

From Three to Two to Three Dimensions: Exercises for Architectural Knowledge

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Abstract

The search for the spatial and formal quality of architecture still finds its best referent in the physical model. Reproducing the material texture of built architecture communicates the idea of form and volume that is presented in real space. Models, in the construction of image sequences, reproducing existing or designed buildings, fulfill the task of tools for knowledge.

The underlying rules of architecture materialize, deconstruct and reassemble in a dialectical process in which thought takes form and becomes space.

Representing an architecture by separate parts, selectively describing its characteristics, reducing them to fragments of compositional units, and then reassembling them in their configuration, becomes a useful cognitive exercise in the investigation of architecture.

A tool of study, investigation and interpretation, the model represents an intermediate figure between the imaginary and reality. In the form of ideation it is anticipation of spatial organizations; in the form of representation of the existing it becomes a process of control and analysis.

Keywords: physical model, simulation, figuration, observation, architecture.

Simulation and figuring

The model is a tool for visualizing and controlling space, a step of technical and theoretical knowledge of architecture. An intermediate figure between the imaginary and reality.

In the *Preface* to issue 32 of the 1987 review *Rassegna*, editor Giovanni Vragnaz writes that: "The model is an instrument of representation [...] an instrument of verification, often temporary and partial [...] an instrument of poetic declaration" [Vragnaz 1987, p. 5] [1] a vehicle for the transmission of ideas. In the way of ideation it is anticipation of spatial, constructive, syntactic organizations. In the way of simulation, representation of the existing or unbuilt, it becomes a conceptual process of control and analysis, capable of defining and communicating character and content

of architecture in a continuous dynamic of dimensional and relational connections.

The model "thus evokes the notions of measure, norm, rhythm, mode, limit, until it assumes the Platonic sense of 'ideal form' of paradigm on which material existences are regulated" [Croset 1987, p. 47] [2].

Through the model, architecture is conjugated by two instances of the triad with which Vittorio Ugo articulates representation: *mimesis* and *metresis*. The 'imitation' as physical correspondence, the 'measurement' as compartability. The model is thus an artifice that through simulation, participates in the process of figuration of architecture and expresses the theoretical value of its compositional parts. An object that mediates between the abstract and reality,

between imagination and figuration. As one of the possible forms of representation, the physical model constitutes an instrument of visual simulation, which, however, represents only part of the properties of its referent. During the 2008 Venice Biennale, *Out There: Architecture Beyond Building*, director Aaron Betsky, argues that architecture is not the building, it is instead the way of thinking and talking about buildings, it is the way of representing them, of giving them form. The architecture of a possible world is expressed in physical models to offer concrete forms and seductive images. In the Australian Pavilion titled *Abundant*, 300 models built to a scale of 1:100 are exhibited (fig. 1). Some two hundred participants including professional studios, academies, artists and students were involved in developing models that interpret the aesthetics of Australian architecture, past and present. A forest of yellow aluminum pedestals, supporting discs and celebrating, in their diversity, the hybridity of Australian architecture in the twenty-first century. The models are not all completed, but the materials are homogeneous and the colors coordinated. This was intended to emphasize the conceptual approach from which the meanings of Australia's heterogeneous architecture are derived. The form of architecture lies not in the actual built configuration but in the concept it expresses.

In the same exhibition, Alejandro Aravena proposes *Elemental*, the outcomes of workshops conducted together with residents of the Quinta Monroy neighborhood of Iquique, Chile. Each family designs and colors its own house, based on an essential typological model that is repeated (fig. 2).

The theoretical level of the model lies in the dialectical mechanism between being the object of representation and the self-representation [Holtrop, Princen et al. 2011]. In the 1976 exposition *Ideas as Model*, Peter Eisenmann reformulates the meaning of the model in terms of an object capable of opening up reflections on the design process. A tool for study, investigation, reading and interpretation capable of establishing new forms of balance between representation and reality [Eisenman 1981].

