior rules as described by Craig Reynolds.

The diagram in the next page explains the workflow for geometry and architectural exploration.

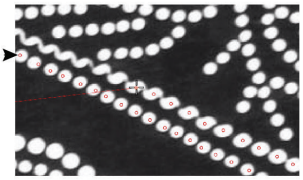
In IGeo, the flocking swarm behavior is coded by Sugihara as a Class named "IBoid" that has three parameters for threshold distances and three others for force ratio that control the strength of cohesion, separation and alignment. For the case studies discussed in this research, the agent-based algorithms were based on the following parameters :

Input Katagami Pattern	The top down pattern that will evolve through agent based simulation into a non deterministic bottom up spatial formation.
Population	Number of particles that constitutes the pattern.
Number of Frames	Necessary update counts for generating the geometry.
Cohesion Distance	Going to the center of the surrounding agents : agents are considered as neighbors if the distance to the agent is less than the threshold. The center of the agents is calculated by adding their respective position vectors and then divided by their total number.
Cohesion Ratio	The force vector is calculated by taking the difference vector between the agent and the center. The force is adjusted by the Ratio coefficient.
Separation Distance	Going away from other agents : This parameter works in the same method as the cohesion distance and is used to determine if the other agent is close enough to get away from.
Separation Ratio	The Ratio coefficient is adjusting the separation force.
Alignment Distance	Heading towards the same direction of other agents : velocities vectors of the agent's neighbors within the threshold are calculated. The difference between average velocity and actual position is measured and the force is added to the direction difference vector of the two velocities.
Alignment Ratio	The amount of the alignment force is readjusted by this ratio.
Initial Direction and Velocity Vector	A direction / amplitude vector that acts uniformly in space : a vector force that is added to the locomotion of the swarm to help it grow vertically.



Import the pattern image in Rhino

Transformation into points
(centroids of each white circular area)



Rhinoceros
modeling tools for designers

Import the points in Processing

```
IG.open("S_katagami_kihon_01_1000.3dm");
//import the points from the Rhino layer
IPoint[] kihon01pop = IG.layer("katagami_population").points();
int num = kihon01pop.length;
//Select each point of the pattern
for (int i=0; i < kihon01pop.length; i++) {
    new MyKatagamiSwarm(kihon01pop[i].pos().cp(), IG.v(0, 0, 25), null);
```

Apply different M-A classes to the pattern for behavior exploration

Export the generated geometry to Rhino/Grasshopper for further post-production (structural analysis,geometry sculpture, renderings, etc).

Rhinoceros
modeling tools for designers

Diagram describing the pattern bottom-up translation process into architecture.

Furthermore, the following lines of code depicts the core of the agent-based algorithm applied to the katagami patters:

```
import processing.opengl.*;
import igeo.*;
void setup() {
  size(1600, 1000, IG.GL);
  IG.background(0);
  IG.duration(250);
  IG.perspective();
  IG.open("AS_katagami_kihon_09_5800.3dm"); //Initial position of swarm society
based on katagami organization
  IG.layer("Boundary_Bounce").hide();
  IPoint[] kihon01pop = IG.layer("katagami_population").points();
  int num = kihon01pop.length;
  for (int i=0; i < kihon01pop.length; i++) {
    new MyKatagamiSwarm(kihon01pop[i].pos().cp(), IG.v(0, 0, 50));   // Input
Initial Velocity Here
    kihon01pop[i].clr(IRand.gray(48)).setSize(2);
  }

  new MyGravity(IG.v(0, 0, 0.5));
}

class MyKatagamiSwarm extends IBoid {
  IVec prevPos;
  MyKatagamiSwarm(IVec p, IVec v) {
    super(p, v);
    cohesionDist(50);
    cohesionRatio(5);
    separationDist(30);
    separationRatio(3);
    alignmentDist(10);
    alignmentRatio(3);
    fric(0.01);
    clr(IRand.gray(48)).setSize(2);
  }

  void update() {

    IVec curPos = pos().cp();

    if (prevPos != null) {
      ICurve crv = new ICurve(prevPos, curPos).clr(clr()).weight(0.5);
    }
    prevPos = curPos;
  }
}

class MyGravity extends IAgent {
  IVec gravity;
  MyGravity (IVec g) {
    gravity = g;
  }
  void interact(IDynamics agent) {
    if (agent instanceof MyKatagamiSwarm) {
      MyKatagamiSwarm swarmagent = (MyKatagamiSwarm) agent;
      swarmagent.push(gravity);
    }
  }
}
```

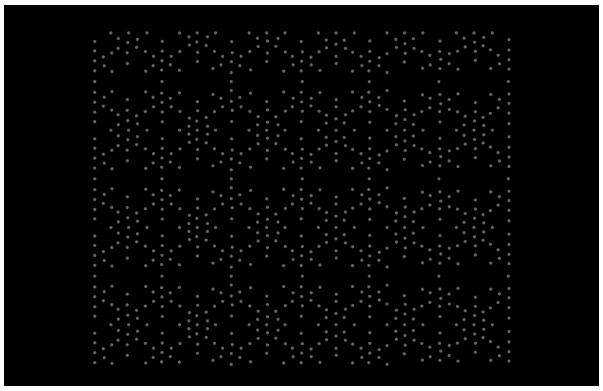
The following case studies investigate potential application as wall surface and bring another agent class to interact with the flocking IBoid class. A branching behavior was added to create branches between each particle's current position and other particles previous position within a distance threshold in order to control the density of the geometry and therefore the porosity of the facade thanks to the branching threshold and the frames count.

Population	1000
Number of Frames	20
Cohesion Distance	60
Cohesion Ratio	5
Separation Distance	50
Separation Ratio	8
Alignment Distance	40
Alignment Ratio	0.5
Initial Direction and Velocity Vector	(IG.v(IRand.get(20,40), 0,i%2*100-10).rot(PI*2/num*i+PI/4));)
Branching threshold	10 - 15

Case 1 input parameters

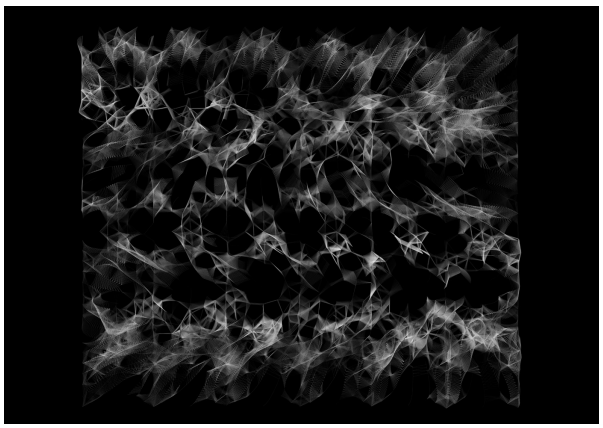
Population	2500
Number of Frames	5 and 8
Cohesion Distance	50
Cohesion Ratio	4
Separation Distance	40
Separation Ratio	6
Alignment Distance	25
Alignment Ratio	0.5
Initial Direction and Velocity Vector	(IG.v(IRand.get(20,40), 0,i%2*100-10).rot(PI*2/num*i+PI/4));)
Branching threshold	5 - 10

Case 2 input parameters

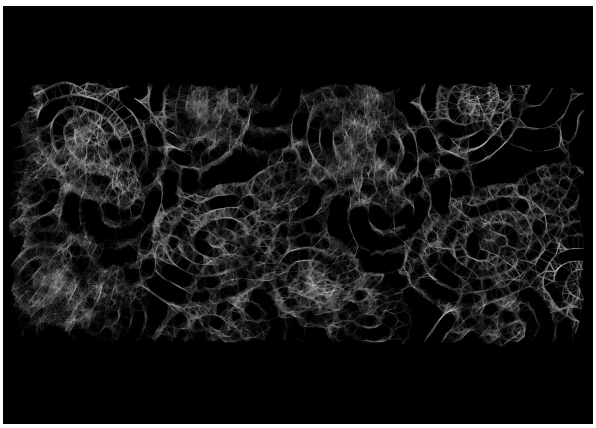


Case 1 input pattern

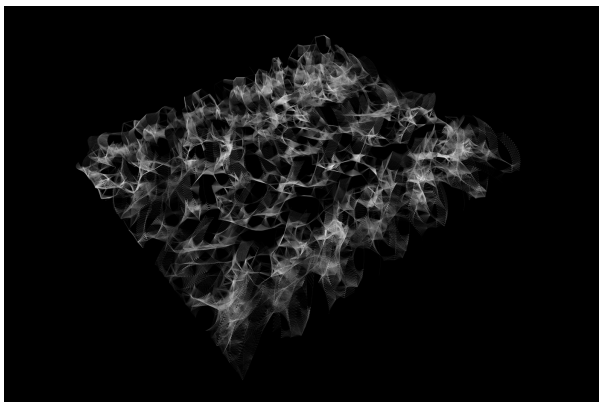
Case 2 input pattern



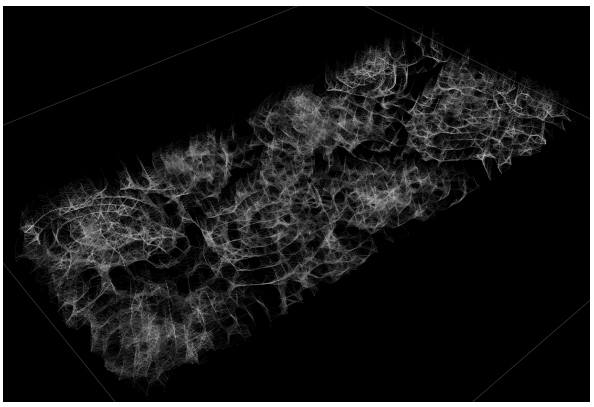
Simulation top view at 20 frames.



Simulation top view at 8 frames.

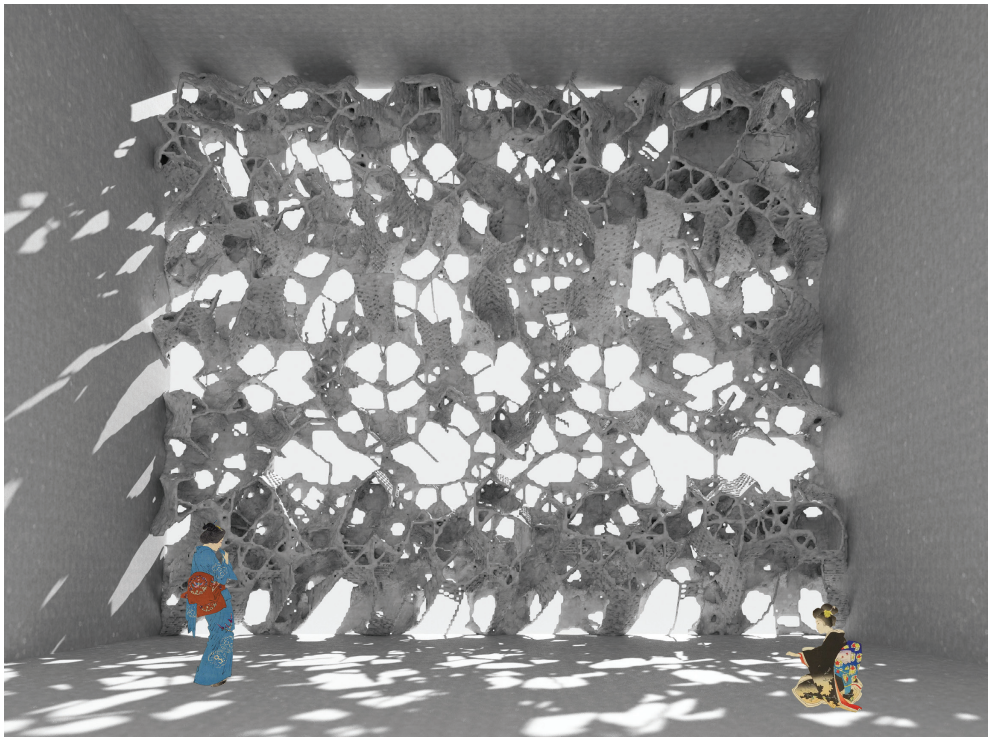


Simulation perspective view at 20 frames.

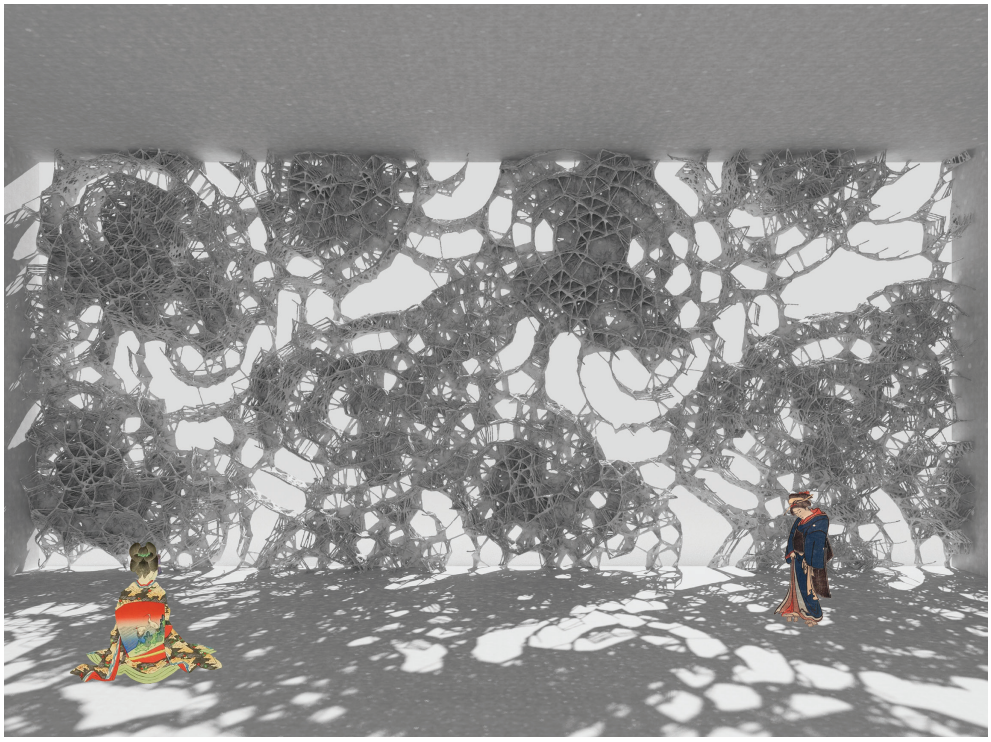


Simulation perspective view at 8 frames.

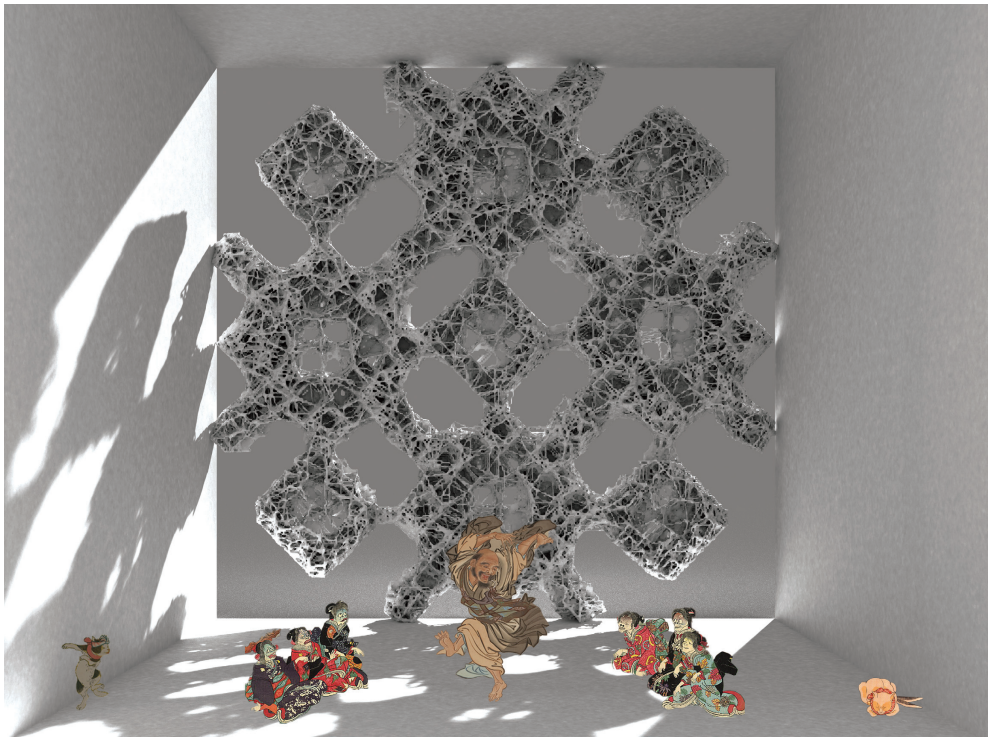
Once the algorithm generated geometry is thickened into a mesh (or used to host any other kind of geometry), the following drawings illustrate speculative applications.



