



Research Article

**ARCHITECTURAL MODELING CRITERIA. MORPHOLOGICAL VARIATIONS FOR
A GENERATIONAL MODULAR TYPOLOGY IN PROGRESS**

Tanvi Mittal, Parveen Shah and Uma Sharma

75, Godavari Apartments Alaknanda

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ABSTRACT

From transformational and generative properties, raised from mathematics and geometries such as fractals (Mandelbrot, 1984) and IFS -iterated systems function- (Lindenmeyer and Przemyslaw, 2000) we propose work possibilities, based on the so-called morphologies of the amorphous, looking assimilate it to the principles of modern and contemporary architecture and aesthetics, such as free, minimalist and essential lines, paying particular attention to the richness of its patterns and configurations, as well as its scalar and transformational properties. This is how, in previous publications, work has been carried out, from university teaching and various visual art projects, to the work and development of models of fragmentation and scalar growth, which lead to the generation of modules, plots, minimalist landscapes-, showing diverse possibilities of creative assimilation from architecture. From the process of vector fragmentation, the general objective is to take modular portions of the plots, deepening the general methodology exposed in Cañete (2014, 2016, 2017, 2018a, 2018b) in order to detect modular configurations that can be worked and modeled, according to criteria of change of position and relation between its parts, generating dispositions and, therefore, new arrangements, which introduce, from a series of position variations (fit and disengagement of modules) a wealth of volumetric and spatial configurations, which give step to a basic typology of architectural work.

Key words:

Architecture / teaching / minimalist landscape /
changing configuration / spatial disposition

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INTRODUCTION

Presentation

In previous works and publications, it has been shown, in the field of pre-architectural modeling, various experiences, the result of visual art projects, various explorations generated from interaction processes, fragmentation and scalar-morphological growth. All this, from a minimalist perspective, following the general criteria of pure forms, postulated from modernity, which, having covered permeate diverse fields of art and contemporary thought, It should be considered that, after the works of the outstanding mathematician Benoit Mandelbrot (1984), by postulating the fractals in relation to the problem of irregular shapes and the scalar properties of these new geometries, where these would not be but a result of processes of interaction and continuous transformation, which from our own elaboration and assimilation, We have assumed from a logic of minimalist debugging.

This has allowed us to generate a pre-architectural exploration field, which we have basically defined, based on its attributes and morpho-spatial relationships, without necessarily referring to a functional program, but which is guided according to

criteria of formal-operational complexity and algorithmic, where a sensitivity to the problem of space, transitions and gradients, its circulations, volumetric hierarchies, etc., predominates.

In this crossing of criteria, in the present work, we have to explore the possibilities of this approach, in a specific and limited scope, which is a look of decomposition, disarticulation and modular assembly, where operations of lace and lace, superposition, take precedence. relations of proportion, distances, and variable orderings according to diverse configurations and dispositions, of those pieces generated from said de-articulations and positional play between the pieces, of greater morphological frames.

Background: From the year 2000 to the present, to date, within the framework of the chair of Fractal Geometry first and since 2015 in the field of morphologies, morphological exploration has been considered as an area of relative autonomy in modeling and architectural creative processes, as part of the second cycle of the race. This has allowed us to explore different lines of morphological modeling with students, ranging from the general approach of the so-called pure forms in art and architecture, confronting and enriching this true paradigm of pure forms in modern architecture, with the approach of irregular shapes, coming from the contemporary morphologies. This has allowed the progressive assimilation of geometries and forms that emerge from the

*Corresponding author: **Tanvi Mittal**
75, Godavari Apartments Alaknanda

study of other disciplines, such as art and / or mathematics, where the processes of growth and modular fragmentation and landscaping of minimalist style stand out.

In this context, a review and systematization of part of the teaching work carried out based on these principles is presented at the School of Architecture of the University of Valparaíso. Chile. (Cañete, 2012, 2014, 2016, 2017, 2018a, 2018b), oriented to the study of configurations and variations in modular frames.

Theoretical Framework 2.1.- Creative Processes and aesthetic-Architectural Assimilation.