Eisenman's experimentation with card-board houses (1967-1975) represents an example in which the role of the model and its potential is clearly discernible: "starting with the geometric datum, the foundation for architectural construction, he proceeds to its deconstruction, through deformation first and decomposition later" in a spatial dislocation "implemented by moving from one sense, one direction, one meaning, one plane, one space, to another; to the apparent non-sense, non-direction, non-significance, non-plane, non-space" [Ciucci 1995, p. 8] [3]. The model

Fig. 1. *Abundant*, 2008. Exhibition of the Australian Pavilion at the 11th Venice Architecture Biennale (photo by the author).



of House X (fig. 3), is realized by moving from the space of construction and axonometric representation, to the space of the image: "The axonometric model denies the rotation of both the object and the observer, forcing this and that to the immobility of the one determined point of view" [Ciucci 1995, p. 9] [4].

Representation and critical observation

The transposition of an architecture from its two-dimensional extension to a new material configuration becomes a process for knowledge and analysis [Florio 2020, p. 123], it represents in fact, a privileged means of understanding, as it assumes the role of foreshadowing the quality and theoretical conception that supports it.

The scale of representation of the model expresses the general structure and form of the architecture, the composition it takes on in space, but also the quality of the space, such as its exposure to light, its plastic body, "the figure in short that architecture takes on in manifesting itself" [Cellini 2006, p. 93] [5] and, when one "scaling the scale of representation" the syntactic composition of languages emerges in a theoretical synthesis of historical and cultural orientations.

In the transition from drawing to model, the passage from a mathematical dimension to a physical dimension induces a comparison between two entities, belonging to different realm and placed in relation. The mathematical dimension belongs to the world of scientific exactitude, the physical quantity belongs to the real world of approximations. Measurement in architecture is understood as synonymous with dimension and "assumes great importance especially because of the relations that the various metric systems have [...] with the definition of the dimensional scales typical of the different compositional poetics" [Sacchi 1994, pp. 73, 74] [6]. Moreover, measurement, in architecture, is not an exclusively technical datum, but tends to the definition of relationships between parts, thus of proportions, and not least, to the configuration of images that delimit a portion of built space.

The repetitive formulation of the measurement defines a purely mathematical relationship that, while being related to the configuration of the architecture, e.g., the score or rhythm, expresses above all "an invisible rationality of the building" [Sacchi 1994, p. 85] [7] in which the qualitative dimension of the measure implies a proportional structure. In the model, the algebraic reduction deduced from the drawings is transformed into empirical simulation in which all "the expressive capacities of the scalar dimension"

Fig. 2. Alejandro Aravena, *Elemental*, 2008. Exhibition at the 11th Venice Architecture Biennale (photo by the author).