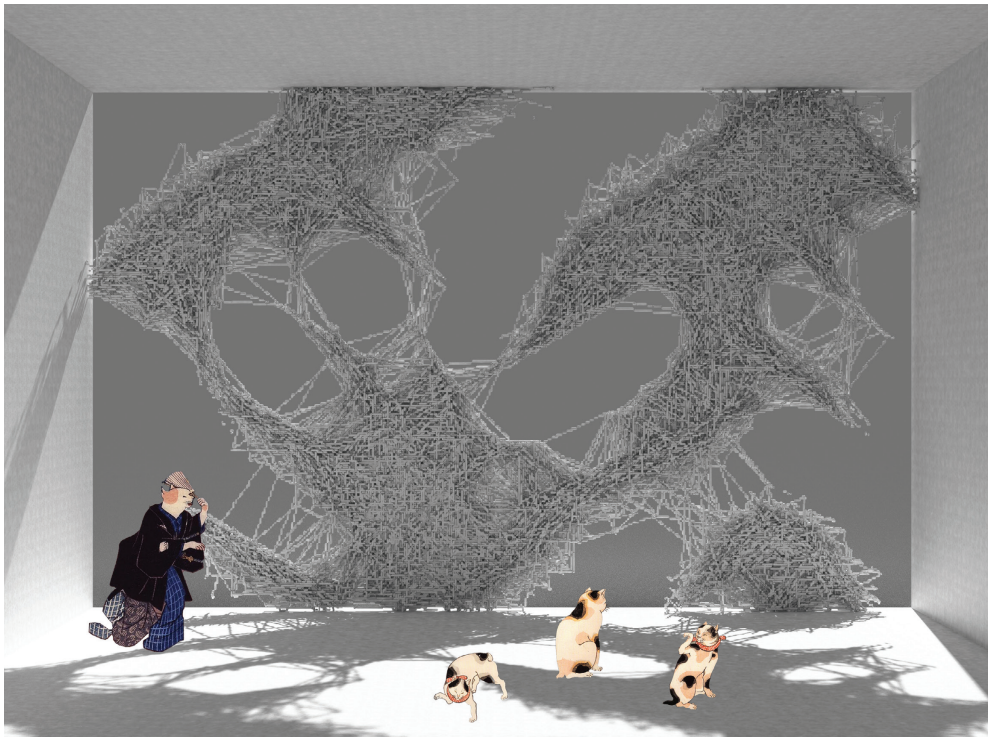
Personal production
Kabeus Katagamus [1]
Inkjet on handmade washi, 60x90cm
2019



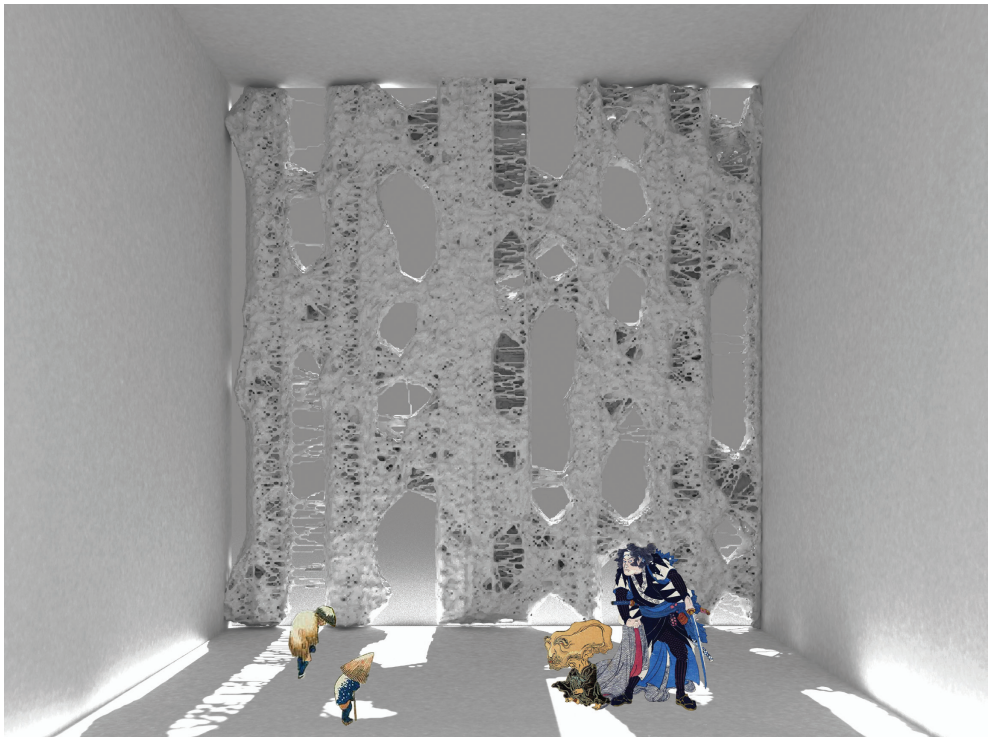
Personal production
Kabeus Katagamus [2]
Inkjet on handmade washi, 60x90cm
2019



Personal production
Kabeus Katagamus [3]
Inkjet on handmade washi, 60x90cm
2019



Personal production
Kabeus Katagamus [4]
Inkjet on handmade washi, 60x90cm
2019



Personal production
Kabeus Katagamus [5]
Inkjet on handmade washi, 60x90cm
2019

IV. Ornament from optic to haptic, from surface to depth, from small to monolith.

Despite being my personal production, i think that up to now explorations are linked to the affect aesthetics linked to a Deleuzian conception. Jacques Rancière in conversation with Mark Foster Cage in 'Aesthetics equals politics' tells us on the new superficial condition of architecture echoing a propensity to live and perform at the surface of things. Frederic Jameson as well has observed how in many post modern productions, depth is replaced by surface or by multiple surfaces. The contemporary subject similarly displays a marked tendency to recognize textures and patterns rather than forms and structures.

In her several manuscripts, Alina Payne demonstrates how modernism was clearly about object73and brings a new understanding of the early twentieth century's movement. She invites us to understand and read differently the well known modernism's radical aesthetics made of technology, mass production, clean lines and unadorned surfaces that broke decisively with history by making the infamous Adolf Loos's statement "ornament is a crime". One of her key arguments was that ornament has been detached from surfaces and was relocated in the objects that populated architecture's space. 1925's Le Corbusier and Amedée Ozenfant's 'Pavillon de l'Esprit Nouveau' is what epitomizes her contention best. In that pavilion, "there was no adornment, no ornament, no decoration. But what was equally if not more remarkable were the pavilion's furnishings. Few and apparently simple objects inhabited the space […] what was particularly striking was that these objects existed in a dialogue with the paintings on the walls". Indeed in that year Le Corbusier published one of his four manifestoes on the arts: The decorative art of today; and which preoccupied architects, critics and politicians by delivering a strong message : modern decorative art is not decorated.

Paraphrasing Alois Riegle, Payne wonders if this move from ornament to object was a move from optic to haptic. For modernists, ornament was always designated as a surface add-on; and the fact that it was associated to sculpture was a problem as Alina Payne provides the most direct summary: *"The fact that ornament cut across scales and mediated between architecture and sculpture placed it*

73 The Object was defined by Alan Payne as the following : *a class of man-made products that are (potentially) mobile, even portable, hence of a scale and physical integrity that permits circulation and removal from a specific site. Such is, for example, the equipment of the domestic space -from cups and saucers to luggage, furniture and paintings on the wall- as indeed, the equipment of any environment (church, office, laboratory, and so forth). Belonging to a collectivity aptly called in German " SachKultur" and embracing everything from luxury goods to everyday items, objects are collected and consumed, are detached and detachable, discrete and unrooted, transient, short-lived, both close to the body and discardable at the same time. Indeed, they represent the anti-thesis of architecture.* In From ornament to object : genealogies of architectural modernism. Yale University Press, p11.

Le Corbusier and Amedee Ozenfant
Pavillon de l'Esprit Nouveau
1925
Photograph

even further outside the mainstream. Ornament and architecture was a topic, albeit negative one, and objects and architecture was another one, but no questions connected the three".

Payne further offers a clear historical insights and a valuable comparison between ornament, object and their relationship mutually and respectively to the built environment. Ornament was always an important component of architecture anchored to the oeuvre of artist-as-genius of famous architects, while the object was either mass-produced or made by less famous artisans. Ornament was permanent and anchored into the skin of architecture, while the object came under the form of movable and detached sculpted forms. Succinctly, ornament and object belonged to different aesthetic regimes of high arts and minor arts74. Furthering this analysis, Payne points out their shared characteristics. Both are of small scale when compared to architecture, "both are three-dimensional, whether carved or cast, assembled or poured; and both elicit the sense of touch, projecting "graspability", the potential of being held in the hand". However, their small scale and craft character constituted an obstacle to be accepted as protagonists in the modernism discourse. Since, traditionally, ornament was meant to "explain" architecture and functioned to communicate with the bodies that inhabited architecture, Payne further questions if ornament's qualities were placed and relocated in the object's that populated the modern spaces. Additionally, objects have gained significance as they are seen to enter the collective subconscious by informing it, they are Aime at extending the human gestures and movements, they allowed for modern types of habitation to be comprehensible and acceptable, which transformed their nature in a kind of rhetorical devices, just as ornament was75.

In this research, Japanese katagami patterns become a host for human activity. This is based on the latin word 'ornamentum' and that has a common etymological origin with the verb 'ordino'. The latest means to organize and to order (Picon, 2013). Here, katagami ornament's geometrical topology is used to implement activity and organize the spatial (see figures ? And ?). When translated to a three-dimensional object and scaled up, this ornament achieves both a structural and an architectural function. Through this framework, the human body engages directly and haptically with the new monolithic, large mass architectural object. The ornament becomes architecture volume, not a mere multi-layered surface outer-shell at the periphery of a building.

The following drawings are speculative collages of different functions and programs held

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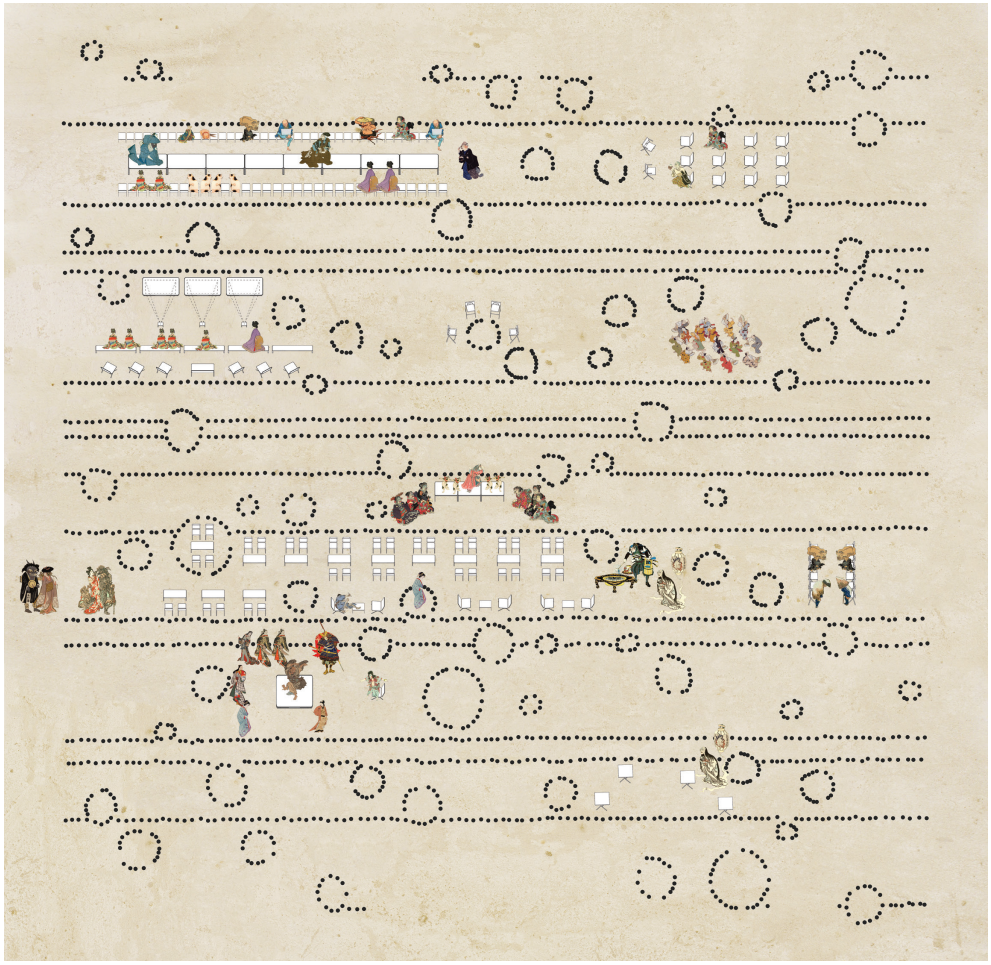
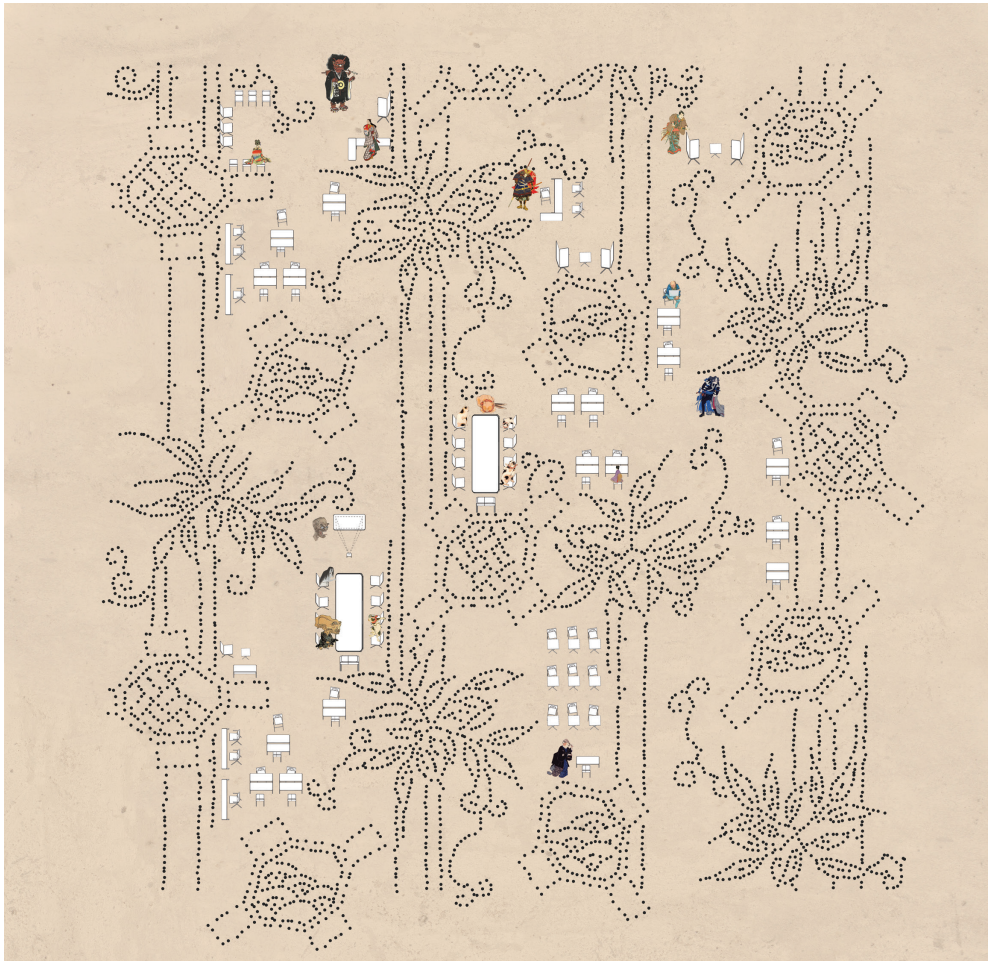
74 Payne, Alina. 2013. From ornament to object : genealogies of architectural modernism. Yale University Press.

75 Ibid 74.

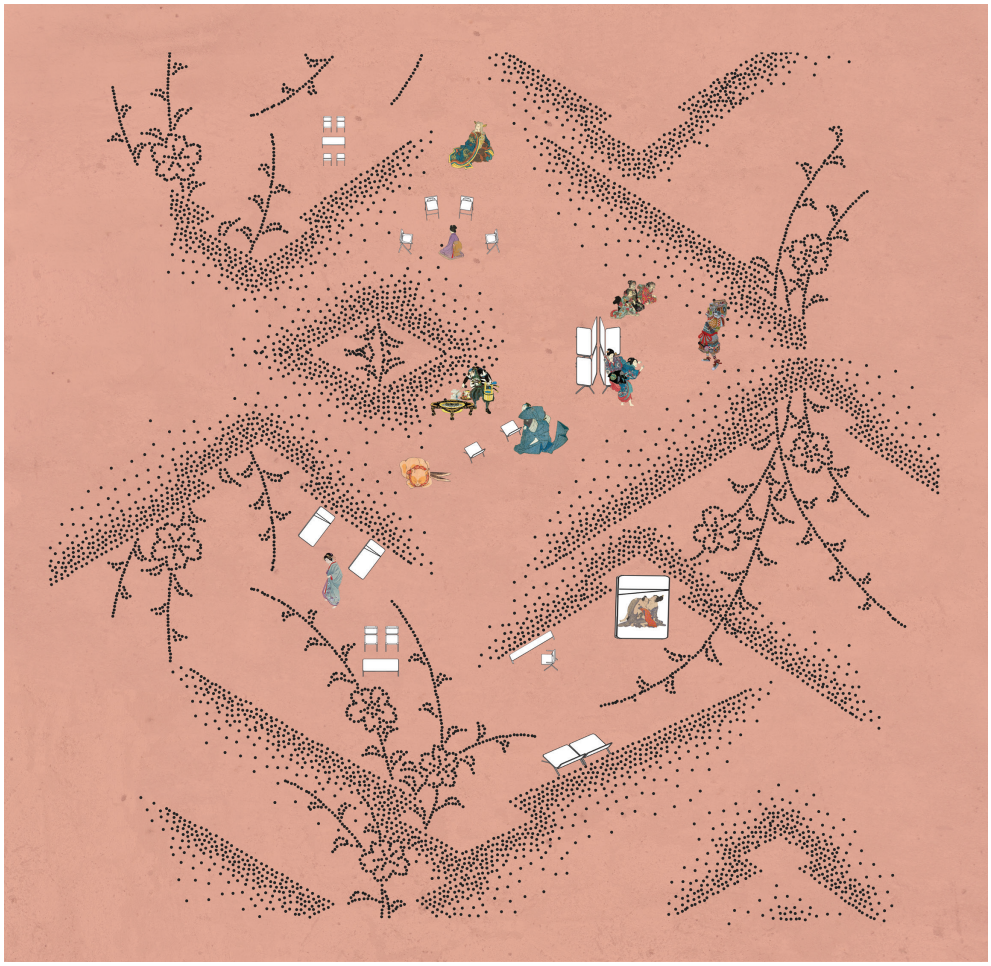
inside the pattern. For instance, the first one being a cultural center hosting activities such as art performances, fashion cat walks, or even a tribute to Hideyuki Nakayama's solo exhibition at the gallery MA under the form of a Cinema. The second speculative drawing hosts for instance an office program, hosting a reception desk, a waiting room, a meeting room and co-working spaces. The third speculative drawing consists of a private house, made of a living room, private rooms and so on.



Personal production
[N]3331
Inkjet on handmade washi, 50x50cm, framed.
2019



Personal production
[N] Ebisu 1-18-18
Inkjet on handmade washi, 50x50cm, framed.
2019

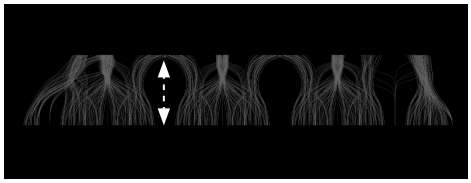


Personal production
Ningyou No ie | 人形の家
Inkjet on handmade washi, 50x50cm, framed.
2019

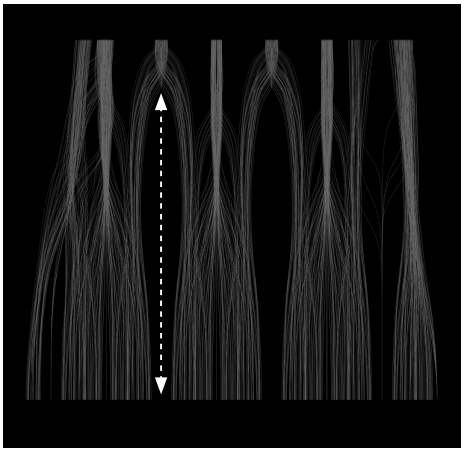
In order to transform the previous speculative drawings into architectures, the previous agent-based algorithm has been modified to create enclosures and control the height of the different spaces as show in the two figures. For the behavior simulation of the second case study, the same flocking IBoid class's parameters are also identical except for the initial direction and velocity vector (respectively IG.v(0,0,25) and IG.v(0,0,125)). When increased, the enclosure's height, indicated by the white arrows (comparison between the two figures), is stretched as the system agents need more time frames to reach their positions according to the IBoid parameters. Through this parameters, the pattern is investigated potentially as a space configured with circulations, enclosures of different heights according to the architectural program needs.