In the field of architecture, this process has allowed us to bridge a morphological exploration gap, very focused on the aesthetic effect, almost purely sculptural or mega-constructive installation, of the first post-modern or deconstructive explorations and assimilations, such as Eisenman called, in the 80s and 90s of the last century, but that few were able to integrate into the urban fabric, almost always, pre-existing, or even linked to the issue of living. Rather, they were disruptive and excluding, with respect to the reconsiderations. The relationship between geometry and architecture, by the way, has always been very close, but obviously, they are not the same. Not only lack the programmatic component, or socio-historical considerations and place, of all work. Even so, this leaves us with a sort of pre-architectural exploration interface, on which we will focus on this article. Thus, for investigative purposes, it is convenient to stop at a cluster of distinctions and differences that arise in this field, especially from an algorithmic-procedural approach, related to geometric-spatial connections, such as the relationships of balance, tension, scalarity, continuity between different configurations and morphological patterns, susceptible to a pre-architectural design and assimilation, and in which framework, it is convenient to explore the wide diversity of new morphologies and properties associated with the development of constant digital languages and complex geometries still little explored (such as fractals or non-linear systems) that together with the well-known ideal forms, Euclidean geometry, symmetries or even the first baroque notions (strong centers, equidistances, symmetries, equilibriums, rhythms, alternation, successions, tensions, limits and leaks, etc.) expand to new notions such as pattern language, open and irregular conformations, multiple centers and planes, groupings, growths, non-linear trajectories, iteration of functions, signal amplification or distortion, ruptures and fractions, network formation, plots, folds, landscape, textural landscapes and transformation mechanisms, interaction, variation and hybridization to scale, to name just a few, in a joint and unitary way, to an architectural-design view that accounts for its constant assimilation and understanding, through new conceptual, aesthetic and operational supports for such purposes.

A reference, relevant, will be, for example, various works and works of architects, such as Álvaro Siza, Steven Holl, Joseph Llinás (2005), Aires Mateus (2018), or Cruz Ovalle, among other contemporary architects. By the way, at this point, we must ascribe ourselves, and understand these developments and exploratory fields, as a way to expand the predominant paradigm to date in contemporary aesthetics, called: from "pure forms", from classic Euclidian forms, to scalar transformational structures, which allows us to even speak, of a sort of "new encounter" (objet trouve) (Cañete, 2016), which

in our case can be summarized in the following principles and postulates of a pre-architectural modeling process (Cañete 2012, 2016, 2017, 2018a, 2018b) carried out, the last years.

Those principles are: to.

1. A minimalist approach and approach.
2. A generative-transformational approach (the study of patterns of growth or fragmentation, hibration).
3. The study of transitions and scalar variations.
4. The study and modular modeling, and.
5. The study of the plots, textures, landscapes and landscapes, emerged from the previous points.

Thus, a general work model for the morphological-pre-architectural modeling, focused on volumetric-spatial, non-programmatic-functional modeling, is postulated:

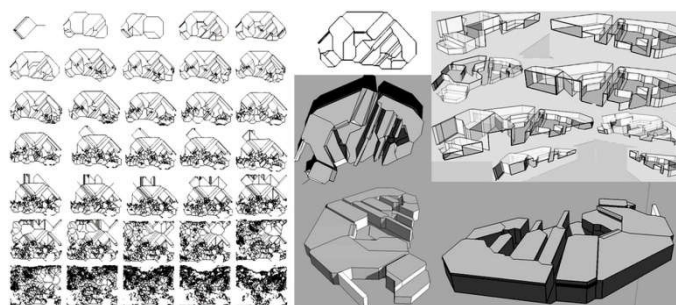


Image 1 Vectorization processes and spatial volumetrization.

Source: Cañete, 2016.

Model of Architectural Modeling Mediated Algorithmically. The following complex exploration model can be summarized in three axes: Morphological, Algorithmic (procedural) and Architectural:

Morphological Complexity Level. This complexity goes from

- Level of the individual Module, grouping or grain
- Frame, fabric or landscape level.

Algorithm-Procedimental Complexity Level: Involves spatial-morphological operations, such as: full, empty, extrusions, circulations. These present two algorithmic levels

- Set operations (meta-language)
- Local operations that affect particular modules or sectors (Object language).

Architectural Complexity Level: a continuum of two formal poles: to.

- pre-project sense or,
- morphological and spatial sense, as an aesthetic expression (includes approximations such as installations or formal interventions).

According to this general conceptual crossing, we must generate a framework of exploration and modeling not only morphological-architectural, but especially, pedagogical, that allows us to distinguish levels of complexity of work according to each assignment (Cañete 2018a, 2018b). The above is summarized in the following scheme, extended from the previously worked version (Cañete, 2018 a; 2018b):

Table 2 Work model, according to type and complexity of design.