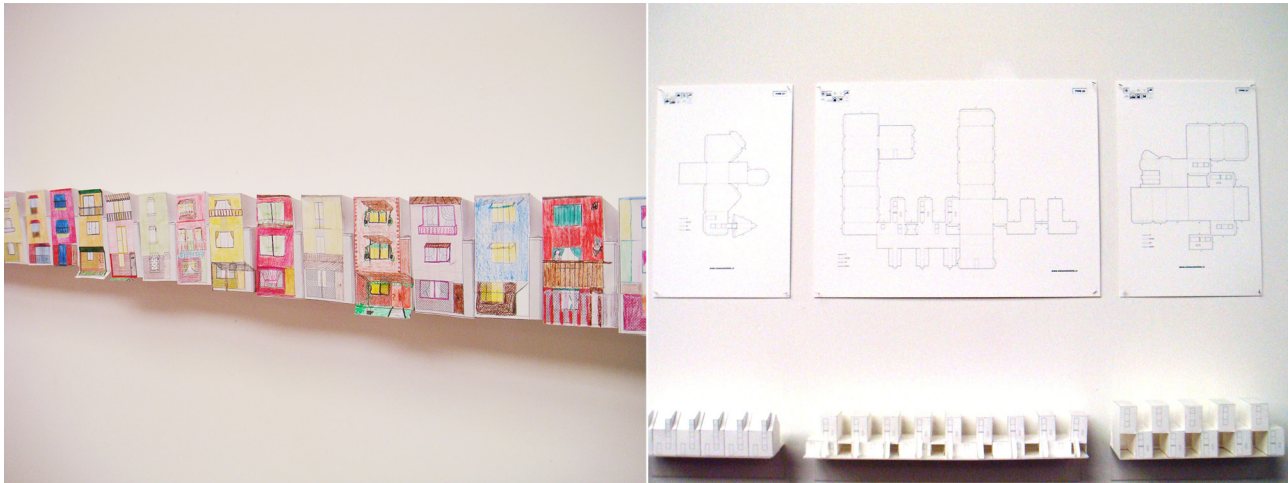
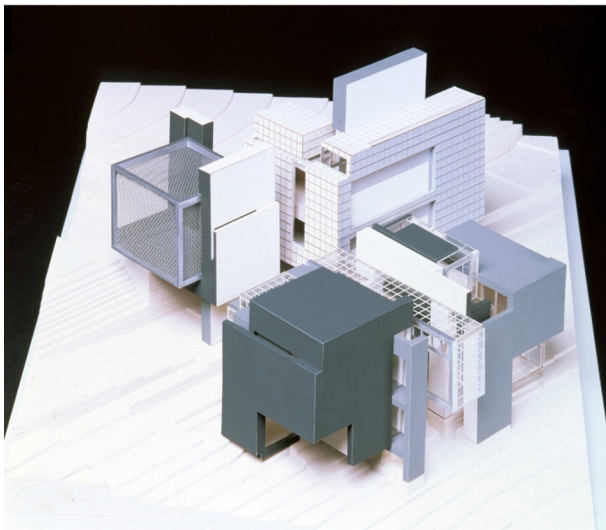


Fig. 3. Peter Eisenman. House X, 1976: <<https://eisenmanarchitects.com/House-X-1975>> (accessed 30 April 2024).



[Pacciani 1987, p. 9] [8] are concentrated, highlighting the formal relationships, between dimension and proportion. The model is revealed as a system of signs and forms drawn from the construction, or the field of representation, aimed at defining a configuration of signs and forms belonging to another system of signs and expressive codes, organized in sequences in which a continuous relationship must be established between drawing and physicality. A perennial relationship between the physical world and the world of signs given by the progressive intermediation to which our experience unites us [Florio 2020, p. 126]. The model is thought as a composite set of morphological units in homogeneous sequences. The function of representation applies simultaneously as deduction and as configuration [Croset 1987, p. 48].

Thus, it is not the act of imitating the form or reporting the exact dimensions, but it is about activating all those processes of aggregation of parts for the purpose of reproducing certain aspects and values of the represented architecture. It is about programming knowledge, rationality, technique, procedures and tools to reproduce a series of configurations outcome of the cognitive process of analogical thinking or deduction of graphic tracing. The purpose of the model will take into account reliability and similarity “playing in the artifice the role of the artifact” [Guillermé 1987, p. 31] [9].

The model, understood as a reproduction of architecture, thus refers to the concept of similarity [Maldonado 1992]. The observable object is subjected to judgment and critical analysis in direct relation to the gaze, but also to touch. Taken as a perspective representation whose purpose is control over the overall appearance, as a simulation of vision, it expresses issues pertaining to the three-dimensional configuration that architecture assumes in space.

The critique of the gaze is characterized by a logical-deductive process, given by the reduction by parts of the compositional elements, from which result hierarchies, systems of interconnections, relationships and, on the part of the observer, the consequent attribution of meaning.

An observation is a programmed perception that instructs the exercise of understanding through the relations in which the empirical world appears [Arnheim 2007].