Population	1000
Number of Frames	150 and 250
Cohesion Distance	25
Cohesion Ratio	4
Separation Distance	15
Separation Ratio	3
Alignment Distance	10
Alignment Ratio	2
Initial Direction and Velocity Vector	IG.v(0,0,25) and IG.v(0,0,125)

Case 3 input parameters

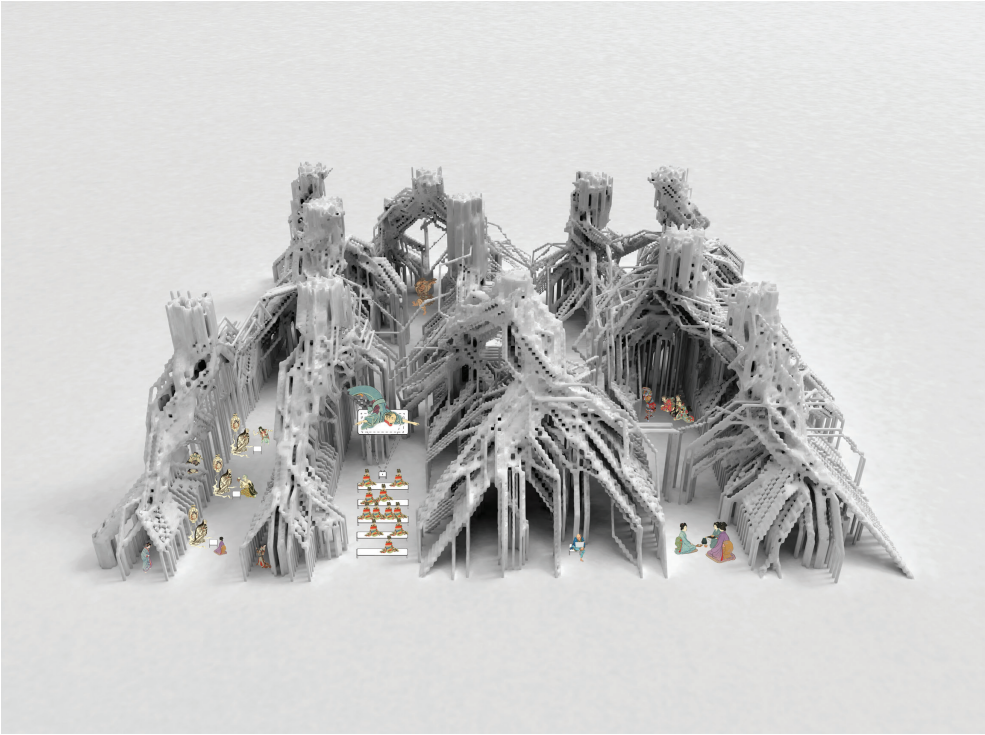


Elevation of the pattern's flocking simulation



Elevation of the pattern's flocking simulation

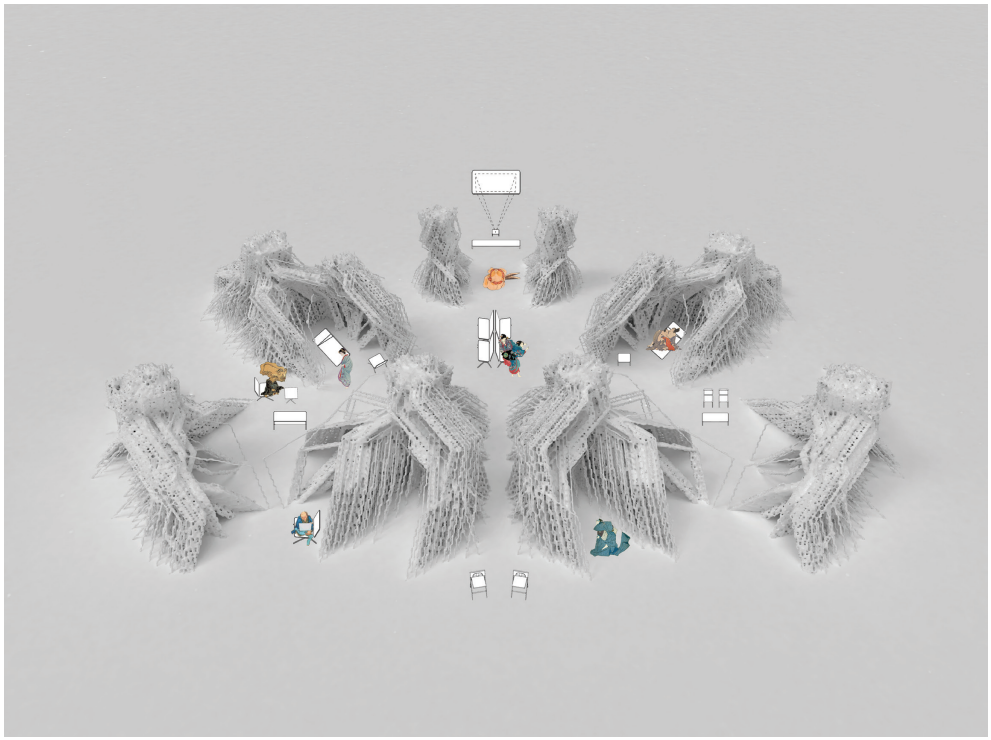
Again, once the geometry is generated, it is sculpted into into the following architectural objects :



Personal production
[haptic] x [N] 3331
Inkjet on handmade washi, 60x90cm
2019

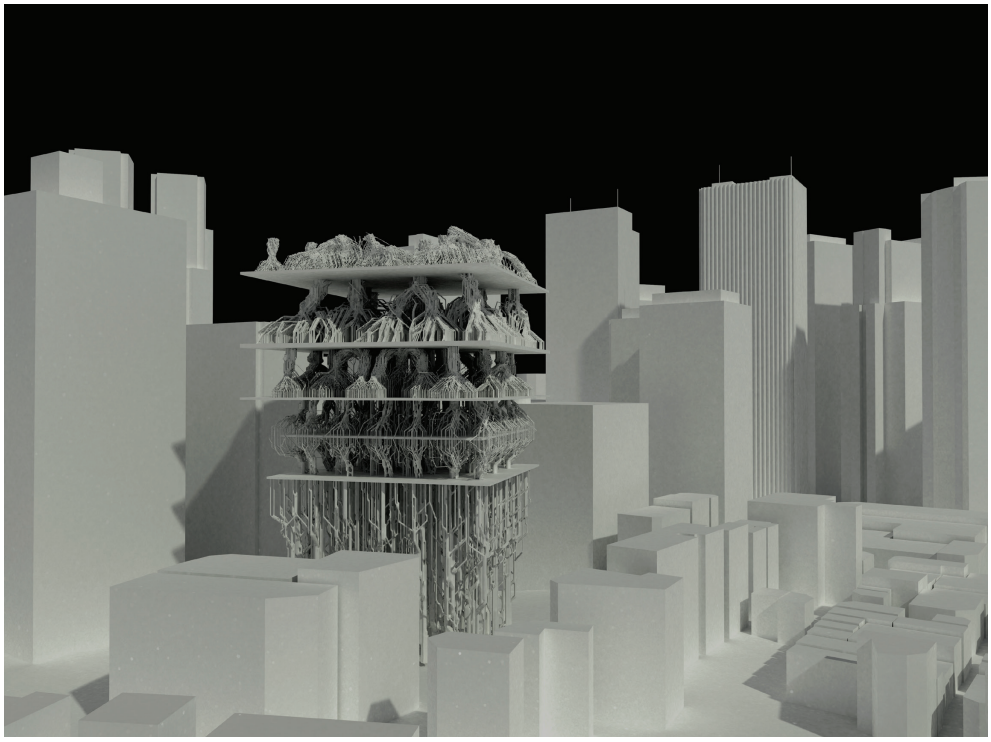
Personal production
[haptic] x [N] Ebisu 1-18-18
Inkjet on handmade washi, 60x90cm
2019

Personal production
Contact Motorpool
Inkjet on handmade washi, 60x90cm
2020

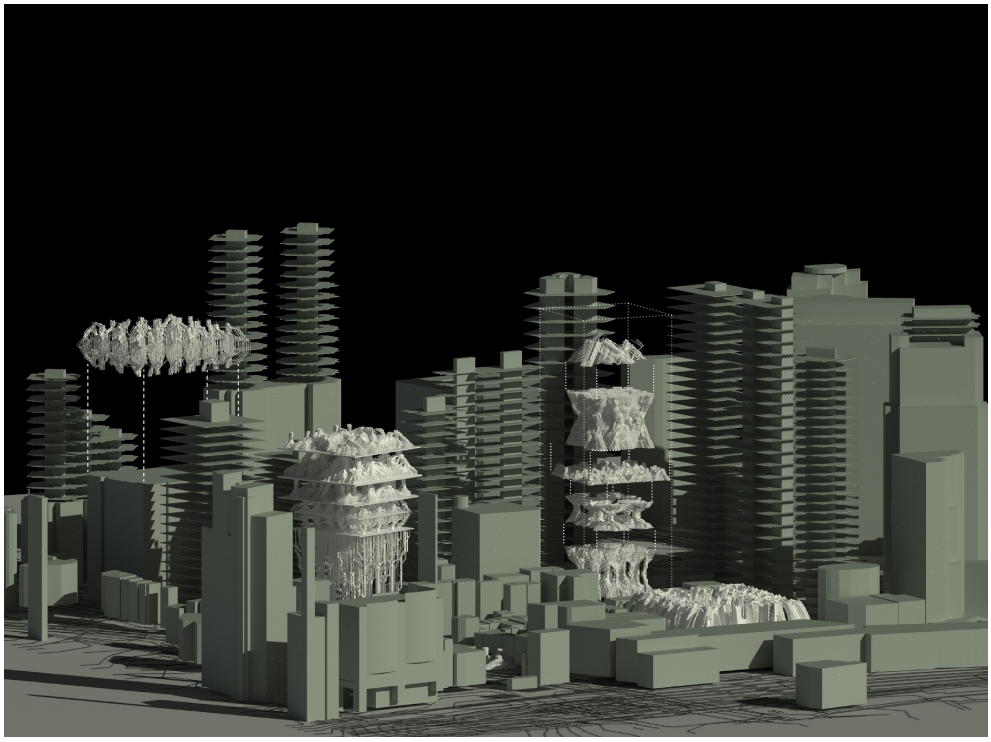


Personal production
[haptic] x Ningyou No Ie
Inkjet on handmade washi, 60x90cm
2020

On a speculative level, one can imagine a tower in an urban context, here Shinjuku district, made of different floors originating from different patterns and that can host different architectural programs at each floor. A stage where ornamented architecture would populate the city.



Personal production
Katagamus Urbanus Tokyoitus [1]
Inkjet on handmade washi, 60x90cm
2019



Personal production
Katagamus Urbanus Tokyoitus [2]
Inkjet on handmade washi, 60x90cm
2020

Discussions

As written earlier in the introductory chapter of this dissertation, many of the questions raised within this doctoral investigation are novel and have not been discussed yet in published scholarship, it was mandatory to conduct qualitative interviews with theoreticians, curators and protagonists from the practice world: artists, architects, ceramists, patternists that work with ornament, architecture, crafts and technology on a daily basis. The following transcripts of those interviews[76] are therefore included in the body of this dissertation and not simply relegated in the appendices as they offer critical ideas and insights.

I. Frederic Migayrou[77] - November 14th, 2019, in his office of the Pompidou Center, Paris.

Frederic Migayrou : Let me know what you expect from me.

Ghali Bouayad: Of course !Today I would like to discuss with you many topics going from of course patterns that are at the heart of my research, the second digital shift that Carpo is discussing in his book, agent modeling, fabrication and discrete discourse, philosophy and metaphors, and if we can afford the time pedagogy and academia since you are the director of the Bartlett school. So as a critic of architecture what do you think of the potential of using patterns within architecture; architects like Kuma. Aoki and Nouvel have used it extensively in museums, do you think of another potential other than just remapping it on the surface, with a power to engage with the user.

First, the history of patterns in the culture, or the shift organizer of the theory of pattern toward the end of the century was Alois Riegle. Riegle was the first to define new identity of the pattern in culture, making studies about Indians, Africans, all the patterns in early cultures to understand their importance in the history of arts, independently from what happened in the occidental art, he was the first to write on this. Alois Riegle is really important. It was defined for him by the new intelligence of space-time, not organized through the traditional occidental idea of the vision as representation coming from Renaissance to Kantian Idea of the representation of space and shapes and explaining that the pattern is related also to the idea of the German conception idea

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76 In addition to the interviews included in this chapter, I conducted conversations with Aoki Jun, Jakob+Macfarlane and Yusuke Obuchi. Following a future discussion with the thesis jury, it will be decided accordingly to be included or not. In addition, future interviews will perhaps be conducted with Satoru Sugihara and Mario Carpo.

77 Frédéric Migayrou is a philosopher, art and architecture critique, founder of ArchiLab in 1999. He is deputy director and curator in chief of the design and architecture collections of the Pompidou center in Paris. Since 2011, Migayrou is chair professor and director of the UCL Bartlett School of Architecture in London.

of the Gestalt. There is something cognitive in the idea of the pattern, which defines a new idea of space-time. It was surely the rules of modernism, this new understanding of the Gestalt and Riegle is in this way very important. The other one could be Ruskin in England quiet at the same period, the idea to not understand pattern as decoration -something additive- but as something directly defined to the cognition and that at the end could be a tool of conception. This is for me really the basis of Occidental understanding of Creation as conception not as a representation of a shape. This is why at this moment, the rereading of other culture appear in architecture like for example Bruno Taut, who after visiting Japan tried to truly redefine an occidental vision and a new idea of the conception of the Tatami, idea of space, an idea which was turned to the notion of conception, not representation. This is for me, if I have something to say about pattern, I will work on this filiation. Before Riegle, surely another German called Gottfried Semper. He is also one of the inventors of the modern architecture toward the end of 19th century and wrote seminal book named De Stijl, this is the first book written about style. This book is defining style not with history of style by style as an history of conception. This was completely new, as the idea to turn what was purely decorative, an addition, a pattern as motif into seminal in the art of the conception was very very important in the history of occidental culture and also the way to re-read early culture, primitive cultures. In this way it changes completely. Second thing, the idea of the pattern as you use it in your research is interesting because this the people I worked with in the 80s - 90s when I made non-standard architecture, mainly Lars Spuybrock, do you know this guy ?

No

He wrote two books on patterns when architects discovered new software which were modulars. Those modulars are tools that create a rupture between traditional representation of building through geometry and those new software opened the way to generative architecture.

This is back in the 90s.

Yes, this is in the middle of the 90s. It began in 95 until 2010. For example when I exhibited first in ArchiLab in 99 Greg Lynn, is exactly part of this movement. You have a shape, that could be generative and extended to multiple vocabulary of shape and at the end, like your pattern. Lars Spuybrock was also an architect in my show - non standard architecture- started to work on pattern and published two books.

(He heads to his desk and picks a book).

This is the second generation to work with patterns. Let me show you. The studio is NOX. After this generation, they still worked on geometry, but the new idea of distribution of elements and the idea of generative architecture appeared. The generation after began to work with agents. It was the generation of Alisa Andrasek and Neri Oxman.

Yeah yeah of course.

When I made non standard with the people from the first generation, it was 2003. You had everybody, Spuybrock, Roche, greg Lynn and so on. But Mario Carpo made his book very later.

Yeah he wrote the first books on the first digital shift and algorithmic architecture, and last year published the second one.
The first one was something he wrote 5 or 7 years after I made the show. And i was the first to publish in French Bernard Cache and the idea of the pattern in Cache was part of this movement. I spoke about Semper, there is a piece of Bernard Cache named Semper. It was directly connected to this architect.
So for these architects, relationship to technology and architecture was not only geometry ?

No. Still there. Still for this generation. For the first generation of course, the problem was that it was not anymore possible to work with a tool as AutoCAD to represent shape of buildings, but to work with the modeler… hmm what was the name of the modeler of Bernard, because he was a scripter for the company…

Objectile ?

No, objectile was the name of the studio. But the name of the modeler, I don't remember.
He was specialist, a mathematician who conceptualized the file-to-factory system with cutting machine at the period, 3 axis, 4, 5 axis, not 3d printer, purely cutting machine. And of course he made the Semper pavilion, you have to check it, it is what I exhibited in the show. The reference to Gottfried Semper who wrote De Still was obvious. Absolutely coherent. Same thing with Lars, he published a book quiet recently, 2012 or 2013. A book on patterns, same generation, some strategy. After that, the generation I work with was the generation working with agents, not with modelers like Rhino for example. But with agents. And I worked with this generation when I was

10 years ago and I bring back all these people to the Bartlett and created the B-Pro. And 5 years after, I bring back Mario Carpo and he published the second book .

Absolutely, regarding Carpo I have a question but I will leave it to the end.

Yeah Mario Carpo followed the movement, but I created…

Actually maybe I can just talk about it. The funny thing with Carpo is a year ago he published the second digital turn, praising mostly 3d printing and agent modeling. And then Giles Retsin published the discrete manifesto in AD last March and Carpo wrote there but went against all people he was praising in the previous book.

Yes because we are working completely differently since 5 years. I made a show, Coding The World, Printing the World, Fabrique du Vivant. And the next show I am preparing for February is about AI. And of course this is the third step to work with patterns coming from the hole history of cybernetics. Very effective now is the deep learning. This is the third way, deep learning working with pattern. We are going back to the roots of cybernetic when Christopher Alexander wrote pattern language.

By pattern here, are you pointing at the repetition quality of a pattern.

Yes this is the way to introduce an enormous library of patterns with parallel computing, with neural network, convolutional neural networks and at the end to turn those patterns into a generative system. Of course, looking at your research, can I be critic at what you are doing ?

Of course, I am looking for critique and feedback.
Making a building with different patterns, you create some kind of collage. There is no real coherence in between.

Yes

It is possible to create the coherence, turning the pattern into another one and at the end -what we are doing now with 3d printing- to have multiple branching system printing in 3D with high level resistance on 30, 40 meters and to make the patterns structural. It is possible to do it; working with generative pattern it is possible to create a continuity in this way. Working with your traditional patterns, you told me about the global grammar of your patterns contains about 500

patterns ?

Roughly 3000.

You could input the 3000 patterns and their variation in a deep learning system, very easy to do with python for example to create a generative system. 2d and 3d. What you did. With this it is possible to preserve the culture of pattern while turning it in a generative system. For example in my show I am presenting a woman working on tulips; she made an inventory of all the existing tulips through deep learning and now she can generates many many variations. In this way it is possible first to create the memory of these patterns, to reinforce the historical culture of their knowledge and third to create a generative system respecting this traditional history but also transforming it and valuing it in new spatial architecture.

Definitely, the tower with the slabs is a first try and the next step is to merge them all together.

That is what I thought when I saw your work. I am sure. To be honest, such kind of work you presented me is what we did at the Bartlett 6 years ago.

Yes, but I am in Tokyo and isolated.

I know, I know, I know.

It takes time to reach.

I am very pleased that you came because most of our students are Chinese and bring back knowledge to China and expose this on patterns. Of course it is interesting to see other people working with these processes or trying to develop their research. When I said it was 6 years ago, it doesn't mean architects are already developing such kind of process in construction. It is purely experimental. But it was the way tutors work with their students and at the end the creation of the geometry was a bit close to your kind of research. Not exactly this, not as your project. We were at this level of research in the school few years ago. But do you it as an autonomous Phd student is fantastic.

Indeed, but also doing a phd, we do not start from nothing. We see what has been done before and start building on it.

I know, I know. What I wanted to say, there is a real richness for you to work on patterns, and to recreate some kind of archeology as I told you with Semper…

Yes, that was the idea.

Bernard Cache, Alois Riegle, German historian and philosopher, and of course you can speak about the baroque too, Gilles Deleuze culture, all these traditional references but the réapparition of patterns in architecture through the generation of work of architects working with modelers and now the new generation of architects working with deep learning systems is obvious. This is real. This is now. You are on time. (Laugh).

You were taking about the 90s architects, I used to work for architects you know very well : Jakob + Macfarlane.

Yeah.

They made the FRAC Orleans. There are two existent buildings with two existent grids, then they merge together.

It stayed a geometrical project. It is a morphological project. It is no a pattern project.

Indeed but the question I am asking is that at the beginning there were two grids…

Yes,

Then they merge together.

Exactly,

A grid is a geometry. The question is from when a geometry becomes a pattern. In their building, all I can are patterns. Patterns of dots -a collaboration with Electronic Shadows-.

Exactly,

But also in their other buildings; they made for instance an exhibition : Invisible Drawings, where we can see X-Rayed wireframe of the constructions. The patterns are there.

It was not really from a pattern, it was a shape, a morphological shape. They made the restaurant here (Pompidou Center), the Georges. They extracted the shape from the mutation of the grid. The grid of the Pompidou is 80 cm x 80 cm and they merged the grid in a new shape; they created three balloons. For me it is pure geometrical research, not a pattern. It is a research coming form a modeling software. They never worked as Lars SPuybrock worked on the real patterns to create a grammar. To have patterns you have to extract the shape and its modularity to create a new language through grammar. It was never defined as a grammar for them. It happened in Bernard Cache. He worked on patterns in the Deleuze filiation and the idea of baroque mutation. Spuybrock thought a little about pattern existence, but really to work with agents is to work differently with what is fundamental for geometry : dots.