Types of Morpho-Spatial Modeling		
Digital Level	Procedimental Level	Complexity Level Pre-Arquitectural
Morphological models based on non-linear equations, vectorized frames and iteration of functions	Spatial design based on growth and fragmentation of modular frames	LEVEL 1: Includes Variables such as: a) Conformation of voids and architectural spaces, intra and inter volumetric, magnitude, b) Circulations, routes and promenade. d) Hierarchy and spatial relationship between volumes
	Spatial design based on deconstruction of volumes and modular assemblies	LEVEL 2: Includes variables as: Levels and accesses, LEVEL 3: a) Frame configuration b) Sorting according to geomorphological conditions territorial

Source: self made.

From this framework of general work, we must consider a specific sub-field, which we can call:

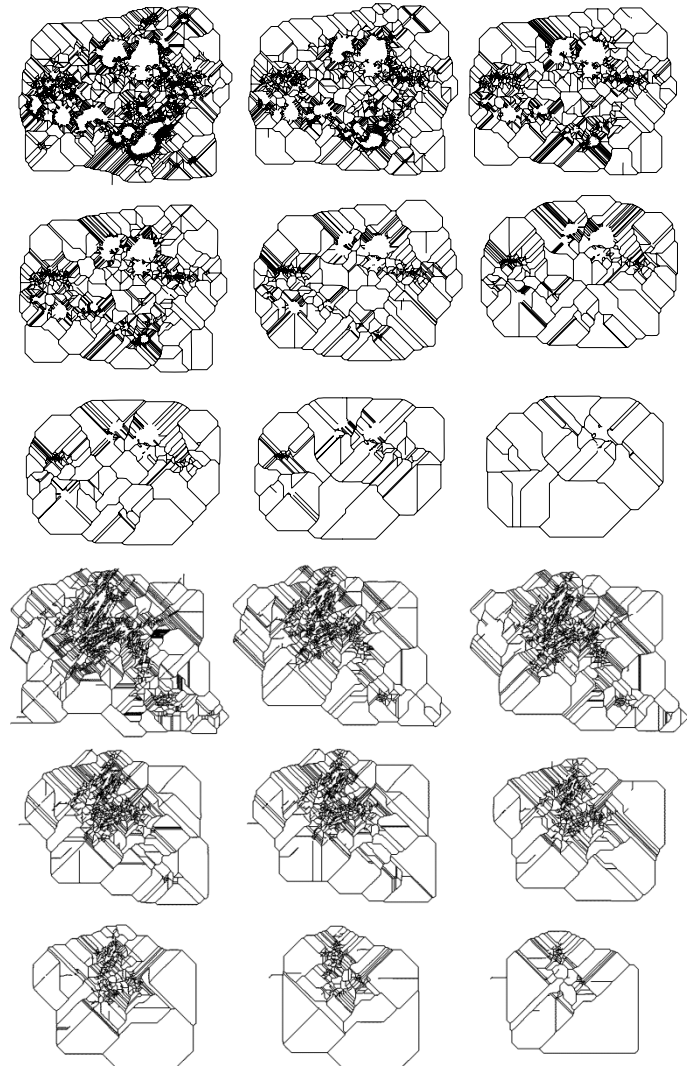
Modeling of Landscape-Modular Minimalist Trams and Fragments. From the previously exposed, in the following case, we have to work first, the conformation of frames based on minimalist fragmentation processes, through image vectorization processes, which allows us the development of units, susceptible to modular decomposition, and to work by assemblies and position variations between their configurations and volumetric-spatial relationships. The study of these transformations generated by scalar fragmentation processes allows us to understand the possible variations and points of morphological generativity, which, as a whole, range from simple polyhedral modules, to complex morphological frameworks, like labyrinths or even true landscapes digital. See the following cases of morphological transformations of a generative scalar plot, ranging from the module to the minimalist landscape. Images 5-10. Configuration of vector minimalist plots, the result of growth processes and scalar fragmentation. Source: self made. Next, we will review, as we have anticipated, a specific field of pre-archival modeling, in the aforementioned terms, from a logic of maximizing the notion of combinatorics and variation, based on disposition, fitting and modular de-fitting operations, of volumetric-spatial configurations, derived from the vector fragmentation of morphological frames.

Objectives: From the scalar vector fragmentation process described above, the general objective was to take modular portions of the frames, deepening the general methodology outlined in Cañete (2016, 2017, 2018a, 2018b) in order to detect modular configurations susceptible to be worked, according to criteria of change of position and relationship between its parts, generating provisions and therefore, new arrangements, which introduce, from a series of position variations (fit and unlock of modules) a wealth of volumetric configurations and spatial, that give way to a basic typology of work.