The gaze is aimed at directing mental activity toward the attribution of meaning to each element. An extreme abstraction of the parts is useful in understanding how their meaning does not necessarily belong to the form, but can be expressed in the relationships that hold them

together; because the parts of the architecture, which are found in the abstract two-dimensional configuration, are representations of elements of three-dimensional space. The relocation of the parts, from the space of the two-dimensional representation to the three-dimensional space of the model, induces a shift from a two-dimensional control of the elements, almost always in frontal view, to that of “their weighting in a three-dimensional space in which, among other things, of fundamental importance turns out to be the movement, the lack of a privileged point of view” [Pagnano 2003, p. 11] [10] that an observed element takes on in space.

Space is no longer rigidly defined by the rules of projections, perspective or axonometric, and elements assume different positions and can therefore be interpreted differently.

The model gathers a descriptive synthesis of architecture, it in fact allows one to perceive and manage a complex reality through “a cognitive strategy in which the idea of similarity with respect to reality plays a decisive role” [Migliari 2004, p. 47] [11] a system of symbols that, according to Claude Levi-Strauss, unlike the reality one has the power to manipulate.

Exercises for knowledge and analysis

In real space, strictly in three dimensions, the vast amount of data is reproduced in analytical schemes that refer to concrete materials. Visual works, Pierre Francastel argues, are acts of figurative language, ordering principles of the process of interpretation and knowledge inferred from the relations of analogy with the real world. The apparent coincidence between model and representation and the full correspondence between the plane of representation and the plane of construction is expressed in the gaze of the observer through physical perceptions, the elements of construction, and indirect perceptions, symmetries, proportional ratios, balances [Migliari 2004].

Programming to construction the physical model, the documentations impose a deductive investigation for the selection of the elements to be reproduced. It proceeds by logical deductions, in which through simplifying processes a reduction of details is implemented, without, however, denying or altering the fundamental characteristics of the referent.

The disaggregation of the elements, into disconnected components and the necessary logical-sequential re-aggregation, leads to a process of knowledge, which through the

recognition of the parts necessarily highlights relationships and hierarchies in a volumetric dynamism that gets rid of the ‘privileged’ viewpoints of traditional representation and allows a simultaneous vision in spatial discontinuity.

The aim of building a physical model, in its visualization dimension, which refers to the field of figuration, is to generate critical knowledge.

The process of model production is aimed at the search for form in space, linguistic syntax, identification of compositional matrices inherent to the design process, geometric ratios, functional relationships, and aggregative logic. The deconstruction of parts into physical conformative elements and theoretical deductive trajectories becomes a tool for learning and analysis.

The exercise of physical reproduction in addition to empirical knowledge of the work brings one closer to theoretical reflection, a critical exercise that connects architecture to compositional theory; the model design becomes a project of subassemblies that will have to be relocated following the theoretical value of the work. The model is constructed, therefore, by discontinuous and partial fragments.

The systemic attitude of rhythm and repetition in the module of the facades of seven of the eleven buildings of the Cortina del Porto of Messina, designed by Giuseppe Samonà between 1952 and 1958, gives the architecture a high unity in the transition from the scale of detail to the city. The dimensional regularity of the form of the facades allows a dynamic relationship of forms and elements to be defined, and allows control of the theoretical input in the configuration of the architecture. The detail of architecture and the urban facade are treated with the same theoretical approach, that of the repetition of an order declined according to the pure geometric language of rationalist architecture. The rhythm of the span has no physical limit. It remains open, undefined, a Miesian ‘defining rather than a confining’, emphasizing the infinite declination in the combination of parts. The two-dimensional transcription in the CAD environment, of the direct survey of the facades and the realization of the analog model in white cardboard, at the scale of the city, architecture and detailing constitutes an interesting cognitive exercise of the logic-deductive type of architecture.