Indeed everything starts with 3d point coordinates.

Of course if you don't work with dots through parameters but through a distributive system, that is the shift. It means you organize the matter not through the shape, but through the matter distribution system (resistance, structure) from the material itself. It is a new way to think.

Yes, I think it is taking the computational design in the other way. I can think of Achim Menges is doing for instance for hygrometry reacting material.

Exactly, exactly, the shift is here. This is the second one. The third one is deep learning.

You think so ?

Of course. The main person you can be interested in is Shajay Bhooshan, who works for Zaha Hadid Code. This guy is an Indian guy very advanced in research and begins just now to work with AI for real construction purposes. I will exhibit it in my show; the Macao hotel, its exoskeleton and its pattern, which is purely decorative and purely structural. For me it is the first best example of AI development in architecture. This is really the new way to think architecture. And to escape from 3d printing -which will still be news more and more at the larger scale-, but really to think this idea of the exoskeleton and the distribution of the material in this way was completely new. It is not anymore about making columns and beams as it was 2 or 3 years ago.

I am aware of the project. Yet, the building has a central circulation core at the middle made of concrete

supporting the slabs. The facade only is self supported.

Of course, it is a transition building, But at this time we can expect and speculate more. When they thought the distribution of the pattern they worked with AI; surely with Python.

Processing ?

No processing is old style. There is one but I don't remember the name. You know I am not an architect and I am not an engineer.

Funny how Patrick Schumacher is still arguing for a parametric style. Just a month ago he published the 13 points on why parametricism is the future.

Yes, they are builders now on a very high level with very complex buildings, but the new generation like Shajay and his brother for example are thinking differently. They are able to develop the speculative research in Zaha studio in a completely different way.

I have an other question if you don't mind. With the first shift that happened in the 90s, with new softwares to understand the curve (Nurbs)… many architects, I can think of Tschumi, Lynn, Eisenman, relied on the Fold.

It was a fictive understanding of Deleuze in architecture. I am a philosopher, I know exactly how they used philosophy and it was more clear for Bernard Cache as he made his Phd at 26 years and was quoted by Deleuze himself in his Fold manuscript. Of course it was a great discovery, the conception of Bernard was very creative at the period but he was stuck with this you know. He was the first to think seriously about the file-to-factory because he managed his own company but the end he got stuck at the geometrical level. This is the great trap for architects. To think how to escape from geometry, it is quite impossible for an architect. But geometry is just involved in a larger system of conception now because you can mix all the qualitative Data like (unheard word) and light as it is for the BIM. The great accomplishment of the geometrical conception in architecture is the BIM because you can add to the traditional idea of the structure any qualitative parameter. The problem is how to escape from BIM ? It means how to escape from the notion of the identity of the shape, the traditional idea of space and so you need to think differently and this is exactly what happened first for me with the Agents, but agents came from cybernetics; and the second level with deep learning directly relied on the neural networks which directly come from cybernetics. Now with effective computers it is possible to work with millions of

data, which was not possible in the 60s, 70s 80s…. You know the idea to work with computer geometry appeared with SOM in 63. What did Eisenman with FormZ was existing in big studios like SOM in the 70s, but Eisenman used this with (unheard name) as a generative tool, not as a descriptive tool. That is why Eisenman was in a way important at beginning of the 80s. FormZ was used at the Colombia when I met that young generation of Lynn, Tschumi.

The paperless studio ?

Yes, paperless studio worked with FormZ.

Of course this discourse is important -the geometry discourse-. But as an architect, I am questioning myself about this ecosystem that these architects created for their own… there is a French researcher who also interviewed you some years ago -Florence Plihon- and how researching about the Fold. She proved through her Phd that these architects really created a very fertile environment to disseminate their ideas both in academia and the general world. They relied on philosophy, Deleuze, Derrida, Guattari; and how they used those texts to nurture their imagination and rhetorical discourse. For me it is important. At that time, with the curve rise, they relied in the fold and its idea of continuity. Now with agents modeling, philosophers - or philosophy vulgarizer- like Manuel DeLanda, Graham Harman and Object oriented ontology, immaterialism.

Graham is different, because he is going back in way to phenomenology. For me this is a regression. For me the Object oriented system came from cybernetic. The term was used by computation in a very pragmatic way 20 years ago. Like the Top down, bottom up and so on.

Yes.

The now OOO is changing it into a phenomenology concept. It was not, it was computational. Delanda is different. It is a speculative idea of Deleuze. The problem with Deleuze is that he is a structuralist. He is a post structuralist. He was also influenced by cybernetics, but when he began to work with machines it came from cybernetics. The people who explored the philosophy of Deleuze in term of theory as an application for architecture they thought about Deleuze and Derrida as post-structuralists. But it is little understood that deleuze himself was very influenced by cybernetics through Guattari, and the notion of the agent appeared with another German philosopher not so well now Niklas Luhmann. Now, Schumacher in his big books refers to Luhmann. And to understand what was the effect of cybernetics, to understand the development of technology, it is very important to understand what happens now with the

effective development of pattern system in deep learning. Ai application not new, it is always the same fantasme of man machine dialogue from cybernetics, but that could be developed on high scale. To understand the critical positioning of the deleuzian effect in architecture, magazines like ANY were really the American platform and they explored French philosophy. But to hybrid this to other influences in architecture like cybernetics is important. It was important for Lacan who was also a structuralist and to hybrid those two schools of theory, it is important to understand what happens today. For example the theory of agents in Bruno Latour came from cybernetics. Everybody believes he is a post deleuzian. No, he worked with Luhmann philosophy. The notion of agents in term of computation -actor agent-. The problem now is to define what could be the critical field of architecture that comes tomorrow. This is your purpose. I think it is important to understand what was the platform developed in theory around the built environment that at the end killed architecture. In schools like Princeton, Columbia, Yale, Pen, Pratt, Cornell; the Einseinmanian system was there and after Wigley (Mark) / Colomina (Beatriz) nothing happened in architecture. It is difficult for me, I mean the architects of my generation : Greg Lynn never built anything; Francois Roche never built anything; Lars Spuybroek built little things, Ben Van Berkel built bridges before, he was a builder at the beginning. All that generation was lost and now, this generation, there is no longer young practicing architects.

They are all in academia ?

Yes ! They are purely academics now, they are doing Phd, writing about sociological things, about media studies, post Colomina media studies. There are no more practicing architectures, it is actually terrible, it is killing architecture. Of course I expect the generation after, working with new tools -3d printers, distributive systems and so on- to be more effective in the practice, to build, to get commissions, to be open to competitions. This is why I believe critical positioning will develop real practice.

Okay. Still American architects relied on philosophical theory. While the French never did.

No they never did. That is why as a young philosopher thirty years ago I was interested by the American architectural scene. I was curious to see that the philosophers I was reading at that time found an objective opening in the practice: in aesthetics, in arts and creatives practices, in architecture, in the united states. It was fascinating for me ! It was possible to find creative way to think differently the world. But at the end it was a complete failure. In France, in Europe, you have only post-modern, neo-modern, post-italian scene. That is why it was so fascinating at that

period to meet young American and Dutch architects. When I made the first ArchiLab, I tried to mix young Japanese; the first time Kengo Kuma was exhibited in France was in my ArchiLab…

SANAA also !

Yes SANAA also, I also invited a young team named Snohetta, completely unknown at the period; with Greg Lynn, with Hani Rashid. The first ArchiLab in 1999, they were all together. The idea was to say : I want to work with builders, theoreticians-creators. At the end somehow the less advanced theoreticians became the main builders. (Laughs).

Do you think this was because of promoters and developers?

No ! Because they others were very pragmatic…. Oh I don't remember the name, there was this guy who worked with Coop Hemmelblau, no he is teaching in Sci-Arc; as a curator I invited him, after that he went to Sci-Arc and never did anything; Fictive competitions and so on. Bernard Cache stopped to work ! Mark Goulthorp, that I promoted at that period, was so advanced, beautiful conceptual architect, magnificent projects about shadow of Ledoux… he went to MIT as a professor and never reappeared.

Are you saying academia is killing the …
American academia is killing architecture, I am sure ! I am absolutely sure of this. This is why I did exactly the opposite in London with the Bartlett Pro.

Architecture that can be built.

I want to develop real practicing studio where architecture can be built. I ask to make prototypes. I am always fighting to make the members contextualize the projects. I want the context, I want the program.

Don't you think this is compromising the possibilities of theory to explore volumes, shapes, space ? Maybe the tools now are now ready….

Architects of my generation were fascinated by theory, they did experimentation in the good way, but they missed the opportunity to make real competitions, to practice, to organize a studio, to be 2 or 3 people to begin, to start small, with a house, with a two story building; even to

compromise ! First, you need to build ! It is like a musician who wrote only partitions and never plays music. It is ridiculous.

When it comes to big competitions, you should first get invited…

No. I tell architects MAKE ANYTHING : A facade, a chair, anything that does not stay at a conceptual level. It is through application, through confrontation of reality that you build your own language, not only in the speculative way. It can't work. To be an architect, is to confront many socio-economical and political problems : this is how architecture appears. It could be bad architecture. It is to objectify, to actualize the purpose through constraints, not to stay at a speculative level.

Do you think the discrete discourse is the answer ?

No, no, no.

You don't believe in that ?

I am believing in the energy of Gilles (Retsin), Manuel (Jimenez) for me is more realistic. They are very creative and very advanced hein ! The notion for me, I mean imagine, it is the most basic notion in computation.

Yet they are reaching complexity and building very cheap.

I promote my tutors you know to the maximum, I push them. But I want to create diversity, to provoke debates. I am not sure that this concept at the end will survive in 10 years. I am not sure at all, I push them to make a pavilion (TAB). I say make a competition, do something, confront yourself to reality. I am doing my best to promote them. An architect needs to answer a question and the question is the commission. This is fundamental: it is the old way to structure the purpose at a real level. Look at Zaha, she made the Vitra fire station. It was a really nice building however the trucks could not go in. It was a kind of sculpture, not architecture. But at the end, she came as a big architect. If she never had the opportunity to build that, even it was a full mistake, absurd building, Zaha wouldn't have existed. So confront yourself to the alterity of a commissioner and of a public system : This is important to make your language effective. It was the strength of people like Kuma or Snohetta . You know Kuma is not really

a nice guy, he is very pushy, I know him since 20 years. I purchased the bamboo house for the FRAC, for me it was nice but it was a little bit kitschy. But he was a fighter, a real fighter, at the end he got commissioned; not my favorite architect. But for example woman like Itsuko Hasegawa. Hasegawa was the girlfriend of guy named Toyo Ito, and she is a fabulous architect. She was an engineer who worked with Kikutake for Osaka 70, she was 22 years old and she made the drawing of the nodes for the structure as an engineer. At that moment she refused, like Isozaki, to continue in that capitalistic objective architecture and she met Shinohara, worked with him, and started to make little houses like him with but with a technical language she got from Kikutake studio. She invented , her ! Her !, light architecture. She is the inventor of light architecture and Toyo Ito picked up the idea and evolved it. And as you know, Sejima worked with Ito. But the inventor of light architecture is…

Hasegawa !

Yeah. (Laughs, and phone rings).

I think it is time for you. Thank you very much.

Are you in Europe for a long time ?

Only another 10 days before flying back to Tokyo.

Let me know if you come to London !

I will definitely visit the Bartlett. Thank you very much ! Please if you come to Tokyo, I definitely would like to see you again.

I hope this meeting will help you. What we talked about in 1 hour is a much more complex story.

II. Rafael Balboa78 - October 28th, 2019, in his office at The University of Tokyo

Ghali Bouayad : First thank you for granting your time !

Rafael Balboa : Thank you for coming !

I think the current research I'm conducting in Geidai under Kanada San is somehow due to my first encounter with you and visit to your research office where we sit in here so on many opportunities you've been kind and caring to let me not get navigate through your private book collection.

(laughs)

And you've been curating it quite carefully through the 15 years spent here in Tokyo. So I guess my interest in patterns grown since you advise me to read function of ornaments by a Farshid Moussavi and patterns and layering which is a collection of essays published in 2012 and written by various architects of Kuma Lab including yourself.

Yeah by doctoral students…

Yeah ! so my first question would be ; as your experience evolves through the years and with it your understanding of spaciality, Japanese culture and various elements how has evolved your understanding and relationship to Japanese patterns ? and has it impacted in any way your own practice of architecture, designing spaces or relationship to aesthetics in general?

Correct. I mean when we were writing this book of patterns and layering, we started around 2010 and it was first, another friend Italian researcher, he's a social professor now in Leuven and he runs his practice in Paris so at that time he was researching all this more graphic patterns trying to understand what we call the Kamon all these family crests and also tried to break them in a more intelligent way, what kind of rules that would apply to, you know it is usually one component which is twisted or having certain kind of refraction so there are certain rules and we try to do that in the book. I remember at that time I was very curious about this idea

78 Rafael Balboa is an architect,PhD and senior researcher at the Kuma Kengo Laboratory of The University of Tokyo. In 2013 he co-founded STUDIO WASABI, an Architectural Design Firm and Urban Think-Tank based in Tokyo, Japan. In 2016 he joined the team of Casa Wabi, an Art Foundation in Mexico designed by Tadao Ando, as Director of CASA NANO, a residence and art space for Mexican artists in the neighborhood of Sendagi, Tokyo.

of eccentricity so I remember I used to first use that since the very beginning to refer about Japanese culture as an eccentric culture but more from the form because basically it is eccentric from the for the foreign eye but eventually I started to realize more this eccentricities in the geometrical way it was very relevant just to realize that the more I was looking to the things in detail and also understanding relationships with China -it was basically that the modern culture or the first seed of knowledge in Japan-, I realize how relevant was to talk about the topic presented to label it as ecc-Zen-tricities, basically because it was inherited from this idea of being different than China so basically you see the Forbidden City for example in China you have perfect symmetry and you can even tell this kind of writing which bathroom, something more which is called Karajo which is more structured so something that we call ya-yo which is more fluid and somehow it was relevant to understand how it was very persistent this idea of none not-symmetry so we wanted to understand first geometrically how this was out of the center impulse or deliberate design of the center is slightly off the center was nurturing all the formal culture in Japan, not only geometrically but also metaphorically in this case so I think first how it was it started as something eccentric just because it was different then it passed to something geometrical that we could measure basically and then it went back to inform more in a philosophical level how asymmetric is Japanese thinking or how deliberate is this manipulation of being out a little bit of the center so still until today I think I continued observing, I think you can definitely make a book just about this eccentricities. For example when you go to the Meiji Shrine you enter and you have trees at the beginning if you observe in detail you have on the left hand two trees and on the other you have one tree. Or if you see outside the Kaido which is this corridor that connects all the open spaces and you see how one side is different from the other… so it's not in your face, it is basically very subtle, very elegant, so I think that is something that still the Japanese explore a lot basically wherever I look I see more and more eccentricities so I think it's a topic that probably that article was just the beginning of to understand that is basically everywhere, it is just something which is recurrent and it's what makes Japanese design, Japanese. We love making things a little bit of the center, and eventually I was also very interested in maybe Tsuji Nobu; he wrote this book about lineage of eccentrics which is a book that he made in collaboration with…

Takashi Murakami !

Murakami, basically he's the one who legitimizes all his academic approaches and it was relevant to see how this eccentricity was also happening in art so you can bring it to the geometrical and also to the artistic side of Japanese culture so it's a relevant topic. I guess as now you are talking

about it I should consider it as a serious research.

(Laughs). For sure, after reading your article I definitely started paying attention to the asymmetries… once in a drum concert where performers were not coordinated and started wondering if that was related to eccentricity…

Well basically the Japanese traditional music is pentatonic so it has a different system of measuring the rhythms which is eccentric again. it's not the Western Way so it sounds sometimes a little bit out of tune but that's because it's not pentatonic.

I was going to talk about eccentricities but you raised the question before. Just one question that's crossed my mind : when you when we see a lot of plan drawings from Japan, architectural planning, i means it is never symmetrical. So do you think it is because the design emerged from how we use the space ? so we constitute like we think about first how the space is being used and then the whole emerge from each elements of space or is it like also related to being eccentric to not implement symmetry within the design.

No, it is an understanding of the nature basically. IN nature there's no perfect symmetry that's something more invented in the Western world to idealize all the proportions and I mean if you take there's this photographer who takes half of your face and then he mirrors display your face and then he put with the normal face and it look totally different, so we are not even symmetric in our faces so it's something that is coming more from an obsession of the western side of the world for keeping all these ideas of proportions. But in Japan it was basically saying it's the fusion between Shinto and Buddhism so and they were making for example there for the first Buddhist statues in wood you would have this dichotomy or this syncretism so somehow they were going back to the moon, natural understanding of Buddhism which is asymmetric. So you can see all the especially all the arts and crafts produced in the fall of the edo period it was all about asymmetries, you can go to the Tokyo National Museum and you would see every single piece is a symmetric, everything. It's just really really constant you can prove it.

But yet architects are really concerned by proportions, even the smallest proportion of volume, maybe not of composition.

Yeah but also I think they have this card which is asymmetry which is the one they use always, so you see for example the Christian Dior for of Sejima in omotesandou if you see the slabs they are different so this asymmetry is coming more in the vertical direction but basically all the architecture in Japan is based on from these images. It is the big secret or the big legacy or

uniqueness of Japanese wave composing things, because we are learning from the Western world which is about the same truth, they basically learn from China that and eventually they torn this into something more Japanese. So it's a tool of design basically all the big designers are working with this idea of asymmetry, it's a powerful tool. All of them.

When we see famous architects on how they used patterns to give materiality and expression to their buildings, they usually remap the geometry on the walls. When they use it on facades they reconstitute it, they repeat the geometry on it. For example Roppongi Louis Vuitton building by Jun Aoki, it is a repetition of a remapped pattern to which he gives thickness. What do you think about the power of patterns to engage with society especially when we use it on this frontier skin between private and public and that interacts directly with the urban space especially in Japan the geometry is well-qualified and it has a meaning within society ?

Usually they exploit this idea as I said of asymmetries and it's just a very strong resource to create other variations not to have something very homogeneous so there's always this variation in the textures, that's very powerful in a way. It's something that is not in your face you need to look for this thing it's kind of hidden in a way so I was putting the example of this I know in that book I remember and if you look at Asanoha it looks like equilateral triangles but when you only measure it you realize that actually the triangle has two same pieces but one is different so it's when you look at the thing and I think, here's the interesting thing, how you evaluate the things visually without measuring and you can tell there is some kind of dynamism in the patternology but you cannot tell where it's coming from until you start to understand that it was for example as I mention in this case; this one piece is different, just in the eye it creates some sort of movement we don't know where it's coming from so it's very subtle very very hidden.

So what you are saying is the power of engaging with public comes from this intricacy ?

It's more avoiding the obvious I mean not showing the things if let's say if you compare the DIOR building versus building from Gehry let's say, basically there are convulsions in the volume of the Guggenheim, in the Dior building each one of the panels is different basically so it finishes flat on a bump and each bump is different so somehow this manipulation of the shape is not obvious you need to go and measure them to realize that none of them is the same. It is very very capricious in a way. That's what I said it would never be too obviou, in Gehry's it is obvious. In Japan it is tried to be hidden so that's what you need to look at so you're when you live in Japan you train your eye to start to read all these little nuances in the matrix.
The examples we were just talking about we can cite Jun Aoki who used patterns for a lot of retail stores like

Louis Vuitton in Nagoya and in Tokyo, Kumiko Inui also for many stores, SANAA and many of them basically all use the patterns on vertical flat walls right?

mm-hmm .

It's like flat surfaces I would say. Even if it has details construction and some kind of thickness. I would like to give you an example of a brick wall that is also flat and maybe I do consider it as bi-dimensional surface. It is a surface even though the thickness -the inside of it- is a cross pattern of bricks to give it structure you know resistance so I'm just wondering if we can consider the facades by these architects as bi-dimensional surfaces or we can consider them as a three dimensional volume ? According to you ?