METHODOLOGY

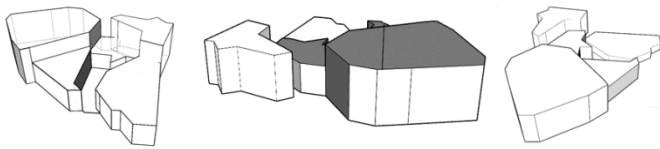
The following work steps are proposed:

1. Identification of units and pieces to decompose from minimalist and scalar frames and landscape.
2. Unlocking and changing positions of the modular parts of the frame
3. Selection and aggregation of pieces as criteria for generating new configurations, which generate new growth patterns and patterns.
4. Location of frames in territorial conditions, typical of slope and irregular configuration.
5. Results. According to the objectives and methodology indicated, the following modular unit was worked on.



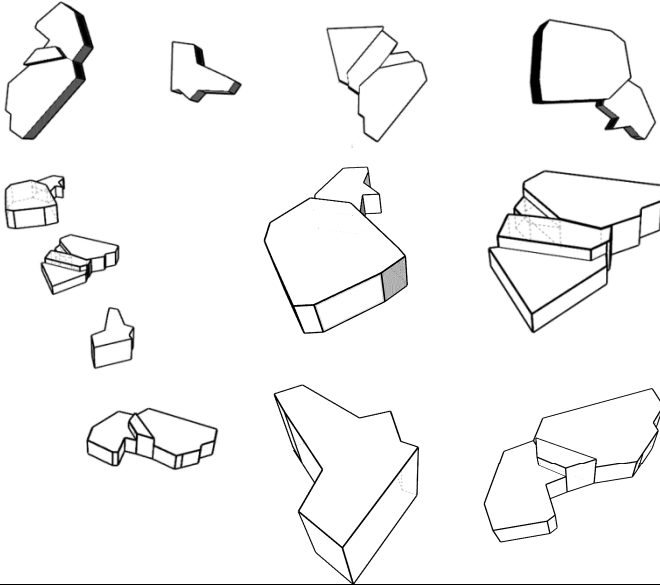
Images 1-2. Axonometric of the initial work model. Source: self made.

Defining some initial volumetric configuration, reference, which was to differentiate some volumetric-morphological pieces, with which to operate spatially and modularly, where it is relevant to point out that, we tried to apply grouping criteria, it is said, generation of vices between volumes, projection of angles and succession of volumes, and circulation between modules, as criteria of aesthetic-configurational ordering. Then, we proceeded to identify units with modularly decomposable pieces.



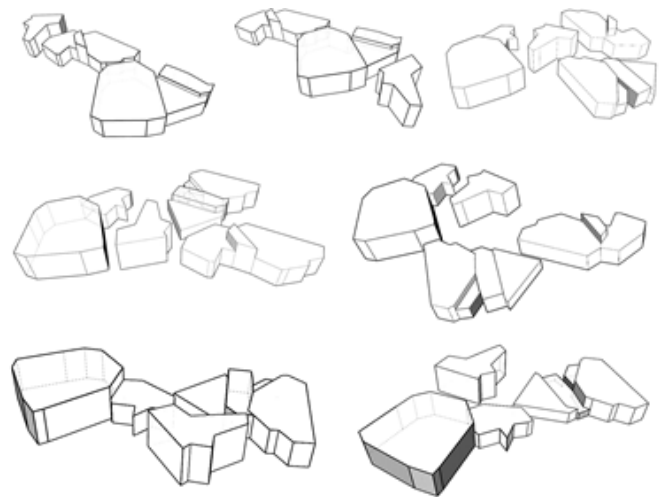
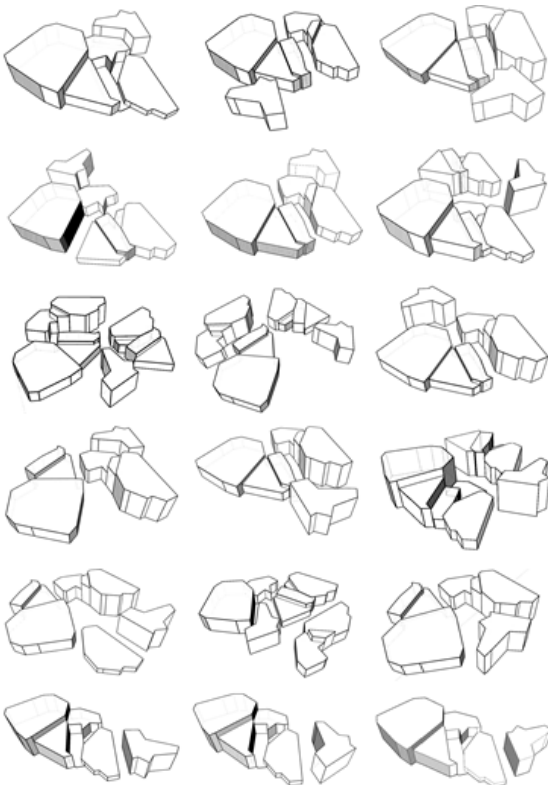
Images 3 Axonometric views. Source: self-made