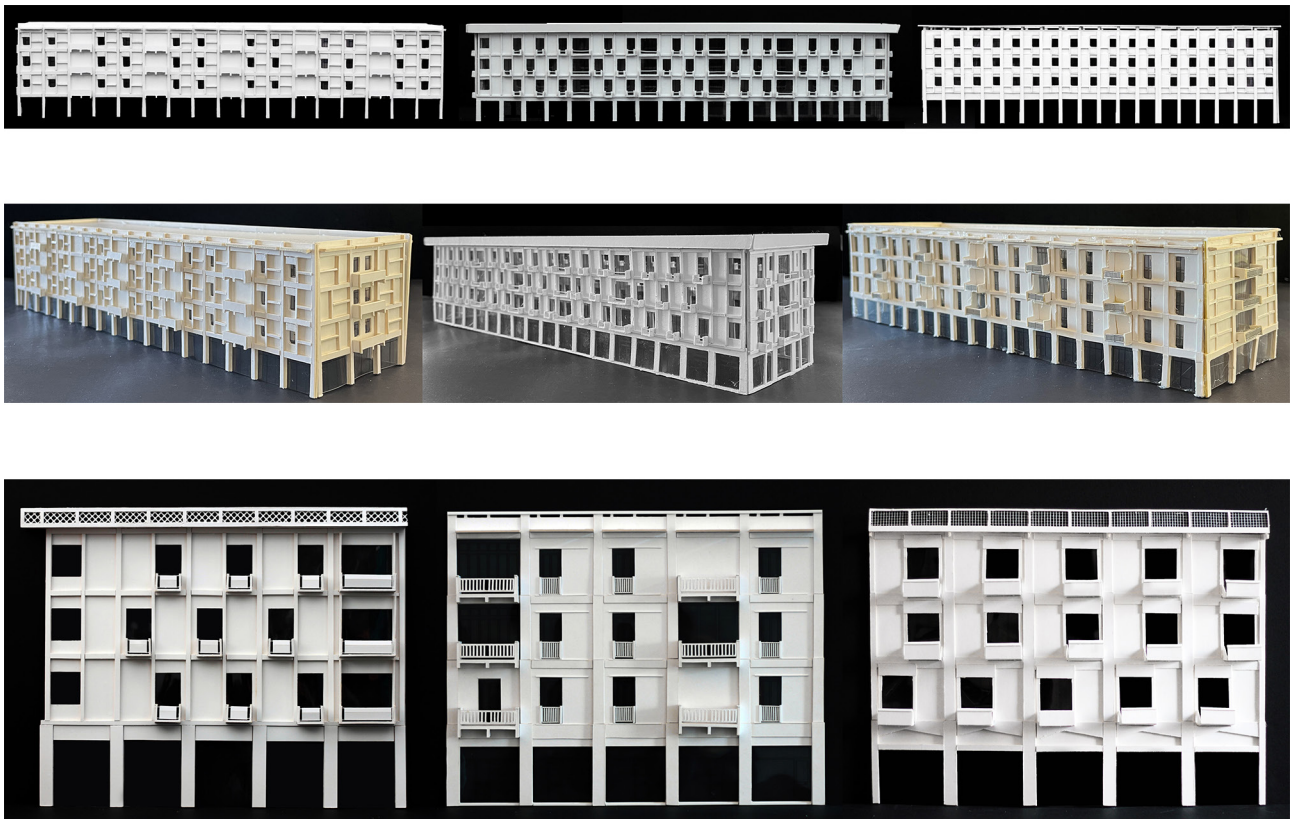
In the different scales of the model, the configuration of the architecture is shown in the reproduction of the span and finds the character of the urban space in the shape of the blocks and their aligned arrangement. The abstraction of facade models is directed to show the relationships

that hold elements together in the configuration of parts. Transferring the three-dimensional reality to the geometric plane and still transport to a codified three-dimensional level simulates the process of abstraction and conceptual re-composition of the project.

The focus is on the qualitative difference of the span in which the clarity of the compositional character; order and measure highlight the identity of the entire urban compartment.

The modest presence of thickness in Samonà's facades and the modularity of surfaces, emphasizes a vertical building and the pronounced prominence of balconies accentuates grazing shadows. Each building subtends a syntactic order that is repeated in the building that precedes it and in the one that follows it; the alternating composition of the bays and the prominence of the balconies and loggias exclude them from the banal and from that 'linguistic routine' that finds in modernism the academic conventions of architectural identity.