Well they do have the power to engage in a more three-dimensional experience even if they are bidimensional so I think that's part of the trick that they engage in this depth, it has this little Oku (depth) but sometimes it is created by the pattern itself. That's very unique no ? it's not about the thickness it's more about how they treated patterns to create this kind of…

Kinetic effect ?

Exactly! so for example Kuma-san uses a lot of moiré, or Hiroshi Nakamura for example he has this house which has this this wall which is just like bricks it's made of glass. They are bricks made of glass and you can see this kind of effect. But again I think these patterns in many cases they work in combination with what is around so I think there are two ways to evaluate these kind of patterns either just as a that's an isolated thing so you take this bi-dimensional pattern and you start to understand it how it works how its organized and the second is when you put it in the context because usually I think these patterns are related to the context so for example when you see the Todd's building and you know that he took this pattern from the trees that were around or for example Klein&Dytham sometimes they make these perforations which are taken from the tree so I think there is a story also behind the pattern. I think the pattern engages with something more within the site. I think it's not only the pattern just like a paper, it is basically the paper in a space in a neighborhood or it also gives account of how fast you pass this building so it has something more than just its bi-dimensionality which is more related to the locals, to the space itself.

It cannot exist only by itself it needs a context !

Of course I mean of course it is connected to a more wider narrative you can evaluate it of course as an isolated bi-dimensional screen but at the end you are missing the other half of the story which is where it's located. I think that is necessary to evaluate it in performance: the pattern in the city, in the neighborhood and then it gives you a completely different effect so it's a little more emotional, or urbano-emotional you could say and the other is more geometrical which is more just the pattern itself and all the geometry is manipulated so that's I think when you evaluate the patterns you should always put it in practice which is in where is located otherwise you cannot see all the story. At least that's my appreciation.

You talk about this parameter of the thing not being obvious; this is also related to one of the question I wanted to ask you. I don't know if you saw one of my drawings included in the article I sent you where patterns emerge into architectures and not into surfaces.

Mm-hmm. Let's see it again just so I can follow exactly what you're referring to.

What I wanted to discuss with you is this flat Japanese Katagami pattern that grows, thanks to algorithms, into architecture hosting human activity and where I speculate on how this generated space could eventually be used. I consider the pattern as a topology ! I am looking for discussions to help find answers on what to think of the fact that when translated into architecture, the original pattern might disappear. When looking at the new object, we might not automatically recognize exactly the initial topology of the pattern. Can we still speculate on the power of the generated object -even when the pattern is abstracted- to still have the power to engage with its environment and the local society who is familiar with the initial codified pattern.

I mean it's hard to evaluate only from a picture. You would need to have the space built to understand how much it gets but for sure it is like a grotto. The word grotesque is coming from the grotto resulting from this penetration in the surface, it is now having holes and it is porous. It's interesting because what you're showing is kind of of the continuation of what the other guy that was studying these patterns and that he couldn't reach because basically in his case it was very obvious, very bi-dimensional I would say. It was basically just like cutting the Kamon and putting it as a flat surface so I think this one is really creating space. I mean this one is really it's a habitable pattern so I think it's completely different thing it's much more relevant to step to the next level. I mean aesthetically speaking I think it is not even relevant to have the pattern there any more, there are narratives that are behind the generation of this pattern and how it evolved into this kind of thing. But at the end the space itself has certain qualities which are beyond the pattern itself.

You say that the only way to know is to build the space and experiment it.

I mean you can never read it from here. I can show you a grotto somewhere in the world and it wouldn't be the same if you really go inside and experience this proximities, the relationship between your body and these textures would be completely different because it is very alien literally speaking in this case. When they were making the movie Alien, they were working with this kind of organic textures, but I guess they were trying to replicate the texture of the human body. In this case it is coming from a completely different path, it is interesting that it feels organic and it's coming from something so geometrical. It's a quite engaging.

Right ! I would like to jump to another topic of predilection of yours which is prosthetics in architecture. Y our research is trying to combine or reconcile organic and mechanics.

Mm-hmm !

To bring new ideas, it's a highly metaphorical discourse I would say. I'm wondering how metaphor is giving you a whole language to theorize your own practice. I'm trying to understand the logic of comparison the metaphor is involved in.

Well maybe before replying to your question I tell you how eccentricity led to the question of prosthetics because basically in the in the normal use of the word eccentric you have something that is precisely out of the center right? and prosthetics has this quality of, we're shifting the organ in the organization of the human body. It is alien to the body it's not part of the system and it makes it eccentric precisely so when you see someone with a prosthetic it's obviously visually eccentric but also geometrically basically his arm is much longer and it's a completely different thing so I think there was a strong connection between these eccentricities apply to the prosthetics because the body is observed as something something that is not anymore keeping the symmetries basically growing in other directions and extending capabilities that were given in the original system. They are all connected and I think the first monster that would ring the bell it's Frankenstein. I mean the Frankenstein syndrome is as a collection of parts from all the world which they were coming from in the original book and all the pieces of the body were coming from a jail where they had people from all around the world. It was an international entity because the parts are coming from everywhere and the collection of all these international parts create something alien that you've never seen before so it's a completely eccentric body

in all senses: geometrically, visually. That is what links or clings this part of the eccentricity with the prosthetics. M y interest for monsters came more from that part. It is something that is called teratology. Teratology is the study of deformations. I was interested in the deformed body, in the eccentric body when it's geometrically not responding to this Western symmetries recess I was more attracted to that so I was more understanding the other way of appreciating beauty something which is more grotesque in this case so I have written a lot of things about grotesqueness so somehow when I saw your images automatically thought about this some of the papers that I had published about the grotesque-urbanism. I am very interested in what you showed me because it is not intelligible visually, that was something very interesting for me. I mean I started by studying the mutant body for example, when the body is not complete, it's lacking parts. This was one big question for me how the body can reform or recompose. [He reaches for some books and shows me images] this is just how the body starts to be deformed. For me this is very attractive. It is coming from the body ! The eccentric body ! It led me to the next thing. Of course there are asteroids, completely different. It's not anymore just geometrical, you can extend it to a more philosophical way. Especially the word prosthetics comes from PROS means to add and TITHENAI comes from position so when you write a thesis for example you are making it, you're making a position on any topic so the same prosthetics the position is where it is metaphorically but also physically but in English you cannot sell prosthetics without saying of what? So it's a prosthetic teeth ? prosthetic hand ? that gives you the position. I try to apply this to the city and I ended up researching sign books because I thought that was a sign world. You know advertisement ! Because these are things that are coming after the building exists, I was not intending to study sign boards but I thought that would resonate very well with my idea of prosthetics so the building is the original body and the things that come after the building which are adding the building they supplement the body but they also confer identity so that was very important for me that they did. The Capitan hook is Captain Hook because of his hook. so it's given by these prosthetics identity. Shibuya is Shibuya because of the signboards, Shinjuku is the same. I wanted to understand more the differences when you see Shibuya Shinjuku or Ueno for example, they look alike because they have bunch of samples so I was much more interested in the text of Deleuze: difference and repetition. How would you understand the differences just based on very factual things beyond the size of the streets or because there are other factors which can affect it, but I was just trying to measure these things as if it was a city building basically with the virus and I was trying to understand where they were located and positioned. Based on that I was able do it in a very methodical way and understand these identities.

So it gives you directly the power to work on your aesthetics and research ?

Yeah because you need to measure. I mean you need something that you need to be scientific, it needs to be measurable. When you try to prove something it is not because you feel it, it's because you can prove it, you have numbers, you create a narrative and then you start to just apply to different cases and and if it makes sense then you can compare data.

In this case how would you compare data ? it's not something you could really measure !

You can absolutely! You just count how many of the sign boards are there. As simple as that. At least historically it is very interesting because it's a long research. The current buildings in Japan are having less of these sign boards, the older buildings used to have many of them once this is coming from a concept called Kanban Keichiku.

Cited by one famous architect right ?

Yeah, Fujimori. Basically it was the owners of the shops who were doing this Kanban signboards to create identity in their shops, it was very linked to the ownership of the places. Now the tendencies is rather different because we have something that is called land readjustment in Tokyo which means that the developers are trying to buy large portions of land or to fuse two or three of these pencil buildings and then they have these right to go a little bit higher but the new building tends to have some very mega signboard and that's it! it's not any more coming from this! It is more a dictatorial thing, so that's the new trend of the city. What gives character or the charm to Tokyo is precisely this prosthetics. Under my frame anything that comes after the building exists and supplements in this case economically, it can be considered prosthetic. They're different from a parasite. A parasite is coming from the Greek PARA which means side, it's the person who eats next to you or from you. The parasite is negative, it has negative connotations; the prosthetics is completely positive, it supplements the body in a positive way. It supplementes these buildings because they you can see them you can know what's happening and it bring money physically because you also pay for this angles to the tenant. It all starts from a metaphorical thing, going back to your first question because all the big theories in urban planning came from metaphors : the city as a mechanism, the city is an organism, the city is not a tree. All the metaphorical thinking appears in urban planning. It was more my interest, reconciling these two positions : the city is not an organism and is not also a mechanism. It is a combination of both.

Do we really need the metaphor rhetorical discourse to theorize our ideas or at the end as the French and Japanese

are doing architecture is much more like a narrative and a way of using space?

You can frame it in both directions. In the Western Way of thinking we have this urge of saying things on the top of all the knowledge. We cannot just say things because we want to say things basically you are continuing a lineage of learning so you always reference people say because this guy said this and because these people say that it legitimizes that I can say something on that, but it's a very Western approach. In Japan there's no need for! There are still publications called Japanese young concept series and when you see them trying to talk in a more philosophical approach they usually cite themselves, they say : I believe, I think. they don't have this urge of legitimizing their knowledge from a lineage, it's more based on their own experience. I guess in Western world philosophies it's just legitimizing what you're saying makes sense or resonates with certain kind of positions that came before you. That's something that doesn't happen in Japan. The only person who is really dealing with that would be Isozaki. He is exactly the only real architect who is dealing more with this Western philosophical approach but besides that I mean no one really needs to or have this origin for legitimizing their ideas based on philosophy.

When you say the West, you mean continental philosophy !?

Yeah I'm talking Europe and United States for example.

All right ! Maybe one last question. You are now the director of Casa Nano, which is an artist residency in Tokyo and part of Casa Wabi that was built in Mexico by Ando Tadao in 2014.

Correct.

I'm wondering since I'm using patterns to generate architecture and space; how can architects collaborate closely with artists and create space in general. And in my case and maybe in your case also, since we're implementing patterns, how can we include pattern artists in the environment design process, we are using their work, their own production.

I think just the fact of making the discipline, architectural discipline or architecture as a discipline in a more transgressive way, like just entering into other areas or domains which are not forcefully architectural usually ends up nurturing in a very interesting direction and luckily for us Art is more transgressive than architecture. I think you can get a lot from working or mixing architectural approach versus something which is more aesthetically driven for example

or more morally driven or more socially driven. I think the next step of architecture is to do it not only with arts but with biology or with materials, with everything. At that stage, architecture is becoming less architectural. You see for example Nery Oxman now in the MIT, she's doing biotechnology and researching materials but also materials that self-regenerating. We see the architecture, I think it is architecture, but it is not anymore the architecture that you would frame in the Beaux-Arts of the 19th century; it's more responding to an other kind of agendas that are more contemporary.

That way, can we consider it obsolete? An architect's working by himself ?

Yeah absolutely. I think the future of the architect is gonna be a more like a DJ. He's gonna just take pieces of here and other disciplines and just put them together and he's gonna be maybe mixing in real time not like a DJ. Very much like pulling connections, the body body is becoming already very interdisciplinary. It's taking longer because of course this is more experimental I mean somehow you can see these two approaches of architecture : one which is more the everydayness which is made by real estate developers and the other one which is coming on the other hand is much more experimental and that's the one that is not gonna be implemented right now but in the coming years is the one that will come so basically did you are just building the the platform for what is gonna come in the in the next 20 years. Obviously it cannot be implemented yet for example when you can 3d print houses which is already happening little by little, the story's gonna be different, you will really have mass-produced completely customized and also other quality that we cannot produce anymore without computers. It's beyond those basically, we need to embrace that approach and and be more transgressive in a way. My research took me long because it was transgressive. Teratology is a term used in embryology which has nothing to do with architecture. Prosthetics has nothing to do directly with architecture so it depends how you frame the problem, I think the more you transgress, with certain logics of course, the more it leads to something that you won't be able to see if you just dig within the architectural discourse. The architectural discourse itself is limited on its own, it doesn't allow you to jump forward. You need to just start to source information from other disciplines: it's the only way to continue evolving! I don't see other way of making architecture in the future, it needs to be interdisciplinary in all directions. Going back more to how the carpenters were making architecture before they were architects coming to Japan in the Meiji period. When Meiji started to bring Western architects especially, the first thing Westerners said was : where are the architects? They replied: we don't have architects, we have people who do many things and we have craftsman. They didn't even have a word to translate the work of these people because their

work was already multidisciplinary. They were crafting, they were carving things ,they were using their hands. It was in a way a little more artistic but also very technical, it had these two sides. I think we are kind of going back to that direction but in a much more sophisticated approach because we have computers now, we have all the tools that allow us to jump in a more complex direction. Toyo Ito was the one who invented this world Kenchiku, he tried to find a word that would kind of encompasses all the concepts that an architect would have in the Western world and that could be used or applied for architects here in Japan, but before that there were not architects, carpenters! It will be more in that direction, I mean it would be more crafty but also aided by tools.

I guess you answered all my questions.

I'm not sure how it can help you but for sure it is a long path. To construct your discourse you need to assemble and disassemble many times and just to make Frankenstein of your thoughts and change positions until you find one that starts to make a little more sense and then you start to discover something new because that's what research is about. It is about discovering something that no one has done. In theory it's impossible that you do something from theory, you're not inventing something, you're just basically reframing things, but you use your own methodology, you use your own terminology. That's what you are adding to the body of knowledge that we have today. That was the intention with talking about prosthetics. The prosthetability, prosthetizer, prosthetizer, we know these words which are not used in architecture which I was trying to use them to validate merit, that is what I was trying to do in a more philosophical approach.

Thanks a lot, very very interesting.

You're welcome. It is interesting ! when I saw your images actually I thought you can really argue about that from different directions because you don't see the path, it is not evident. You were asking if it's necessary or not to legitimize. A shape versus something more theoretical, I think in the very end of the stage when people are experiencing this space, it will speak by itself. They won't see the patterns, they just experience the thing. That's the only thing that counts. Space itself has more power to drive emotional responses from the user than the theories. Theories are flat you can always use them to disguise your intentions but in the end the space goes beyond the argument. Many people who were great thinkers in architecture, in practice they could never take this to the next step. I think you need to start attacking the problem from both directions.

III. Ebrahim Poustinchi79 - July 17th, 2020

Ghali Bouayad : Shall we dive in ?

Ebrahim Poustinchi : Sure ! I read the text you sent me, it is super cool.

Thank you very much ! And thank you for accepting to talk to me. I appreciate your work and have been following you now for few years. Really impressive, working with mixed media from Robotics to music to coding. Nicely done !

That is very nice of you. I mentioned it in the email, I appreciated the precision of your language describing my work. It is exciting and refreshing. Again the topic is super interesting, and reading your email I honestly never thought about my work being ornamented necessarily, but it makes sense.

Well, as Olgiati said, architects think of something, build, and then critics, historians and users look at it differently; they have a different interpretation.

Exactly.

Please discuss freely. As you know the notion of ornament has no specific definition. Architects have been struggling to define what ornament is, what is not ornament, what is its function socially, economically, politically, aesthetically and so on, how does it perform. I really would like to grasp and understand your process, despite being difficult to do so in only one hour. The world you are living in, you are unique in producing your shapes and objects. As you might have read it in my mail, currently my doctoral investigation is titled Ornament in the Age of Postdigital architecture. I would like to first frame the word Postdigital as now everyone evolves in a personal digital world. One definition that I find interesting is the one by Adam Fure published in Aesthetics equal politics…

Yes his text on digital materiality.

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79 Ebrahim Poustinchi is an award-winning designer, artist, and inventor, is Assistant Professor of Architecture and founder/director of the Robotically Augmented Design (RAD) Lab at Kent State University and the founding principle of the STUDIO EP L.L.C. Poustinchi's research is focused on the intersection of media and robotics, with an emphasis on an alternative reading of "post-digital" discourse through UI/UX, Human-Machine Interaction (HMI), and physical computation and tangible interfaces. https://www.ebrahimpoustinchi.com

Exactly. He defines it as the digital transitioning from the extraordinary to the ordinary. When digital technology becomes ubiquitous in our daily life. He is quoting Lev Manovich citing the Transcoding concept; for instance in our practice, architects stopped using ultra realistic renderings to rather use gradients palettes to communicate their intentions. First, could you please describe briefly what you are trying to achieve with your students in the different studios you are teaching ? Methodology, visual aesthetics, if you are relying on any kind of philosophy, I know you were a student of Greg Lynn many years ago, so perhaps the Fold ? In the US currently the OOO is rising among academics.

Absolutely ! I will probably start since you brought it up, briefly the ideas of the postdigital. I agree with you, I think it is such a loose topic at this point, loose and defined in an interesting way. I am aware of text Adam wrote. That is one reading of it, questioning the digitality and its ambiguity and how it is becoming a day to day thing. I think that is more the question than the answer. All the readings of postdigital are looking into that. There are different ways to look at it as you mentioned, to propose an alternative to it. Now that is becoming the Normal, how can we again make it abnormal and create an intellectual take on it. One is definitely Adam's view, one is Matias Del Campo's reading, one is Neil Leach's -We have never been Digital, maybe ?- One is Gilles and Manuel and the whole discrete movement that push it even further in the digitality. There are several readings. Personally I don't like to categorize my work as postdigital, nor digital. As you said, I am interest in perhaps not labeling the thing and leave it up to people to understand it and interpret it. It is interesting actually to leave it up to the audience. Obviously I have categorization in my mind and used to be loud about it, however now I am more interested in siting and listening to different readings. Regardless of the work, how I define personally the postdigital -and it shows the relationship to my work and the work of my students-, it is somehow close to Leach and Del Campo. My reading and interests are more happening in hybridization. For me, the postdigital happened when the digital and physical started to merge into a third hybridized cyber-physical setup. That is more or less the core reading of the postdigital for me. Then we start to blend qualities and media into a third possible medium. Some of the work with robots is looking in the same things, some of the work with AR is very similar to that, and that is one of the reasons I am choosing robotics over computation, I am choosing AR over VR, I am choosing some of the materiality experiences over new trends. I think those trends just connect together to that reading of the Postdigital. To answer your question more precisely about Studios, I care about hybridization at large, and specifically cyber-physical hybridization, and that leads to multiple readings at least. One is about digitalizing the physical, which is about bringing out the digital qualities from the computer, that usually happens with the use of AR, the use of robotics, some of my studios, some of the research are

looking in the idea of bringing the digital qualities out and applying them in physical contexts. And the other way around, to take the physical environment qualities and then apply them in the digital one. That is physicalization. If I remember the images you chose, some of the work from the AnimoEmbryonic Solids studio, I think it is about using physics engines, in that sense somehow it gets closer to Adam's and Neil's reading, but again theoretically I have some sense with that movement in general, but I think just maybe in term of the result it gets a little bit close by digitalizing the physical environment. I am living at the border in terms of hybridization at large. I think I talked about it in the column I write for Archdaily, which is less scientific and more casual observational writing, I am less interested in the thickness of the screen, meaning the classic first movement of the digital, I am either interested in going inside the screen or coming the other way around and take out those digital qualities outside the computer. I am not interested in the flat sense of the digital. I don't know if I am answering your question.

Absolutely.