Table 1 Initial work model. Source: self-made



Variability of Modular Groupings: Next, we will proceed to explore decomposition and combinatorial actions of pieces, according to positions and simple volumetric-spatial relationships, of which we highlight some cases:

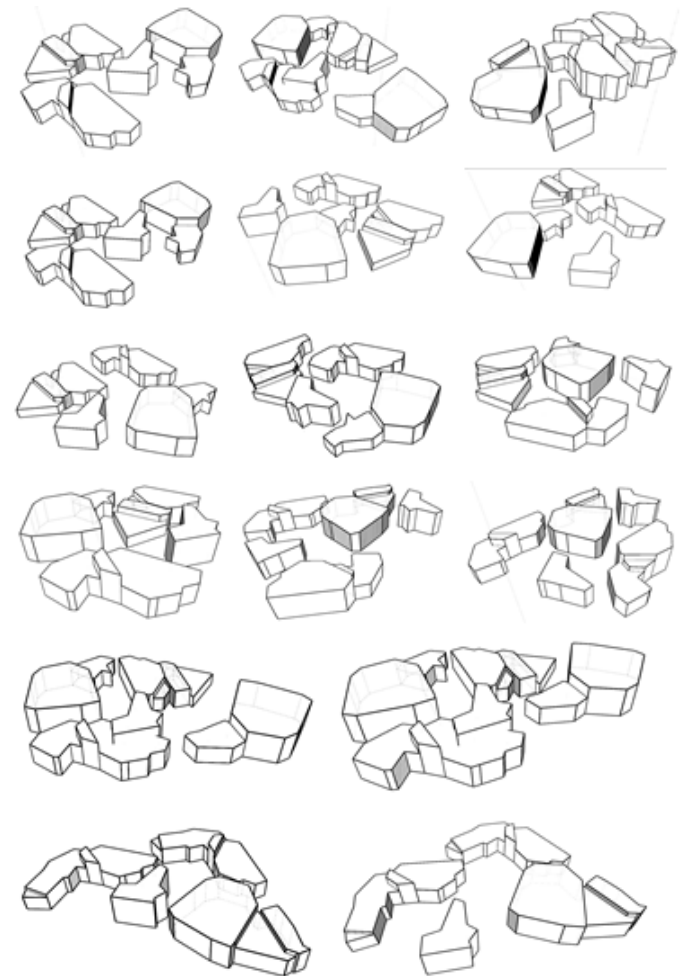
according to spatial arrangement Variability of modular groupings
Table 2 Variability of modular groupings, according to spatial arrangement.
 Different cases Source: self made



Composition of Groupings and Small Trams, according to combinatorics and repetition of modules. In this field, the repetition of some pieces is allowed, according to various ordering criteria and volumetric-spatial arrangement.

Growth based on combinatorial and modular aggregates

Table 3 Variability cases of modular groupings, according to spatial arrangement based on combinatorial modules. Different cases Source: self made.



CONCLUSION

In present article, an incremental and generative modeling exercise is proposed from the combinatorial variation of pieces according to criteria close to the traditional grouping (relative

centrality, diversity of circulations, mutability of the location, etc.) and in this meaning, it is important to highlight this type of compositional exercises, which serves not only as a bridge within morphological exploration and pre-architectural models, but also, because it integrates notions of plot and eventual urban ordering, in cities such as Valparaíso, with a strong component and neighborhood orientation and even vernacular typical of inhabiting its hills and slopes (Moraga, Cañete and López, 2015, Cañete, 2017b, Cañete, Moraga and López, 2018c) .. In this sense, this type of combinatorias, can serve as a principle of territorial organization, which allows generating groups and groups, based on the same modules, granting variability and fun the same time that identity to each aggregate or unit, that fits morphological-territorial conditions, also variable, but also allowing an intensive production and location of frames in territorial conditions, typical of slope and irregular configuration. Finally, in order to advance the pre-design design, especially the volumetric level at the territorial site level, it is necessary to explore possible arrangements of the plots and groupings, under conditions of slope variability and future and configuration.



Image 4 Various geomorphological configurations of the territory appear as a challenge in cities such as Valparaíso, characterized by self-construction and constant spontaneous densification. Source: Cañete, 2017b.

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Notes

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