Fig. 4. Cortina del Porto of Messina, models of the facades and urban block, scale 1:200; models of the spans, scale 1:50 (Course of Architectural Drawing 2008-2012, Mediterranea University of Reggio Calabria, Prof. P. Raffa).



To overcome the limits of material physicality, each model made at the scale 1:200 is joined by models of the facades at the scale 1:100 and of five spans of the facade at the scale 1:50 (fig. 4).

"Classical theory assimilates the maquette to a perspective representation whose purpose is to judge the 'overall effect' of the building [...] this does not mean that the maquette can represent all the features of the building" [Croset 1985, p. 48] in order to achieve a deeper knowledge "it is advisable according to Alberti to employ 'numerous' maquettes, in order to reach [...] that point of certainty which is attainable only when each architectural element is precisely defined" [Croset 1985, pp. 48, 49] [12].

The single-family tower houses proposed by Osvald Mathias Ungers for Marburg [Ungers 1977] constitute a variation on the theme of the urban block to the point of total deconstruction into individual dwelling units measuring 6.5x6.5 m for a height of no more than thirteen meters.

The production of 1:100 and 1:50 scale models of the thirteen typological declinations set on a constant grid in plan and volume shows how morphological unity is not given by the homogeneity of formal language but by the mutual interaction between each unit (fig. 5).

The model belies the one axonometric view in which houses are represented as isolated units and highlights the network of relationships established by their different possibility of aggregation, and the definition of different figurative compositions.

In the production of the architectural model whose purpose is that of compositional research and comparison between the parts, the dialectical overcoming of the antithesis between two-dimensional representation and 'spatial construction' is symbolized by the use of white cardboard, an aseptic dimension, of vague Suprematist conception, in which through the simplicity and linearity of the material the theoretical concept prevails over that of the real. And Philippe de l'Orme is of the opinion that monotonic and even imperfect models should be proposed "as long as their proportions and measurements are well respected" [Croset 1985, p. 50] [13] to ensure the relationship between the parts.

The control of the form of an architecture through the model recalls the concepts of harmony and proportion, in which the possibility of deconstruction and re-aggregation of volumes, or of parts in general, allows for the enunciation of geometric, morphological, and dimensional declinations, but also of relationship, perception, and communication [Albisini, De Carlo 2011].

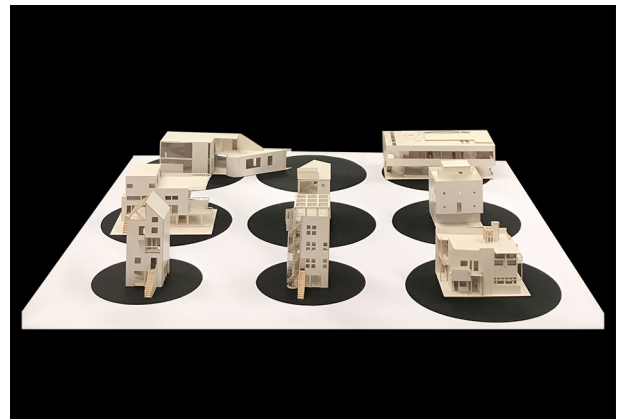
The International Garden Festival of Chaumont-sur-Loire is a competition that has been held every year since 1992 from November to April with the realization of winning gardens design. Twenty gardens of about 200 square meters surrounded by a hedge with the perimeter of a bell become places of sensory experimentation. A sequence of ephemeral gardens that deal with plurality of languages and symbologies; they are episodes of the gaze and the senses made with temporary and reversible materials not bound to long duration.

The representation of a garden is a issue of signs. Each sign in fact expresses a changing condition that refers to a configuration capable of translating the image of a changing reality. Vegetation must be represented from a process of interpretation and selection capable of highlighting the characters of the plant element, of aggregation with other similar elements, of the formation of space.

For the building of the models of the Chaumont-sur-Loire gardens, it was necessary to describe the individual materials in topological terms and reduce the vegetation types to schematic form. The juxtaposition of different materials and different properties ensured the physical nature of the represented object while leaving out mimetic characteristics.