For this I use whatever I can. We have a lot of OOO conversations in the formal way, not the philosophical way. I think I would accept that label on my self. I would say it loud I am a formalist. OOO among others are serving the formal qualities. I appreciate that you precised it in your email, the quality emerges out of the part to part, part to whole relationships.

Especially you are talking about the object within the object. You cited Retsin… he always bring this notion of mereology. When I see your work, I always ask myself from where does the feeling of being highly ornamented come from ? It is an open question, you are the author ! Do you think the fact of blending the objects into each others, if we consider the embryonic project, the mechs-system projects, the Somebody's house project, we can see it in the title, it is using objects from two or multiple grammar worlds we are not expecting to see them merge together. For instance taking the industrial/ mechanical parts and then stacking them up, sculpting them and turn them into architecture. Maybe the ornament quality comes from there.

Again I am really interested in your reading of the work, I think the way you are describing it makes sense. It also depends on the definition of ornament as you said. I honestly can not make a comment on that part, but I can translate it on my own and through your readings. I think it is much similar to what you said but it is for me more a discussion about qualities. About their projection and the curation of those qualities obviously through the hybridization as you said as means of transition. In my readings of ornamentation in the classical term, as means of transition from a surface to another, or an object to another. The whole concept is structural,

turning a square planning into a dome. It becomes means or media of transition. My work conceptually does that. For example when I use hair, somehow it is ornamentation because it does not have a direct relationship to the project, it is overlaid. It is truly about transition, going from condition A to condition B, that hair makes that transition. Same with the overuse of texture, is more or less doing the same. The ones you mentioned, it is about blending two qualities at least and then transiting from one to another, I think what you are reading as ornamentation and I actually agree is those transitional elements. Maybe I can call myself part of the discrete conversation, because it is all about separation of parts, clearly !, What I do is working on the line of blending and discrete.

The Mech-Animal Sitelessness was also very appealing. The fact you are suggesting this possibility for a building to relocate itself within the urban fabric, I think the movement ability is ornamental as we are not expecting that characteristic.

Exactly ! In that sense, I am really excited about your readings because that is literally not ornamentation in my initial proposal, that is a a composition project ! The units that move around become the building, if you see ornament in the work as means to mediate, it is becoming another ornamental project through the edges. How it connects to the urban context and the urban condition; how it blends the moving parts to the urban fabric.

I have few question, perhaps not directly oriented toward your projects. You have been working a lot with digital craftsmanship, I can suspect you are using many sculpting softwares -ZBrush, Blender-….

We mostly use Maya as our main software, and then some ZBrush and then obviously Rhino.

One of the questions I am raising in my PhD investigations is: who are the agents involved in the production of ornament? If we go back a 100 years, we had the architect, artist, inventor, pattern maker, and then you have the craftsmen. Now, it has all been relocated to the architect hand. The architect and maybe the algorithm and the machine. This shift in the craft culture going digitally is interesting for me. In your work you are augmenting ! Giving the ability to robots to blend the physical into the digital and vice versa. Perhaps you haven't thought about it, but how would you imagine your collaboration with robots, or robots as independent agents would produce new hybrid objects and ornament.

I think that is an interesting question. I recently had a conversation in the Archeologist Podcast about that. I don't really know the exact answer, what is the balance between the agents and crafts

when you start doing co-design and collaborative projects in that sense when working with a machine. I think It has two heavy sides, one is super technical : the human machine interaction, it obviously has its own ethics, more like a computer science oriented field. And then as you said it has all the other sides when it comes to crafts. I think there are multiple readings. One that interesting is Jose Sanchez's reading as communist way of working, everyone as an author. I am not necessarily interested in that reading, but it is interesting. What I am trying to push for is more a healthy cooperative setup. I think there are two extreme readings, I can put Sanchez's one in, the other one would be - and I hesitate to use these words due to the historical context-, a relationship of robots seen as slime-master relationship, between the technology and the user, the later taking all the authorship, the robots becoming workers, just service providers. My interest is in the setup of celebrating the individuality of those elements, the robot, the machine, the software, meaning of it doesn't do what we don't want, we don't immediately turn down the project. I am interested in seeing what is the proposal coming from the machine, and then analyzing and bringing it back into the game, rather than shutting it down. I am treating the machine as a collaborator. You become more like a director rather than a designer as you are writing the operating algorithm, more than the other way around where you know what you want and you make it happen. I am open to suggestions coming form the machine, open to mistakes, the feedback loop coming from the machine or the design environment and the operating system, I am a big fan of ongoing conceptual miscommunications in a sense or misreadings or post-rationalization. Making a straight concept from the beginning to the end is losing opportunity. Especially if you are dealing with other agents that may have suggestions. A lot of good things happen through experimentation and suggestions of the simulation, or sometimes things that are not supposed to happen and we improvise based on it. For me that is the optimum healthy relationship, similar to a flat hierarchy ontology type of reading. We are equally existing but not existing equally. Im quoting a text about ooo between Graham Harman, Todd Gannon and David Ruy. It is not related to this topic, but I am using as a definer for our discussion.

I would to jump to a word you used, the mistake or misreading of the machine. Sometimes when the machine makes a mistake we are very attracted to it, like in an ornamental manner. I wonder why as architects we are attracted to algorithmically generated mistakes. Would you care elaborating on that ?

We were having Hernan Diaz Alonso as guest for a lecture in Kent University, during the dinner we had a conversation about his work and the control generally. I would answer your questions through his reading. I 100% agree with what we he said: It is about the difference between the interest for control and the interest for not having control, and why we have them. He was

bringing examples of Renaissance, where the idol is god and is perfection, and the world is reflecting that ideology. Because they don't have control over things, the idol is having maximum possible control. Technically the work becomes as realistic as possible as real life simulator as possible. And now because of digital technologies, because of all the media, of everything we have, that becomes ambiguous in a sense. You pointed out about renderings to do hyper-realistic renderings, to do super precise simulations, we are looking for another agent, that would be all this mistakes. Now that everything is perfect, or conceptually perfect, then we are interested in imperfection. Again the conversation was about something else, but I translate that to our conversation. In my reading that is the reason. At the end, you are the one who decides if yes or no you use the mistake in the design process. It is not disconnected after all. I am happy I live in this era, where mistakes are accepted.

I enjoyed what you just said, having or not having control. The way I see it, the architect is perhaps a masochist in the way, because having a lot of control, he is now looking for ways to loose it away.

I think It is applicable to other disciplines as well. If you look at the work of media artists, or post-internet art in general, or even the pop-art movement. It is more like a social movement in a sense.

I would like to react to the "We have never been digital" you are quoting often. Im my PhD I discuss Retsin's theory as he is as well referring to it by saying that currently we rationalize computer generated forms, while he is proposing digital materials that are generated and already ready for assembly on site. I am interested in Retsin's discrete in the way it is bringing equity to young designers, as it is theoretically cheap to assemble objects, but I am not a big fan of letting the machine completely generate the architecture. I think there must be a space narrative behind.

I really like the work of Giles but…

Indeed, aesthetically, it is stunning.

I believe it is an honest statement, but I don't think it works. Cheapening the parts, it is theoretical still. It is still expensive as no one can afford it except galleries. That aside, I agree I am not fan of taking the agency out of the designer. I leaned toward the designer as director reading, I am much less now. Making the decision is important. And despite their honest statement, I don't think it works out the way they describe it. That discrete architecture is not

machine generated, all this Bartlett chairs, those installations, they are not machine generated, they have some logics embedded in them coming from the agents. Again I refer to Leach saying there is a difference between computation and computerisations. The latest happening much more, meaning we use the computer to generate something.

Finally, there is one specific project I would like to ask you about: the Sunken Room of Venus.

Yeah ! That is a fun project ! I like it.

I read the text but it is highly abstracted. I couldn't get it. All I can see is the plan object, where the Venus is scaled to the size of the space.

I am heavily interested in bodies, and there are two kinds of them : physical bodies (Statues, human body parts, or animal's), and the topological reading of bodies in the contemporary discourse. That is just a formal visual aesthetic interest of mine. This project's idea was about designing a room in instagram. That was the description of the project. For me, if I want to bring to ornamentation, the ornament becomes the architecture itself, grows into the room, it is a matter of hierarchy, ornament as important as the interior object as important as the architecture itself. It has volumetric effect and I think it applies actually to your text.

Just to be certain. I am really flattered. This was your conceptual approach before ? Or are you adapting the discourse just because your read my paper ?
I adapted it into the ornament conversation ! But for me, it was an object that is scaled up, contained by the room ! Statues are usually contained by the room.

I am looking at the axonometric drawing ! It is brilliant, and I couldn't dream of a better answer because it joins the heart of my writings. No more surface, we need objects-architectures ! That project is perfectly depicting it ! A statue, once used as ornament, now scaled up and navigable ! Maybe I am over obsessed by the topic !

(laughs).

I am looking at my questions and I think I went through them all !

Awesome. It was a fun conversation ! We covered a lot of interesting topics. I appreciate all the readings you had of my work, refreshing. Thank you so much.

No, thank you for being open to discuss new ideas !

Conclusion

While I wrongly thought that all patterns behavior can be studied through one same algorithm, up to today's trials showed that each pattern needs its own algorithmic strategy and agent-based model to explore its potential. As Katagami artisans spend a lifetime developing their tools and techniques to deliver unique mind-blowing patterns, I consider that the algorithms are digital craftsmanship as each agent method must be personalized for each pattern. The purpose is to be able to develop an algorithmic tool that takes advantage of the pattern geometry. Furthermore, the methodology and the morphogenetic experiments adopted in this research have demonstrated being able to generate a wide variety of spatial morphologies through the translation of traditional Japanese ornament and show relevant potential for applications on architectural configurations. By contrast to standard architectural process where architectural planning and design are made following a design brief and constraints, blending ornament and swarm intelligence offers new possibilities to explore forms of design and architectural composition. The goal is not to produce clean geometries, but to nurture our imagination for early esquisse phases by generating basic data (coordinates at each time frame) before starting to sculpt form, creating architecture that offers a new interest in space and forces the user to question his practice and curiosity. In this surrealist method of exploration, I abandon the search for the "best" solution and disrupt rationality, alienation, oppression, and predomination of existing design methods.

Proning soberness, I reject ornament meant to produce a continuous stream of sensations and affects, where unhealthy alliance of art, urbanism and commercial-development interests has become dominant. Architecture should not be a monument for consumerism. Especially how the contemporary world only values how fast we can absorb new information. For this, I would like to argue for a return to the roots of space experiment and aesthetics, making architecture deliberately difficult, inefficient experience, forcing the visitor to slow down and think, avoiding instantly consumable spaciality. In this theory, ornament is taking over the mediation role, inviting the user to reconnect with cultural heritage, reflection and knowledge. Here, the three-dimensional translated ornament is abstracted, distancing the ornament- architectural-object from 'the shock of the new' based experiences, far from the superficial condition offered by post-modern architecture replacing depth by surface. Antoine Picon closes his book by a chapter dedicated to reinventing the meaning of ornament. I believe that the contemporary architect can achieve this goal through Functional Ornament -brought to architectural scale- and through aesthetics. Far from a Kantian aestheticism revolving around beauty, but an aesthetic as defined by Jacques Rancière : The sensible experience. The key components of the neo-modern architecture surely enable social groups to share experience. Ornament, as a key element, joins

Rancière in his definition of the aesthetic : "The idea of the distribution of the sensible implies that an art always does something else that its proper business. [...] The aesthetic is not the same as the artistic. The artistic is about implementation of an idea. It implies some kind of anticipation of the result. [...] The sensible experience is not at all about beauty. It is about the experience of a common world". Therefore a society anchored -function hosting- ornament translated into architecture will transcend the immersive yet superficial condition of the deleuzian notion of affect, to reach a sensible primitive experience.

As Valerio Olgiati simply writes it in his recently published manuscript -Non-Referential Architecture-, architecture is "the conception, construction and buildings of rooms; it deals with scenography and movement through rooms", while reminding that the word space is often more used since we refer to not only the closed enclosures but also the landscapes and exteriors that for the totality of a building. The Swiss architect reminds how architecture generates a physical and sensual basic experience before any intellectual interpretation. To demonstrate his argument, he relies on the genealogy of the architectonic ordering system as a way to study architecture and proves how genealogical study is useful as humans are born with a sense for perceiving space. For that, he uses the Mitla Temple as an example to prove that the ability to perceive space is not something learned. Moreover, Olgiati argues that architects must create space that will trigger repercussions in people's souls. An idea for a building is therefore form generative, sense making and capable of provoking inhabitant's imagination.

In conversation with my design proposal and research framework, the haptical scaled-up ornament architecture can engage the inhabitant's senses and cognitive abilities. On the one hand, I do agree with Olgiati in the idea that an architecture that is only experienced emotionally is limiting and rather should also engage people's minds. Looking at the architecture generated out of three-dimensional translations of katagami patterns, one can understand how the space offers a sensual experience thanks to the aesthetics of the construction, while simultaneously puzzling the visitor. The later, speculatively, would be engaged in the phenomenological features of the original pattern abstractly present in the space. On the other hand, Olgiati talks about how we currently live in a non-ideological world and asks how can a building make sense without being derived from an ideology that no longer exists in a world with no more common fixed values. I personally believe that the aesthetic qualities of the ornament and its power residing in its beauty is the answer. The human being no longer share common spiritual, political, ethical nor social values, but he sure does share a common attraction for beauty. The only question that one can legitimately raise is Does meaning translates from one object to another ?

In closing his book, Antoine Picon agrees on the tremendous return of ornament in architecture but questions its subjectivity as still an unclear matter given the abstract character of the postdigital ornament. In other words, the subjectivity is not apparent as contemporary architects do not use anymore visages and human elements, but patterns, textures and topologies.

In the most part of the 20th century, talking about beauty has been denigrated in fields such as arts, aesthetics, music, architecture to cite only a few, as it is seen as a sentiment that is no more relevant for our current world's complexities. The definition of beauty, like the multiple definitions of the postdigital, is a matter of human judgement[80], as it is for the observer to look beyond the image and its message. The concept of Beauty has finally returned and raised discussions during the 2019 Tallinn Architecture Biennale curated by Yael Reisner and titled "Beauty Matters". Humans are visual creatures that collect most of their knowledge through their eyes, the visual brain constitutes about the quarter of the human brain. The most famous phrase of Semir Zeki - neurobiologist- is that most painters are neurologists. In 1999, he talked about how painters work relentlessly until achieving a pleasing effect to their eyes (or brains), and if it pleases others, they have understood something general about the neural organization of the visual pathways that evoke pleasure, without knowing anything about details of the neural organization[81]. I think following this rhetoric, everyone can agree that architects are also neurologists.

As a subjective experience, all humans have the ability to experience beauty. While researching on repetition, difference and contradiction as aesthetic elements, I crossed by this conversation exchange between Markus BreithShmid and Valerio Olgiati discussing the notion of beauty in Emmanuel Kant : "The way you conceive of contradictions as a compositional principle for your architecture reminds me very much of a system with which the aforementioned Immanuel Kant attempted to explain what triggers people to arrive at the judgment that something is beautiful. He argues that there are three phases that come into play before people possibly judge something as beautiful: first, there is the sensory stimuli when a person is confronted with a thing; second, the initial stimulus triggers a person's imagination; and, third, the person's attempt to conceptualize what has been imagined. Kant argues that a sense of beauty occurs not if a person is capable of absolute conceptualization of a thing but by the constant going back-and-forth between ever-new possibilities of imagination and ever-new attempts for conceptualization

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80 Reisner, Yael. 2019. Architecture and beauty: A symbiotic relationship. In Beauty Matters, Ed. Reisner, AD, Wiley, p7.

81 Ibid.

in a person's mind. The best art, and supposedly also the best architecture, is of that kind that is able to continuously engage the person's fantasy between imagination and conceptualization. [...]. Kant also claims that we would be bored if we could comprehend something fully. People would not deal with it anymore once they have conceptualized it fully. The only thing left to do is to perhaps apply it for further reference but the actual aesthetic riddle would be solved. For example, if somebody would stand in front of a painting by Mark Rothko and would come to the conclusion that he fully understands this painting he sees in front of him, this person would never look at it again in that same way because it is now a fully intellectualized quantity."

Zeki suggests to make beauty a decisive guiding component and parameter of the decision making of a creative since pleasure, reward and desire derive from the emotional brain. Therefore Zeki comes to the conclusion that our brain reality is our only reality and suggests that beauty should be a central factor of the design process.

Making Katagami patterns as a host for human wandering in their three-dimensional enclosures is about transmitting complex emotions, ambiguities and only suggests a spatial curiosity82. The scaled abstracted architecture-ornament only suggests but does not dictate and leaves room fo interpretation and relationship establishment.

Discussing the matter of beauty triggers undeniably the need to discuss human attraction to machine generated error that is seen as beauty or of interest to the design making. In the famous manuscript The Sense of Order, Gombrich takes for instance an example as simple as crossing in a forest by mushrooms organized in a perfect circle. He suggests that since the world where the human evolves is made of simple geometric shapes that are a mark of an ordering mind only, our attention is arrested by instinct when nature comes out with such regularity. Here, what attracts us is the unexpected presence of order; Gombrich concludes that humans use regular shapes as a a recognizable manifestation of a controlling mind83.

While working with a multi-agent system algorithm, for instance, the aim is sometimes to generate unpredictable patterns and forms that lie between boredom and confusion with hierarchies not always easy to deconstruct and master. While enjoying the complexity of the geometry, designer sometimes are surprised by how the program could generate a perfect, regular form in the middle of a chaos of lines. The same can happen when for example recent designs

82 Ricardo de Ostos and Nannette Jackowski, in Ibid 80.

83 Gombrich, Ernest. 1979. The sense of order: Study in the psychology of decorative art. Phaidon Press.

through robot 3d printed clay is generating new materiality and textures; here the architect-designer programs only the paths, and it is only the when the material is deposited that the design is revealed; the architect therefore conceptualizes the design before hand but discovers it only toward the end. Cecil Balmond also speaks on the delight and pleasure that take place when chance and informal juxtapositions that happen out of varying rhythms.

Gombrich wonders if we are all Ruskinian disciples, looking unconditionally for a mark of craftmanship while calling for the rapidity and precision of the machine. I personally think that we will maybe stop being amazed by machine made errors when we will be able to program "unexpected errors" or "programming unprogrammed errors". Today, robots are the new artisans augmented with both speed and precision, more and more they do not need to follow pre-programmed scripts but have the ability to adapt thanks to sensors and artificial intelligence84.

As discussed earlier in chapter four with Ebrahim Poustinchi, beauty, irregularity and creativity in the process between the human and the machine is a matter of a healthy cooperative setup and a matter of control, where the architect is the new artistic director with a defined goal without a clear design strategy but offering paths for the collaborating machine to generate suggestions, mistakes and miscommunications from the human brain to the machine intelligence. Indeed, "we are equally existing but not existing equally", us and the machine are not disconnected, and it is for the architect to accept and to include or not the machine made suggestion - mistake in the design process.

On a materialization level, architecture has definitely entered its postdigital era when Gilles Retsin published early 2019 his manifesto 'Discrete : Reappraising the digital in architecture'. In his various research articles, Gilles demonstrates how there is a fundamental problem related to the gap between simulation and fabrication, design and materialisation. Architects have always been constrained to post-rationalize their complex -continuous- surfaces into discrete, flat mass customized elements. In addition, those complex morphologies were reserved mostly to high-end condominiums, prestigious cultural programs, stadiums and so on. By opposition, and in alignment with modernism's understanding of prefabricated assemblages, the discrete discourse is armed with a social agenda and an egalitarian materialisation process based on serially recombinable bits of discrete, assembly-ready, theoretically cheaply mass-produced elements

84 From the final lecture of Kengo Kuma for his retirement from The University of Tokyo. Held on Zoom platform, July 18th 2020.

for highly complex buildings. This is an equity made also for both young and theory architects; complexity is no more delivered exclusively by large architectural firms. Young practices have now the possibility to materialize their own Kleinarchitektur (small architecture) and confront themselves to reality and the alterity of the commissioning system.