The model of the gardens (fig. 6) is made at the scale of 1:100 by referring to the design drawings. The relationship between the material and the object represented in the

Fig. 5 White cardboard models for architectural knowledge and analysis, scale 1:00 (Course of Architectural Drawing 2016-2018, Mediterranean University of Reggio Calabria, Prof. P. Raffa).



model lies in schematic abstraction and synthesis, in expressive meaning rather than simulation.

For surfaces (paths, lawns, pavements, platforms) and linear elements (hedges, bushes, baffles, benches) the material analogy is reproduced with sheets of colored cardboard of different thicknesses, wooden strips, balsa wood, cotton thread, wire mesh, but also with natural materials such as seeds juxtaposed to reproduce roughness, abrasive papers or sands. For the reproduction of trees, a repertoire of shapes associated with the most common species was created: iron wires shaped in the shape of tree crowns, or coiled into spirals for branches. Textures, textures and colors, respond to tactile and visual needs, to reproduce expressive rather than imitative values of the physical characteristics of each element.

The model for territory knowledge presupposes a high capacity for synthesis and schematization, in which form, size and matter must overcome the mimetic limit and lead each

element back to the schematic characteristics that make it recognizable in repetition and juxtaposition.

The scale of representation and the choice of material become the main conditions for the management and reproduction of the lay of the ground, the volumetry of the built elements, the different types of vegetation. The overlapping of sheets of cardboard, the thickness of which should correspond in scale to the value of the equidistance between the contour lines, will serve for the modeling of the terrain, the schematic volume of the buildings will include only the trace of the holes and the roof course, with the same level of schematicity the streets, squares, walls, the lighting system will be made [Colistra 2003]. Important becomes the definition of the themes that the model wants to communicate since the overall finish depends on this, such as treating the entire portion of the area with one homogeneous color or highlighting the different thematic areas with different colors (fig. 7).

Fig. 6. Models of the projects for the Festival of Gardens of Chaumont-sur-Loire, scale 1:100 (Course of Landscape Representation 2010-2012, Mediterranean University of Reggio Calabria, Prof. P. Raffa).



Conclusions

The usualness of virtual models, the abundance of information of intangible places that can replicate visual conditions and simulations of spaces, puts us in a position to associate virtual visualizations with the real world; however, the real, tactile and qualitative conditions of natural light, for example, are confined to two-dimensionality. The search for spatial and formal quality, that is, that portion of space carved out of the physical world that is transformed by the insertion of a new organism still finds its best referent in the physical model.

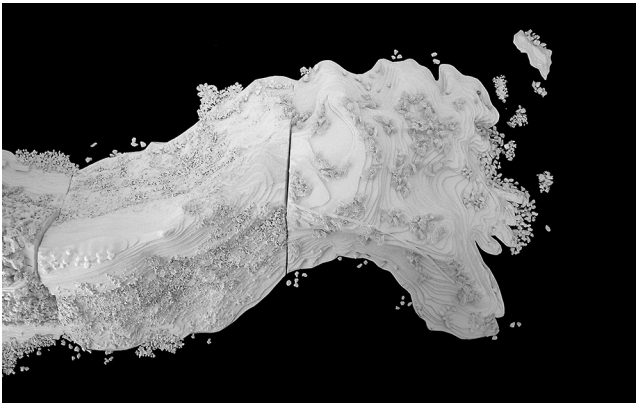
The model "in its dimension as an object interacts with the physical world through the control of form and the use of the senses" [Migliari 2004, p. 19] [14] reproducing the material texture of built architecture communicates the idea of space and volume that occurs in real space.

Models, in constructing sequences of images that reproduce existing or planned buildings

fulfill the task of tools for knowledge. The underlying rules of architecture are materialized, deconstructed and recomposed in that dialectical process in which thought takes form and becomes space. Representing an architecture by separate parts that selectively describe its characteristics, reducing to fragments of forms, compositional units and then reassembling them in their configuration becomes a useful cognitive exercise in the investigation of architecture.

In order to give figurativeness to architecture, "it is necessary to produce, albeit synthetically, an analytical scheme that allows the functions of design elaboration to be read coherently [...] this is made necessary in order to bridge the growing gulf between conception and realization, but also to give the design text a more unambiguous and objective character" [Ragazzo 1996, p. 19] [15].

Fig. 7. Models of Capo Milazzo and Capo Peloro, scale 1:500 (Course of Architectural Drawing 2010-2012, Mediterranea University of Reggio Calabria, Prof. D. Colistra).



Notes

[1] «Il modello è uno strumento di rappresentazione [...] uno strumento di verifica, spesso temporanea e parziale [...] uno strumento di dichiarazione poetica» [Vragnaz 1987, p. 5] (translated by the author).

[2] «evoca così le nozioni di misura, di norma, di ritmo, di modo, di limite, fino ad assumere il senso platonico di "forma ideale" di paradigma sul quale si regolano le esistenze materiali [Croset 1987, p. 47] (translated by the author).

[3] «a partire dal dato geometrico, fondamento per la costruzione architettonica, procede alla sua decostruzione, attraverso la deformazione prima e la decomposizione poi» [...] «attuata spostandosi da un senso, una direzione, un significato, un piano, uno spazio, a un altro, fino all'apparente non-senso, non-direzione, non-significato, non-piano, non-spazio» [Ciucci 1995, p. 9] (translated by the author).

[4] «Il plastico assonometrico nega la rotazione sia dell'oggetto, sia

dell'osservatore, costringendo questo e quello all'immobilismo dell'unico punto di vista determinato» [Ciucci 1995, p. 9] (translated by the author).

[5] «la figura insomma che l'architettura assume nel manifestare sé stessa» [Cellini 2006, p. 93] (translated by the author).

[6] «assume grande importanza soprattutto per le relazioni che i vari sistemi metrici hanno [...] con la definizione delle scale dimensionali tipiche delle diverse poetiche compositive» [Sacchi 1994, pp. 73, 74] (translated by the author).

[7] «una razionalità invisibile dell'edificio» [Sacchi 1994, p. 85] (translated by the author).

[8] «le capacità espressive della dimensione scalare» [Pacciani 1987, p. 9] (translated by the author).

[9] «svolgendo nell'artificio il ruolo dell'artefatto» [Guillermes 1987, p. 31] (translated by the author).

[10] «loro ponderazione in uno spazio tridimensionale nel quale, tra l'altro, di fondamentale importanza risulta essere il movimento, la mancanza di un punto di vista privilegiato» [Pagnano 2003, p. 11] (translated by the author).

[11] «una strategia conoscitiva in cui gioca un ruolo decisivo l'idea di similitudine rispetto alla realtà» [Migliari 2004, p. 47] (translated by the author).

[12] «La teoria classica assimila la maquette a una rappresentazione prospettica il cui scopo è quello di giudicare l'"effetto d'insieme" dell'edificio [...] ciò non vuol dire che la maquette possa rappresentare l'insieme delle caratteristiche dell'edificio» [...] «si consiglia secondo Alberti di impiegare "numerose" maquette, allo scopo di raggiungere [...] quel punto di certezza che è raggiungibile solo quando ogni elemento architettonico è definito con precisione» [Croset 1985, p. 48, 49] (translated by the author).

[13] «basta che le loro proporzioni e le loro misure siano ben rispettate» [Croset 1985, p. 50] (translated by the author).

[14] «nella sua dimensione di oggetto interagisce con il mondo fisico attraverso il controllo della forma e l'uso dei sensi» [Migliari 2004, p. 19] (translated by the author).

[15] «occorre produrre, seppur sinteticamente, uno schema analitico che consenta di leggere in modo coerente le funzioni dell'elaborazione progettuale [...] ciò è reso necessario per colmare la crescente divaricazione tra idea e realizzazione, ma anche per conferire al testo progettuale un carattere più univoco e oggettivo» [Ragazzo 1996, p. 19] (translated by the author).

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