Nonetheless, the discrete -while generating beautiful aesthetics- and other emerging computational practices, from OOO sculptural objects to GAN neural network generated shapes, are denuded of any narrative and poetry and generated without a balance between coherence and complexity. One wonders why computational design practices did not really go through in the practice scene and academia in France and Japan. In France, architecture is still purely functional and to paraphrase François Roche "Amelie Poulanisée", in Japan, the system has abandoned the star-system and the shock of the new images to focus rather on community based design, monogatari and space typologies and proportions that emerge from programmatic factors. Indeed an algorithm does not only execute predefined instructions, but demonstrates a thinking strategy. However, this shift towards an architecture of the code leads some architects to "adore the formula85". Following this path, architects will be replaced by computer scientists.

The return of ornament has been supported by emerging technologies and it is uncertain toward which direction the practice is heading. More and more architects (students, researchers, practitioners) are exploring and pushing the limit of pattern and ornament design making everyday, through top-down, bottom up and robotic materialization. Generative Adversarial Networks is another path, where artificial intelligence analyzes archives of patterns and generate unseen drawings and aesthetics. Others, such as Keisuke Toyoda (Noiz architects) and Shohei Matsukawa are teaming up with craftsmen and artists (Asao Tokolo) to generate new patterns and ornaments.

Most of my rhetorical discourse is based on intuition and speculative questions. In the same way one wonders what is the phenomenological impact of the invisible patterns hidden in Jakob+Macfarlane buildings and shown in the Invisible Drawings exhibition, I am wondering what is the real impact of the haptically translated ornament. For this, the one and only way to verify is to materialize it and build it. As written in the very first page of this manuscript, the doctoral dissertation at Tokyo University of The Arts represents a partial fulfillment of the

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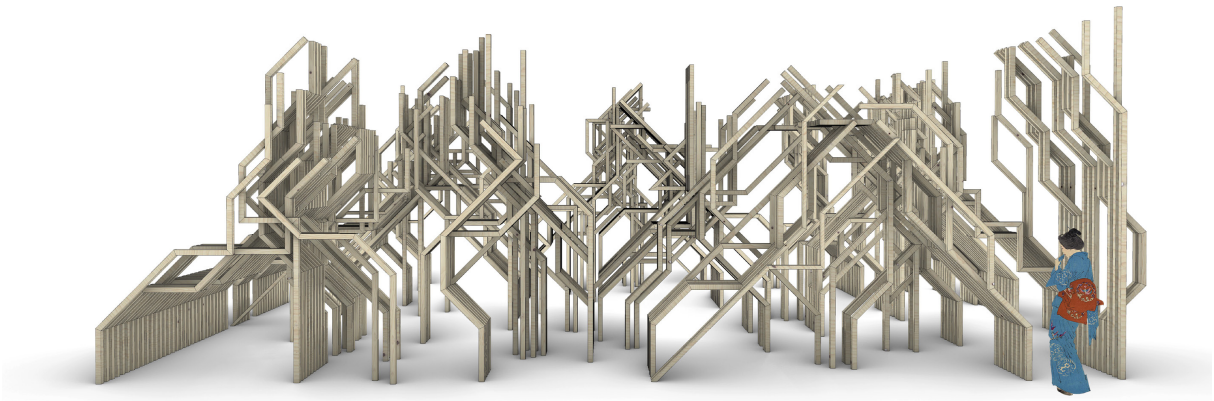
85 Antoine Picon cited in Plihon, Florence. 2016. Architectures numériques et résurgence baroque: Bernard Cache, Greg Lynn et le Pli de Deleuze. Architecture, aménagement de l'espace. Université Charles de Gaulle - Lille III. p381.

requirements for the obtention of the degree of Doctor of Fine Arts, the other requirement is the production of an art work to be exhibited at the Geidai Museum in the defense period. Therefore, I am planning to materialize the Neo 3331 speculative design into a 1:1 scale pavilion of 10 x 8 x 3.5 meters in order to walk in its space and analyze its qualities.



The museum exhibition

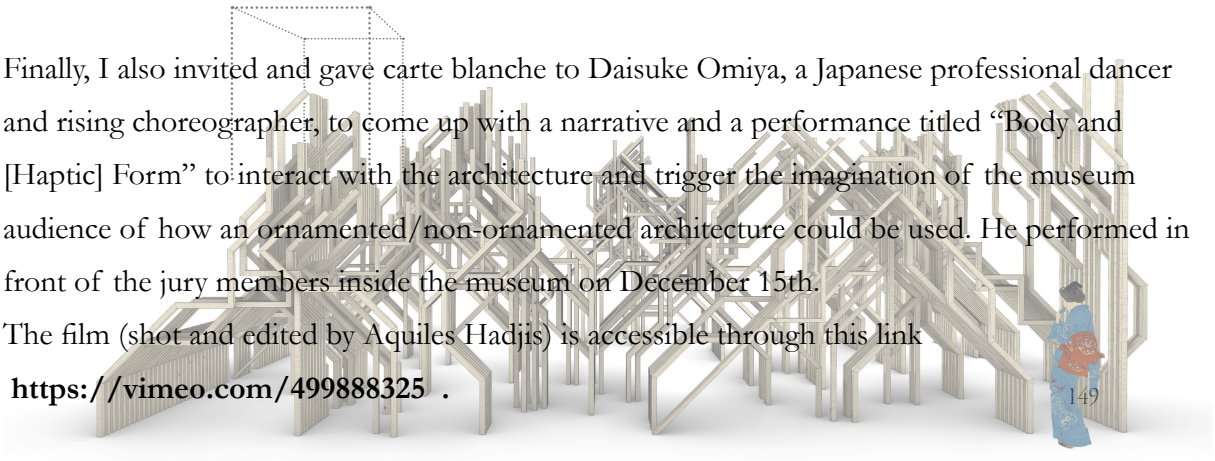
As described earlier in this dissertation, the doctoral program is a practice-based research and it is mandatory for the candidate to verify their hypothesis through the fabrication of their physical work. I focused my energy on materializing the ornamented-NonOrnamented architecture out of the pattern N3331, that was later scaled up and translated to a three-dimensional space. As the geometry out of processing was thickened into a complex mesh, and due to the lack of 3d printing machines/giants robots to fabricate the form as is, I started a process to negotiate the form, the resolution, the fabrication time and method, and the economy-financial feasibility of the project.

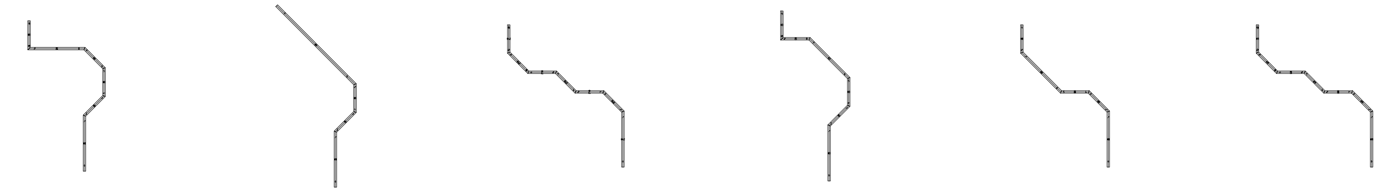
The aesthetics and resolution research began in February 2020. Until September of the same, I wrongly assumed that I will be able to receive a grant from an industrial sponsor (the total wood cost was evaluated to 40 000$. Furthermore, I assumed that the museum curator will grant me the 200 sqm in the third floor necessary to host the entire pavilion. By the end of September 2020, the curator and the academic affairs office granted me less than 80sqm, and I failed to receive financial support from a sponsor.

I therefore chose one cluster/part of the pavilion that represented to my eyes the demonstration of the aesthetics, tectonics and space qualities I wanted to experience through my body and that I wanted the audience to discover.

About 600 Kg of Karamatsu wood of 45x45mm in section were purchased from a wood factory in Nagano. The material was delivered to me early November and the whole pavilion was entirely constructed and assembled by myself, using simple tools such as a table saw to cut the wood, and a Japanese Nomi to cut and finish the joints. A total of 317 wood chunks of lengths varying between 500 and 3500mm, formed 62 different columns, themselves made of 255 half-lap joints (135 and 90 degrees).The following drawings and images provide a small preview of the process and the result of the exhibition. For more details, please refer to the paper to be submitted in August 2021 to the IASS journal conference and which will cover the geometry, the complexity, resolution and aesthetics.

Finally, I also invited and gave carte blanche to Daisuke Omiya, a Japanese professional dancer and rising choreographer, to come up with a narrative and a performance titled “Body and [Haptic] Form” to interact with the architecture and trigger the imagination of the museum audience of how an ornamented/non-ornamented architecture could be used. He performed in front of the jury members inside the museum on December 15th.
The film (shot and edited by Aquiles Hadjis) is accessible through this link **https://vimeo.com/499888325 .**





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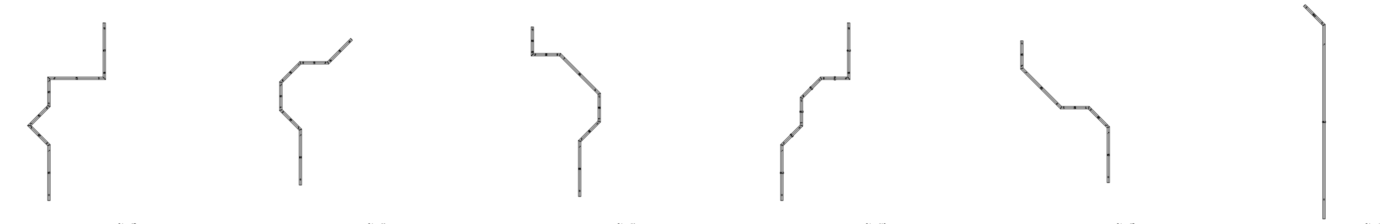

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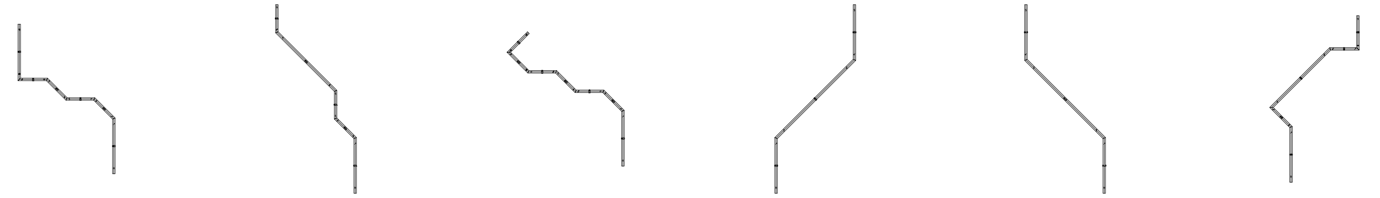

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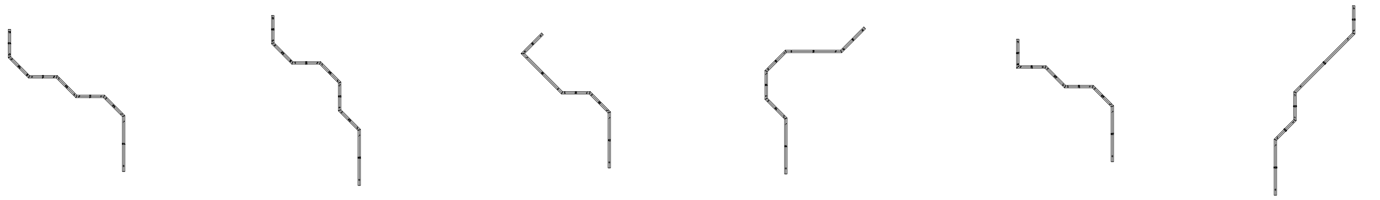

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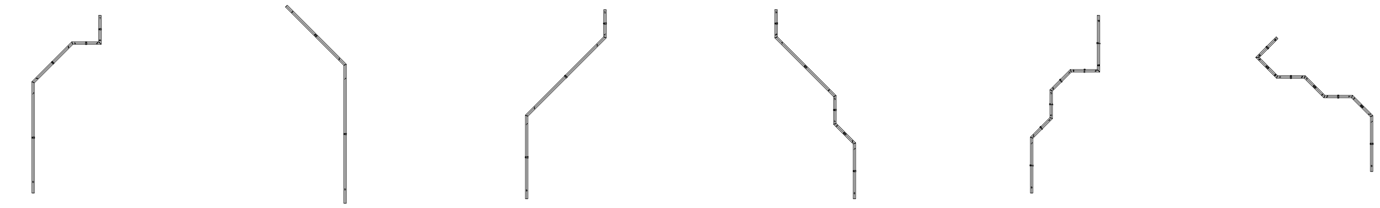

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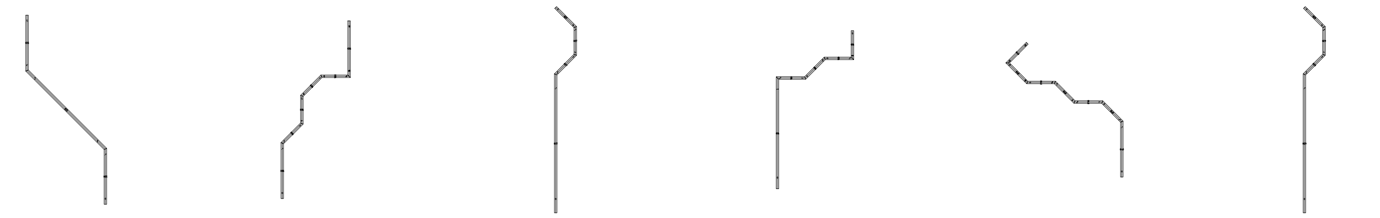

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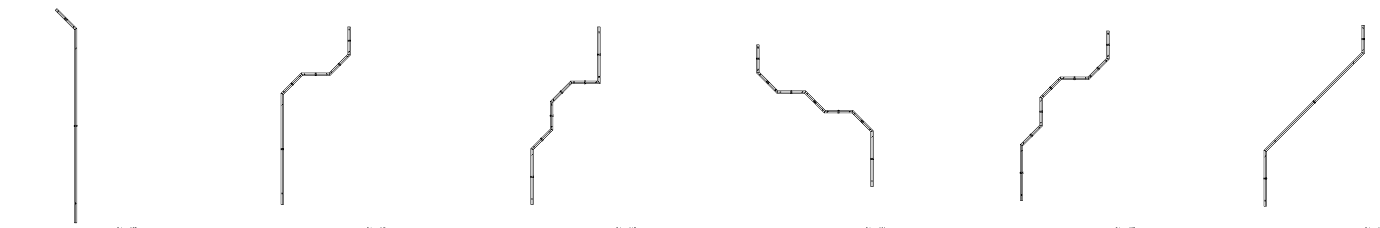

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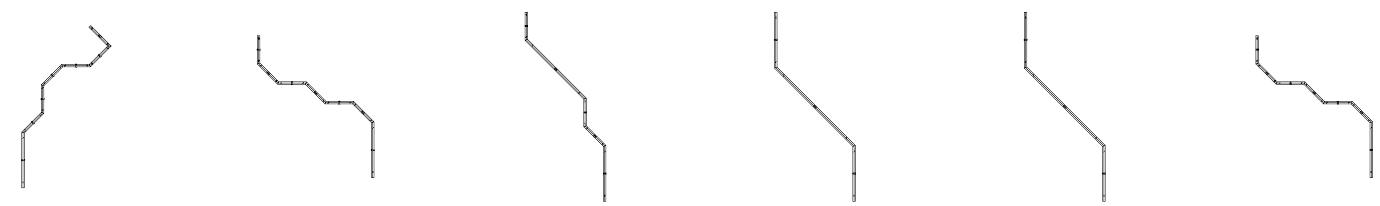

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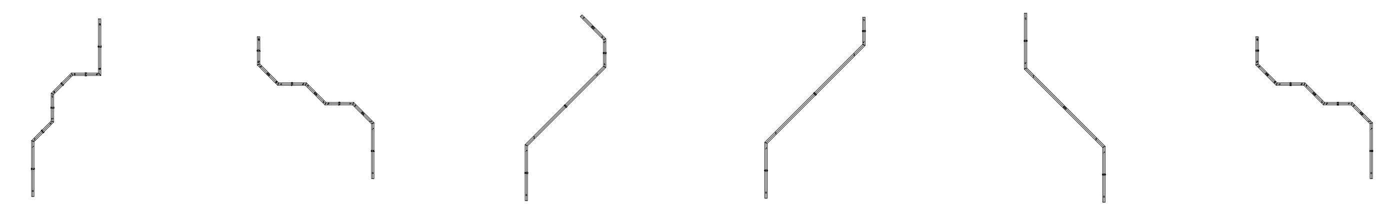

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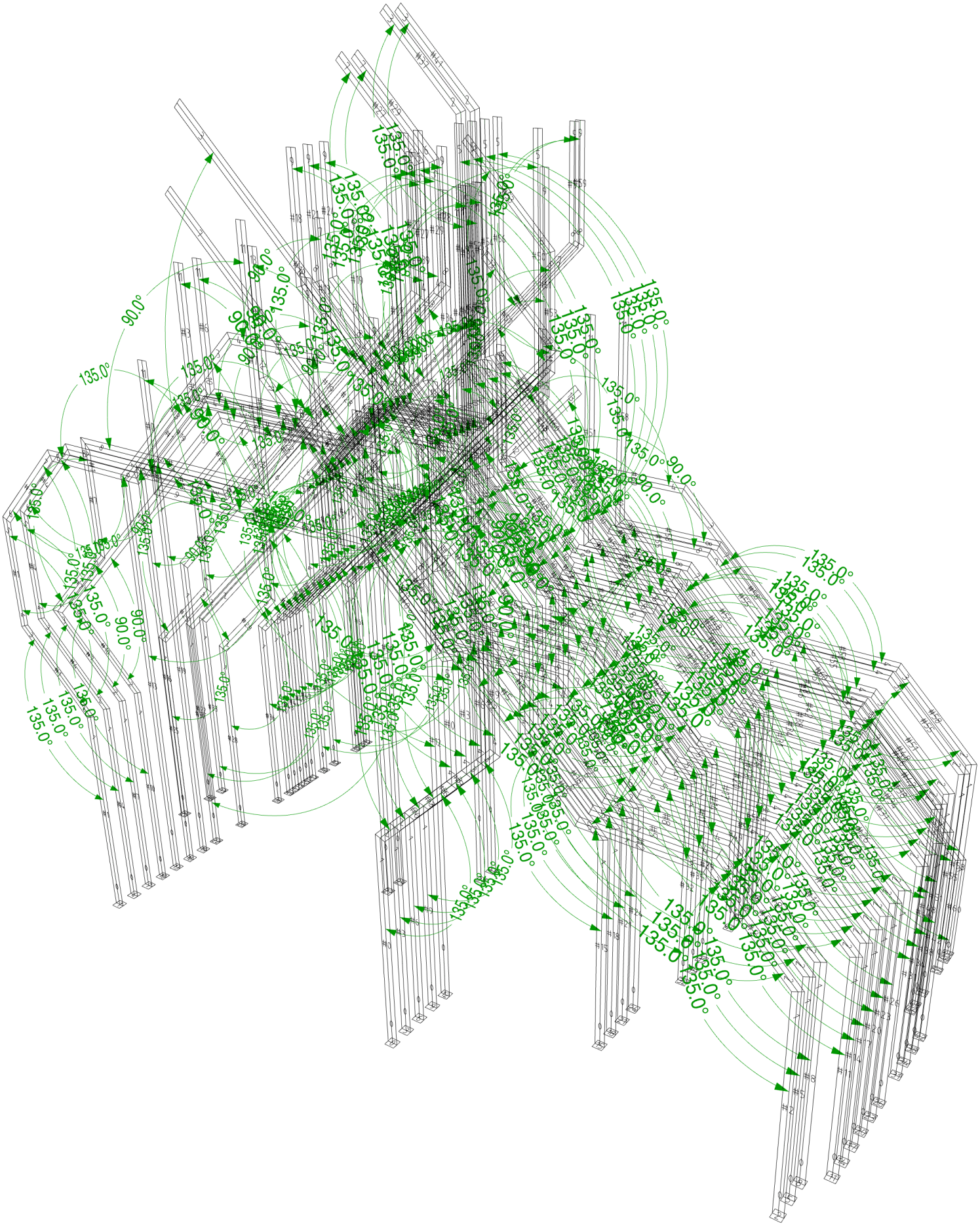
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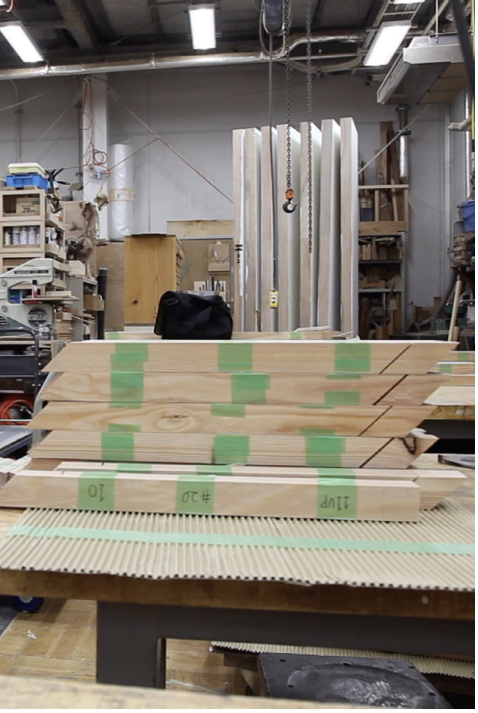
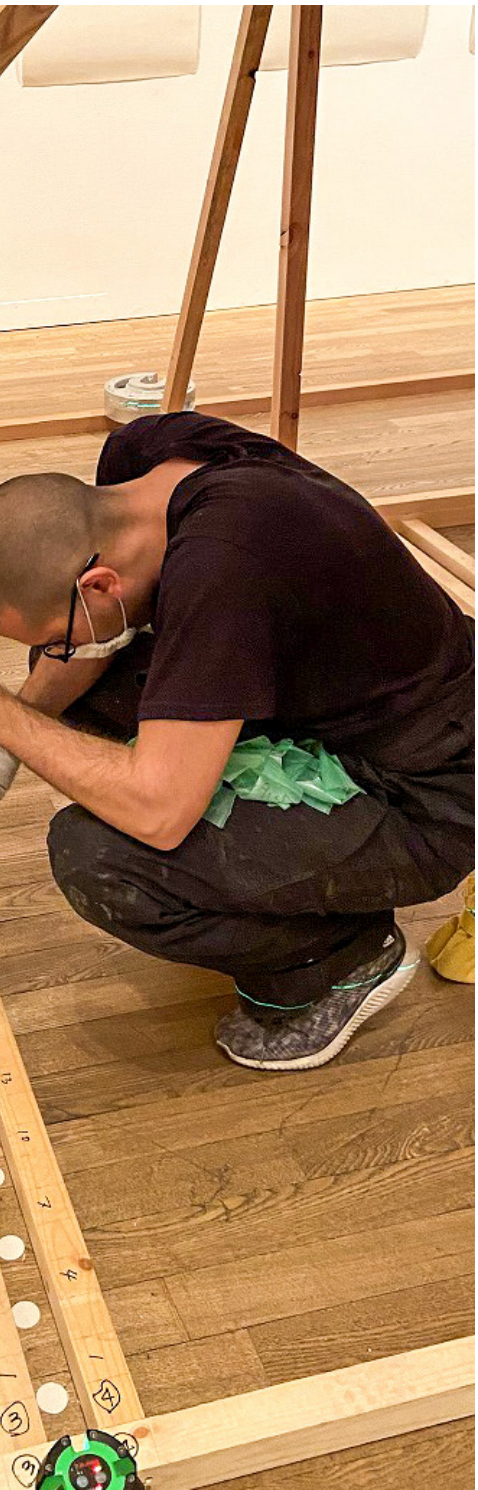
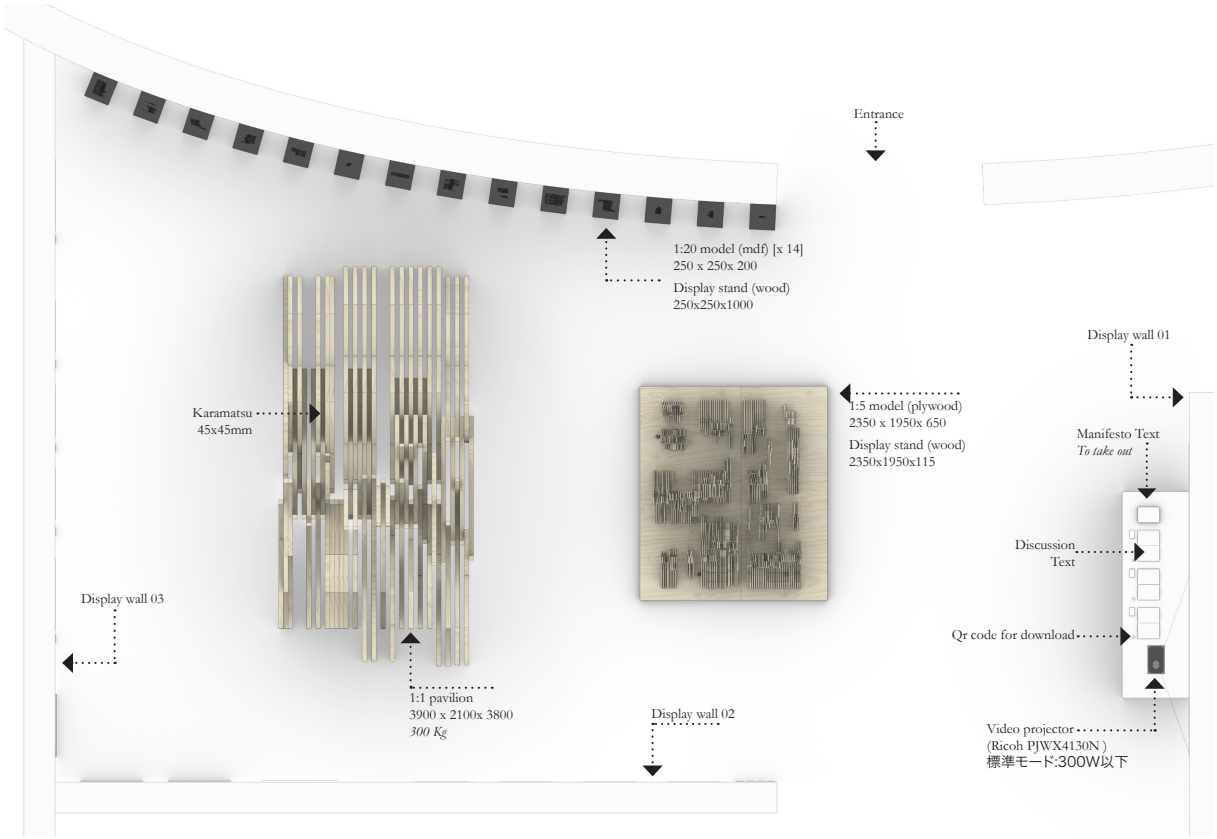
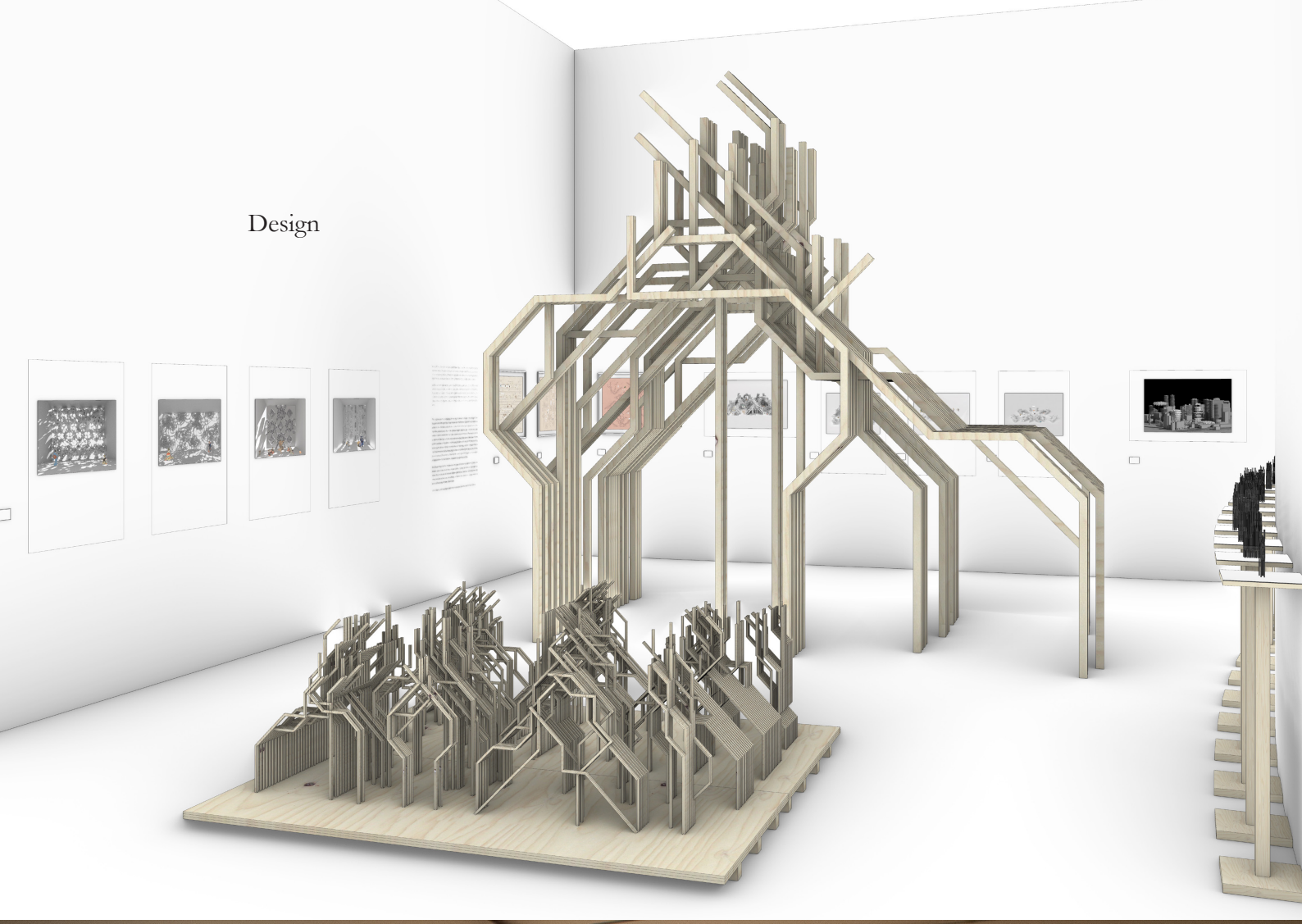




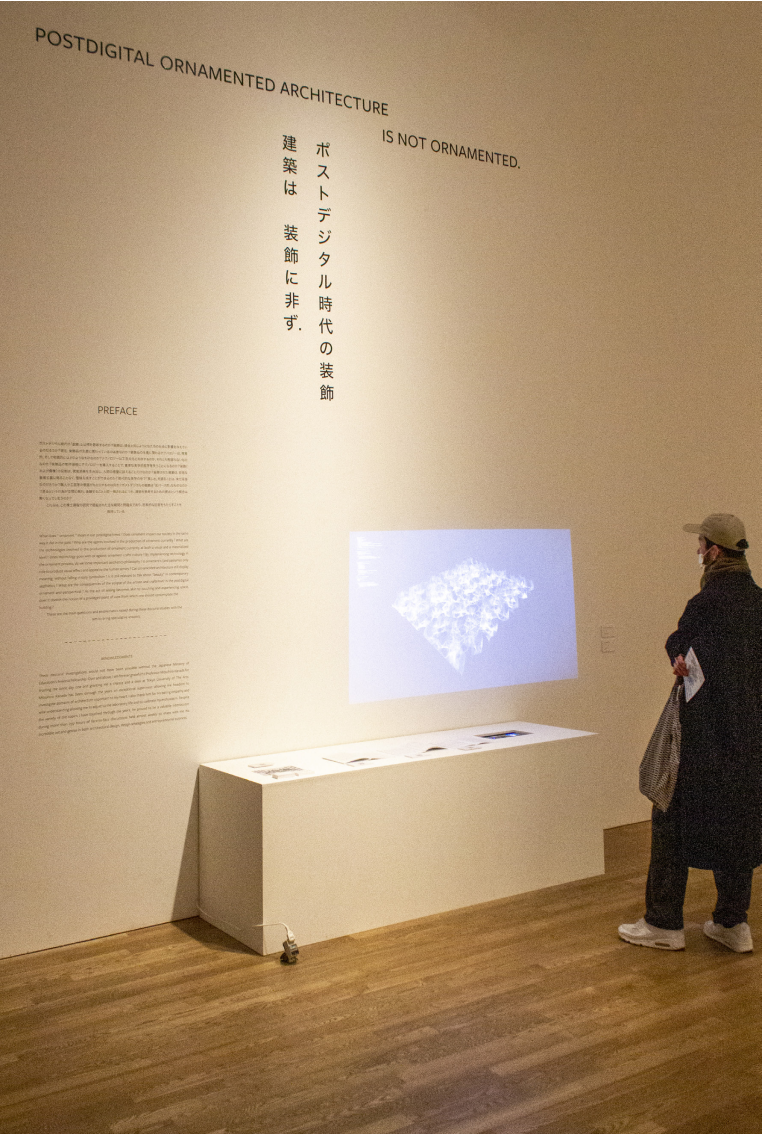


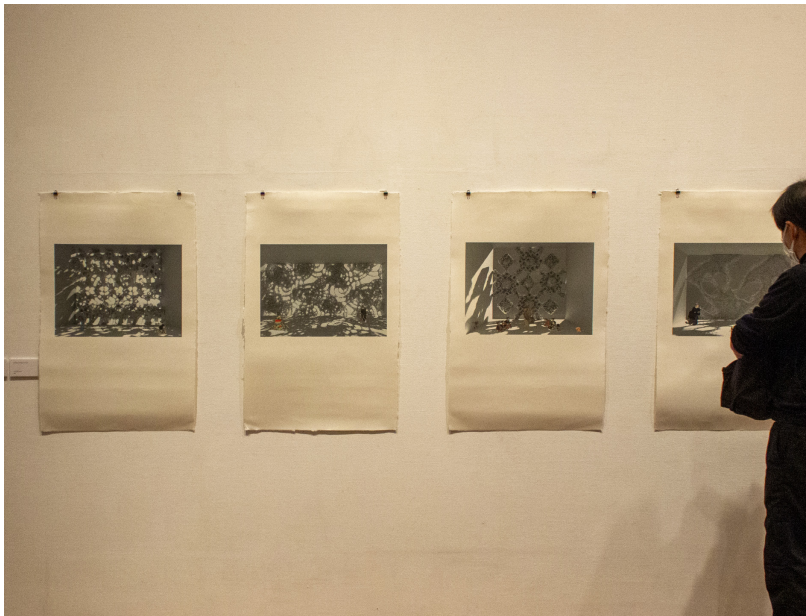
Exhibition design plan

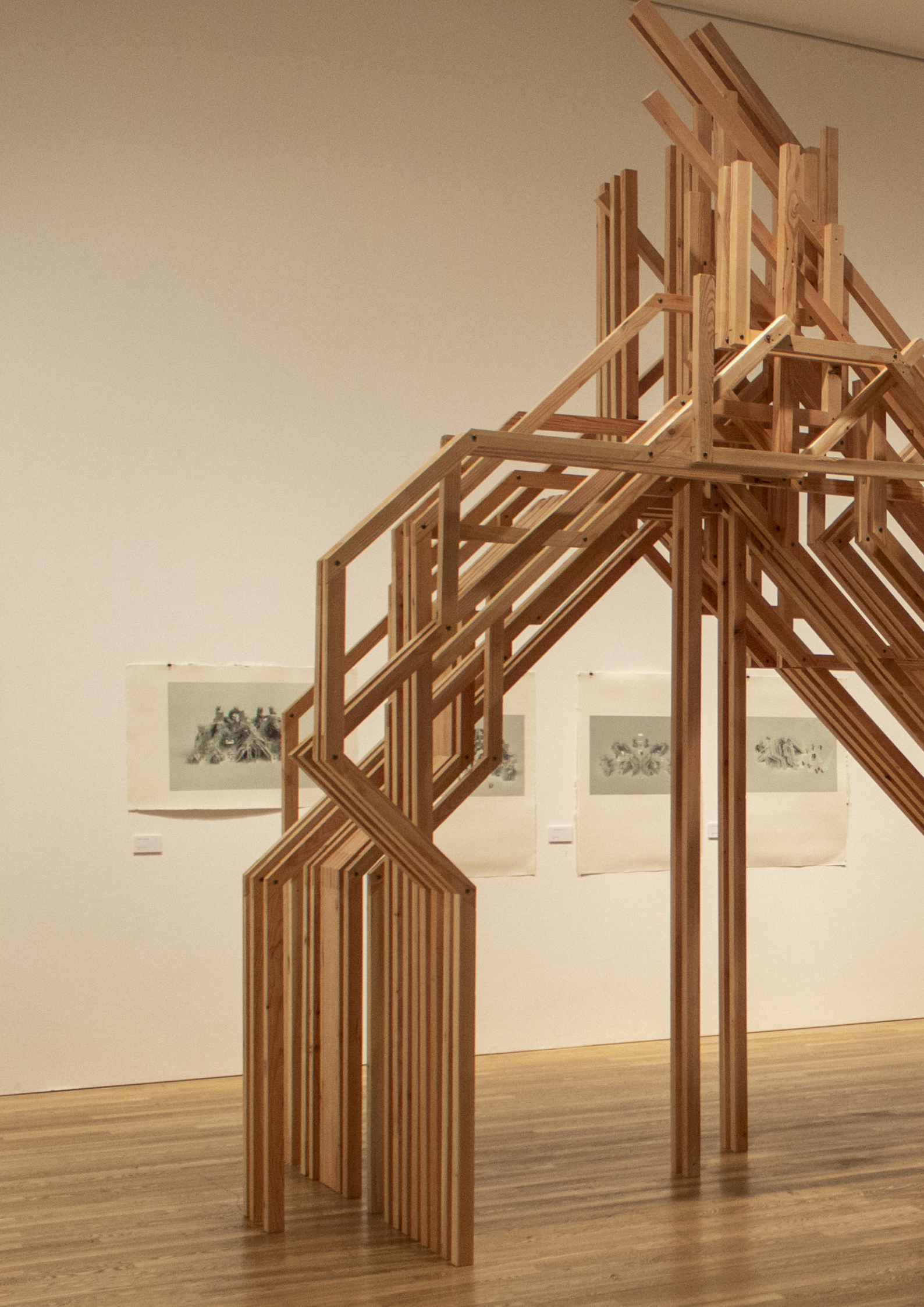
Design



Reality


POSTDIGITAL ORNAMENTED ARCHITECTURE
IS NOT ORNAMENTED.
ポストデジタル時代の装飾
建築は 装飾に非ず.
PREFACE





Body and [Haptic] form - Performance

https://vimeo.com/499888325

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This PhD journey has been extremely enriching both personally and intellectually, it has taught me humility, patience, consistency and discipline, and most importantly empathy and tolerance. The voyage of exploration continues, and I am more than ever starving for knowledge and looking forward to the future challenges.

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